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A WISE DESTINATION IN CONSTRUCTION:

THE ROLE OF TECHNOLOGY IN A GEO-DESTINATION

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Declaração de autoria de trabalho

Declaro ser o(a) autor(a) deste trabalho, que é original e inédito. Autores e trabalhos consultados estão devidamente citados no texto e constam da listagem de referências incluída.

Sofia Maria Vaz Soeiro

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(assinatura)

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RESUMO

Os Geoparques Mundiais da UNESCO são territórios que se distinguem por integrarem património geológico de importância internacional com estratégias de desenvolvimento sustentável e envolvimento das comunidades locais (UNESCO, 2025c). O seu modelo de gestão holístico, focado em três áreas fundamentais - geoconservação, geoeducação e geoturismo (UNESCO, 2024) - alinha estes territórios com os Objetivos de Desenvolvimento Sustentável (ODS) da UNESCO (Gabriel, Moreira, Alencoão, Faria, Silva & Sá, 2018; United Nations, 2024) e, neste contexto, o geoturismo, em particular, é visto como uma ferramenta para alavancar a sustentabilidade económica, social e ambiental do território (UNESCO, 2024).

Contudo, o geoturismo enfrenta novos desafios que refletem problemáticas globais no setor turístico, como o turismo de massas, que já afeta negativamente alguns geoparques (Drápela, Pánek, Boháč & Böhm, 2025). Embora o turismo possa ser um aliado vital na gestão de áreas protegias (Fernandes, Castro & Tracana, 2020; Gordon, 2018) é igualmente reconhecido como uma das indústrias com maior pegada ecológica (Dolnicar, 2020) Importa, no entanto, clarificar que os Geoparques Mundiais da UNESCO não são áreas protegidas, embora partilhem objetivos comuns relacionados com a conservação, a educação e o desenvolvimento sustentável. Neste contexto, o papel das tecnologias torna-se particularmente relevante, uma vez que podem apoiar a monitorização, a conservação do património e a gestão sustentável dos visitantes em territórios que não dispõem de um estatuto formal de proteção. Além disso, a complexidade de conceitos geológicos dificulta a sua comunicação de forma simples e eficaz, o que reforça a pertinência de estratégias de *marketing* alinhadas com perfis de públicos e facilitadoras de ações de interpretação mais eficazes, assim como potenciadoras de experiências turísticas apelativas para públicos não especializados (Dowling, 2011). A Declaração de Arouca, assinada em 2011, no âmbito do Congresso Internacional de Geoturismo realizado no geoparque Arouca, Portugal, é um documento orientador que estabelece os princípios do geoturismo, defendendo a inovação na valorização do património geológico e encorajando o recurso a novas tecnologias, em substituição de métodos tradicionais (Arouca Declaration, 2011).

A literatura em gestão e marketing aplicada ao turismo e aos territórios, incluindo geoparques, tem vindo a explorar diversos conceitos para responder a estes desafios. Neste contexto, por exemplo, o s*low tourism* surge como uma alternativa ao turismo de

massas que propõe a desaceleração do visitante em contexto de viagem através da sua imersão em experiências únicas (Mavric, Öğretmenoğlu & Akova, 2021; Valls, Mota, Vieira & Santos, 2019). A filosofia slow em geoparques da UNESCO não é inédita, embora escassa (Fusté-Forné, 2023). Trata-se de uma filosofia cujo modelo de desenvolvimento turístico de valorização do território converge com os princípios orientadores dos Geoparques da UNESCO (Fusté-Forné, 2023) e potencia abordagens inspiradas no turismo regenerativo que, além de mitigar eventuais efeitos negativos, procura enfatizar os impactos positivos através de ações regenerativas e transforadoras nos territórios, comunidades e visitantes através da experiência turística (Duarte, Cousins, Ficociello, Williams & Khowala, 2024).

Neste contexto, a Arouca Declaration (2011) reconhece o papel das novas tecnologias no centro da construção de um destino *smart*. A literatura explora o conceito de s*mart destinations* e esclarece que o seu foco é a utilização da tecnologia para otimizar a gestão do destino, melhorar a qualidade de vida dos residentes e aumentar a qualidade das experiências turísticas (Gretzel, Werthner, Koo & Lamsfus, 2015). As tecnologias têm sido vistas como ferramentas versáteis e adaptáveis, acessíveis e de fácil aceitação, especialmente por gerações mais jovens, com potencial para influenciar atitudes dos visitantes (Fassoulas, Nikolakakis & Staridas, 2022; Alyahya & McLean, 2022; Tussyadiah, Wang & Jia, 2017; Pradhan, Malik & Vishwakarma, 2023), melhorar a acessibilidade (Ozdemir, 2021; Beck, Rainoldi & Egger, 2019) e fomentar a co-criação (Jovicic, 2019).

É neste cruzamento entre a necessidade de responder a desafios de longo prazo, integrar a sustentabilidade e inovar ao nível tecnológico que surge o conceito de *wise destination*. Definido como uma evolução das *smart destinations*, é uma estratégia de gestão do destino que integra as tecnologias de forma mais humana tirando partido dos benefícios do uso tecnologia, mas tendo em consideração a sustentabilidade, o envolvimento das comunidades, o bem-estar e a necessidade de criar equilíbrio oferecendo oportunidades para a desconexão (Coca-Stefaniak, 2020).

Tendo como base uma extensa revisão de literatura, em particular, em torno dos conceitos de *smart destination*, *slow tourism*, turismo sustentável e regenerativo, é proposta uma *framework* conceptual que relaciona, no contexto de geoparques e geoturismo, conceitos como o *wise destination* e o papel de novas tecnologias na melhoria da experiência do

visitante e na promoção de práticas de turismo sustentável, regenerativo e inclusivo. Apesar de reconhecido o seu potencial no contexto turístico contemporâneo, o conhecimento teórico e empírico sobre o conceito é escasso. Por exemplo, desde a conceptualização do conceito *wise destination*, foram desenvolvidos modelos conceptuais para um *post-smart destination*, na Indonésia (Kusumastuti, Pranita, Viendyasari, Rasul & Sarjana 2024; Pranita, 2023), mas ainda não foi explorado em geoparques e geoturismo. Assim, o objetivo deste estudo é explorar caminhos para desenhar uma estratégia de *wise destination* no contexto dos Geoparques Mundiais da UNESCO, com foco no Geoparque Algarvensis, localizado no Algarve, sul de Portugal, é um território que apresenta uma combinação de zonas costeiras, que, no verão são afetadas pelo turismo de massas, com áreas do interior de baixa densidade populacional, enfrentando desafios de coesão territorial e desenvolvimento sustentável. A nível económico, o turismo constitui uma das principais atividades, sendo o geoturismo uma oportunidade para diversificar a oferta, valorizar os recursos endógenos e promover uma maior ligação entre visitantes e comunidades locais.

A investigação adotou uma abordagem qualitativa, dada a natureza exploratória do tema. Os dados foram recolhidos através de cinco *focus groups* com *stakeholders* do território do Geoparque Algarvensis: residentes, associações locais, entidades regionais de turismo e meio ambiente, operadores turísticos e os técnicos da equipa do geoparque.

A análise temática permitiu organizar os resultados em seis dimensões: *Geo-smart destination*; Comunicação da marca; Sustentabilidade; Barreiras à implementação; Impactos do uso da tecnologia e *Geo-wise destination*. Os resultados deste estudo indicam um forte consenso entre os *stakeholders* sobre o potencial da tecnologia para transformar o Geoparque Algarvensis numa *wise destination*. Os participantes identificaram uma ampla gama de soluções tecnológicas, incluindo realidade virtual e aumentada, gamificação, redes sociais, entre outras, para criar *smart experiences,* imersivas e educativas, e promover um *smart business ecosystem* colaborativo entre os parceiros locais. Foi identificado o potencial da tecnologia para comunicar a marca Algarvensis, tornando conceitos geológicos complexos mais acessíveis e contribuindo para uma estratégia integrada de comunicação. Além disso, a tecnologia foi considerada uma ferramenta fundamental para promover a sustentabilidade através da monitorização dos visitantes, da conservação do património, por exemplo a proteção de locais vulneráveis ou inacessíveis através de alternativas virtuais e da melhoria da acessibilidade. Apesar

desta perspetiva positiva, foram identificadas barreiras significativas, incluindo custos de implementação elevados, desafios operacionais como a falta de conhecimento técnico e fatores sociais relacionados com a literacia digital dos visitantes ou o desejo desconexão em períodos de lazer. Fundamentalmente, as conclusões reforçam o papel central das novas tecnologias no desenho de um destino *smart* mas, simultaneamente, identificam pistas que podem alavancar uma abordagem *wise* que envolve reinterpretar estrategicamente as fraquezas do território, como áreas sem internet, e transformá-las oportunidades para criar zonas de *detox* digital, num equilíbrio entre a inovação tecnológica e a promoção do bem-estar e a conexão autêntica com o território.

Os resultados deste estudo contribuem para o avanço do conhecimento em torno do conceito *wise destination*, em articulação com tecnologias *smart*, num território onde o turismo *slow* e regenerativo definem uma estratégia alinhada com critérios da Arouca Declaration, (2011) para o geoturismo e os objetivos de desenvolvimento sustentável da United Nations (2024). As implicações para a gestão são também discutidas, nomeadamente em Geoparques Mundiais da UNESCO.

Palavras-chave: Wise destination, Smart destination; Slow Tourism; Turismo Regenerativo; Geoturismo; Geoparques Mundiais da UNESCO.

ABSTRACT

UNESCO Global Geoparks are territories that integrate the geological heritage of international relevance with strategies for sustainable development and participatory governance. It encompasses geoconservation, geoeducation, and geotourism, positioning them as laboratories for the articulation of natural and cultural values with socioeconomic advancement. Nevertheless, geotourism faces new challenges, including mass tourism, the ecological footprint associated with tourism mobilities, and the inherent complexity of translating geological knowledge into accessible and meaningful narratives. In response, the *Arouca Declaration* underscores the imperative of innovation and technological incorporation as vectors of resilience and transformation. Parallel discourses in the tourism literature have addressed such challenges through the paradigms of slow tourism, regenerative tourism, and smart destinations.

Against this backdrop, the present study advances a conceptual framework that links these paradigms to the emergent construct of a *wise destination* considered a strategy in which technological infrastructures are integrated in a human-centred manner, privileging sustainability, community participation, well-being, and the facilitation of disconnection. Despite its potential, the corpus of theoretical and empirical research on wise destinations remains embryonic. Post-smart destination models have begun to emerge, however, their application within geopark contexts remains unexamined.

Therefore, the objective of this investigation is to delineate potential pathways for a wise destination construction within UNESCO Global Geoparks, focusing on the Algarvensis Geopark, located in the Algarve region, Portugal. In Algarvensis, the tensions between coastal zones, subjected to the pressures of intensive mass tourism, and inland territories, characterised by structural challenges of cohesion and development asymmetry, are daily challenges to deal with.

Methodologically, the study adopts a qualitative design, comprising five focus groups with key stakeholders. The empirical evidence reveals a strong consensus regarding the transformative role of technology in reconfiguring Algarvensis as a geo-wise destination. Stakeholders emphasised the capacity of digital innovation to enable immersive and educational visitor experiences, foster a smart business ecosystem, strengthen territorial branding, advance sustainability imperatives, enhance heritage conservation, and improve accessibility. Although barriers to implementation persist, findings indicate that

such challenges may be reframed as opportunities for the strategic valorisation of territorial weaknesses.

This research contributes to the theoretical consolidation of the wise destination construct by demonstrating its applicability to UNESCO Global Geoparks. It further highlights the potential of integrating smart technologies with slow and regenerative tourism strategies, thereby reinforcing the normative orientations established in the *Arouca Declaration* and United Nations sustainable development agenda. Management implications are also articulated, particularly within UNESCO Global Geoparks as multifunctional territories at the interface of (geo)heritage, community, and tourism

Keywords: Wise destination; Smart destination; Slow Tourism; Regenerative Tourism; Geotourism; UNESCO Global Geoparks

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CHAPTER 1: INTRODUCTION

The global tourism landscape is defined by a series of powerful and conflicting forces. On one hand, the digital revolution has profoundly transformed the tourism landscape, with smart technologies reshaping how destinations interact with visitors, manage resources, and deliver experiences (Buhalis & Amaranggana, 2013). However, the hyperconnectivity that characterises today's modern society has created a growing need among tourists to disconnect from their digital devices in order to preserve their mental health and recover from states of exhaustion and burnout during their holidays (Stankov, Gretzel, Vujičić, Pavluković, Jovanović, Solarević & Cimbaljević, 2022). At the same time, in recent decades, tourism has become one of the most criticised industries for its contribution to environmental degradation (Dolnicar, 2020). The rapid growth of mass tourism has led to the overloading of destinations, reducing the quality of the tourist experience and compromising long-term sustainability (Coca-Stefaniak, 2020; Drápela et al., 2025).

These dynamics affect different actors in different ways. For visitors, there is the difficulty of finding authentic, sustainable, and immersive experiences while seeking opportunities for digital disconnection during their holidays (Díaz-Meneses & Estupinán-Ojeda, 2022; Hassan & Saleh, 2024; Jovicic, 2019). For local communities, the dilemma lies in how to benefit from tourism for the sustainable development of the territory without compromising their resources and ways of life (Sapkota, Palamanit, Techato, Gyawali, Ghimire & Khatiwada, 2024).

Nowhere else are these challenges more concentrated and acute than in UNESCO Global Geoparks. As designated territories of international geological importance, geoparks have a mission to balance three central dimensions: geoconservation, geoeducation, and geotourism (UNESCO, 2024). This holistic approach presents them with the delicate task of protecting priceless heritage while promoting sustainable development through geotourism (UNESCO, 2025b). For Geoparks, the global problem of overtourism is an existential threat to their core mission (Drápela et al., 2025), as sustainability in these territories is not just an aspiration but a fundamental principle (UNESCO, 2025b). Furthermore, the Arouca Declaration (2011) emphasises the importance of innovation, arguing that traditional methods are often insufficient to communicate complex geological concepts to a wide audience, encouraging the use of new technologies to make

this communication more accessible, intelligible, and attractive. Geoparks thus constitute a critical microcosm where the central dilemmas of modern tourism can be analysed and addressed.

Tourism management and marketing literature has explored different ways to navigate these challenges. The philosophy of slow tourism emerges as a direct alternative to mass tourism, promoting more immersive and conscious experiences (Manthiou, Klaus & Luong, 2022). Fusté-Forné, (2023) has made significant progress in this area by being one of the first to analyse the application of slow tourism specifically in the context of a geopark, the Basque Coast Geopark in Spain. This qualitative study concluded that this approach aligns perfectly with the philosophy of geoparks, enhancing sustainability, incorporating regenerative tourism principles, and reinforcing regional identity. However, the research focused primarily on the slow philosophy, without exploring in depth how it could be integrated with technological innovations to respond holistically to the challenges of geoparks and the need for innovation identified by the Arouca Declaration (2011). Serdane, Maccarrone-Eaglen, and Sharifi (2020) identify precisely this need to conceptualize new ways of harmonizing the slow philosophy with modern technologies, since even slow tourists continue to use digital devices while traveling.

The concept of smart destinations has been a widely researched topic, emphasising the strategic adoption of technologies to improve visitor experiences and residents' quality of life (Buhalis & Amaranggana, 2013; Cerdá-Mansilla, Tussyadiah, Campo & Rubio, 2024). Recent research shows that technologies have the potential to provide more personalised experiences, increasing visitor satisfaction and loyalty (Suanpang & Pothipassa, 2024), improve destination promotion and establish co-creation (Jovicic, 2019), influence visitor attitudes (Alyahya & McLean, 2022), and enable virtual visitation experiences that can contribute to the sustainable management of protected sites (Tussyadiah et al., 2017). In the context of geoparks, the work of Fassoulas, Nikolakakis, and Staridas (2022) offers crucial empirical validation of the application of smart technologies in the context of geoparks. Analysing the case study of the Psiloritis Geopark in Greece, the authors demonstrate how digital tools, such as interactive maps and hybrid virtual and augmented reality environments, have been successfully implemented, doubling the visibility of the geopark during the COVID-19 pandemic. However, just as Fusté-Forné's (2023) analysis focuses on the slow philosophy, the study by Fassoulas et al. (2022) analyses the smart paradigm in isolation, without exploring the inherent tension

between digitalisation and the growing need for disconnection and well-being nor its potential for active sustainability management, such as monitoring impacts or controlling visitor flows.

Agapito & Guerreiro (2023) developed a theoretical framework specifically to fill this gap, integrating the concepts of slow tourism, multisensory experience design, and smart destinations. The "Slow, Sensory and Smart" framework proposes a holistic and participatory process for designing accessible and sustainable experiences, arguing that technology, when used in a smart way, can enhance the experience for everyone without undermining the philosophy of slow tourism. However, this framework focuses on the visitor experience and does not consider visitors' new need to disconnect. Coca-Stefaniak (2020) presented the concept of the wise destination as an evolution of the smart concept, rethinking the implementation of smart technologies, addressing tourism-related challenges and, at the same time, adopting slow tourism strategies to prioritise human connection and sustainable development. As far as the authors know, no previous study addresses the concept of wise destinations within UNESCO Global Geoparks.

In this context, the Algarvensis Geopark stands out as a particularly relevant case. Still in the early stages of developing its geotourism strategy, it offers the opportunity to structure a model aligned with the principles of wise destination, from the very beginning, through a management approach involving local communities, following a bottom-up strategy (UNESCO, 2025c) and serving as a reference for other destinations and UNESCO Global Geoparks.

Leveraged by the aforementioned gaps, this research aims to explore paths towards a wise destination in the context of UNESCO Global Geoparks. In order to achieve the aim of this study, the following research goals were considered: 1) Identify which smart technologies can be implemented in the Algarvensis Geopark to effectively communicate its brand and enhance the visitor experience; 2) Analyse how can technology contribute to more sustainable, accessible, and inclusive tourism and better land management within the Algarvensis Geopark; 3) Identify the barriers that hinder the adoption of smart technologies in the Algarvensis Geopark; 4) Explore how the wise destination concept can be designed for the Algarvensis Geopark. These objectives were explored through five focus groups. Focus groups are a technique in which a small group of participants discuss selected topics for one to two hours with the intervention of a moderator (Tynan

& Drayton, 1988), allowing for an in-depth understanding of the perceptions of the participants (Campos, Guerreiro & Beevor, 2023). Part of the empirical data used in this study derives from a broader research project entitled "Shaping the Future: Strategic Insights for Geotourism Development in the Aspiring Geopark Algarvensis", in which the authors actively participated (Guerreiro, Pinto, Sequeira, Cruz, Henriques, Branco & Soeiro, 2024). Within that project, four focus groups were conducted with key stakeholders of the Algarvensis Geopark territory: residents, local associations, regional tourism and environmental entities and tourism operators, reflecting the participation-based management model of UNESCO Global Geoparks, in which the involvement of local communities is mandatory (UNESCO, 2025c). For the purposes of this dissertation, only the data related to the use of technologies, was analysed, in line with the specific objectives of the present research. A fifth focus group was held with the Algarvensis Geopark team to also explore their perceptions about technology. Therefore, the construction of a geo-wise destination, a wise destination within a geo-destination, is a major theoretical contribution of this study. Considering that a geo-destination is a territory whose core experiential value is intrinsically linked to its unique geographical, geological, and cultural identity, when such a destination integrates technology in line with the principles of a wise destination (Coca-Stefaniak, 2020), it evolves into a geo-wise destination. a place that uses technology intelligently and strategically to enhance the unique identity of the territory, mitigate potential problems associated with tourism, promote better territorial management, enrich visitor experiences, deepen understanding of local geology, and create a harmonious balance between digital connection and disconnection. The construction of a geo-wise destination must follow a bottom-up process, emerging through dialogue with those who live and work in the territory, rather than a purely top-down approach (UNESCO, 2025c). The key to successful sustainable tourism development lies in a Customer Destination-Based Experience (CDBE) approach (Piedade, Guerreiro & Pinto, 2024) where a bottom-up approach, guided by local knowledge, can authentically curate the design of geo-wise experiences, thereby fostering powerful positive emotions.

This research is structured as follows: following this introduction to the research topic, a literature review was carried out in Chapter 2, which resulted in a conceptual framework that demonstrates the potential of the geo-wise destination concept and how it can be designed in conjunction with other relevant theoretical concepts. Chapter 3 presents the

research methodology, Chapter 4 demonstrates and discusses the results obtained, and Chapter 5 systematizes the main conclusions and implications of the study.

CHAPTER 2: THEORETICAL BACKGROUND

2.1. Geoparks and UNESCO

Geological heritage was recognised for the first time as an area of importance for the conservation of geological sites in 1991, at the 'First International Symposium on the Conservation of Geological Heritage', held in France. The first geoparks emerged between 1995 and 1999, leading to the creation of the Global Geoparks Network in 2004 and the establishment of the UNESCO Global Geopark designation in 2015 (Global Geopark Network, 2024).

UNESCO Global Geoparks are characterised as unique and unified geographical areas that contain sites and landscapes of international geological significance and that adopt a holistic management approach that seeks to involve and empower local communities, fostering a sense of pride in their region and greater identification with the territory. This concept has become increasingly popular, and as of April 2025, there are 229 UNESCO Global Geoparks in 50 countries (Figure 2.1), including six UNESCO Global Geoparks and two aspiring UNESCO Global Geoparks in Portugal (UNESCO, 2025d).

Figure 2.1. UNESCO Global Geoparks

Source: (Global Geopark Network, 2024b)

A UNESCO Global Geopark aims to explore, develop and celebrate the connections between the region's natural, cultural and intangible heritage (UNESCO, 2025c) while contributing directly to the UN's Sustainable Development Goals by promoting sustainable tourism practices, environmental preservation and social inclusion (Gabriel et al., 2018; United Nations, 2024) and simultaneously creating or developing the economic, tourist and social value within their territories (Fernandes et al., 2020).

The UNESCO Global Geopark designation is valid for four years, after which each Geopark undergoes an exhaustive revalidation, failure to comply with the following criteria results in corrective measures and the possible revocation of the designation (UNESCO, 2025c). According to UNESCO (2015), to obtain and maintain this status, it should be a unified geographical area with clear boundaries, sufficient size, and geological heritage of international significance verified by experts. The geological heritage should be integrated into the area's natural and cultural heritage to raise awareness of societal issues, such as climate change. The management body should have a legal existence recognized by national legislation and be equipped to manage the Geopark in its entirety. In the event of overlap with other UNESCO designations, such as the Biosphere Reserve, the Geopark must add value and maintain its distinct identity, while fostering synergy between designations. Local communities and indigenous people should be involved as key stakeholders, through a co-management plan that responds to their social, economic, and cultural needs. Furthermore, membership in the Global Geoparks Network is mandatory, encouraging collaboration and knowledge sharing. And finally, geological sites must be legally protected, with the sustainable use of materials permitted only under strict and justified conditions to support education and science.

2.1.2 Geotourism in Geoparks

Geotourism is one of the three main areas of activity of a UNESCO Global Geopark (UNESCO, 2024) and one of the more recent concepts in tourism studies (Ólafsdóttir & Tverijonaite, 2018). Although it has similar connections with ecotourism, cultural and adventure tourism, it is not synonymous with any of these forms of tourism (Dowling, 2011). Early definitions, like the one by Hose (1995), narrowly defined it as a tourism practice that goes beyond mere aesthetic appreciation by providing interpretive and service-oriented facilities to enhance visitors' understanding of geological and geomorphological features and their scientific significance. Adopting a broader

perspective, Newsome and Dowling (2010) conceptualize geotourism as geologically grounded, environmentally educative, capable of generating tourist satisfaction, sustainable, and locally beneficial. Aligning with this integrated view, the National Geographic recognizes geotourism as a branch of sustainable tourism (Ólafsdóttir & Tverijonaite, 2018), although it is recognized as a particular conceptualization (Dowling, 2011), mainly within (UNESCO, 2024).

Signed in 2011 at the "International Congress of Geotourism" held in Portugal´s Arouca, Geopark, under the auspices of UNESCO, this declaration clearly defines the concept of geotourism by stating that:

> "We recognize that there is a need to clarify the concept of geotourism. We therefore believe that geotourism should be defined as tourism which sustains and enhances the identity of a territory, taking into consideration its geology, environment, culture, aesthetics, heritage and the well-being of its residents. Geological tourism is one of the multiple components of geotourism" (Arouca Declaration, 2011:1)

The Arouca Declaration also advocates innovation in the appreciation of geological heritage, encouraging the use of new technologies instead of traditional methods (Arouca Declaration, 2011).

While some criticise tourism for driving environmental devastation motivated by financial gains and increasing social inequalities (Bellato, Frantzeskaki & Nygaard, 2023), others highlight its positive impacts, particularly as a vital ally in managing protected areas (Fernandes et al., 2020; Gordon, 2018). However, UNESCO Global Geoparks are not legally designated protected areas and do not constitute a formal legislative category, nevertheless, they should actively contribute to the conservation and sustainable development of their territories (UNESCO, 2022). In this context, smart technologies assume an even more strategic role, as they can support monitoring, conservation, and sustainable tourism management. In this positive perspective, geotourism is seen as having the capacity to foster local, inclusive, and sustainable economic development (UNESCO, 2024). Achieving this potential requires collaboration among all stakeholders to ensure the sustainability and enhancement of these spaces. This involves valuing local products and optimising resources to generate added value for society and the economy (Fernandes et al., 2020). Geoparks are particularly suited to fostering such collaboration, as their governance model inherently requires the active

involvement of local communities (UNESCO, 2025c). Given the context of this research, the definition established by the Arouca Declaration (2011) is adopted.

2.2 Slow and regenerative tourism

The concept of slow tourism originated from different slow movements that emerged in response to the fast paced of modern lifestyles. The first was the slow food movement, founded by Carlo Petrini in Italy as a reaction to fast food, defending food as a key element of a territory´s cultural identity and promoting the preserving of traditional cuisine, local ingredients and sustainable food practices (Slow Food, 2024).In 1989, the movement gained international recognition with the “The Slow Food Manifesto” (Slow Food, 2024) inspiring other movements, including Cittaslow (2024), or slow cities, which is currently an association that promotes a slower, more sustainable pace of life in urban environments, valuing local identity and quality of life.

Based on the slow philosophy of these movements, the concept of slow tourism emerged, some researchers claim that slow tourism is being adopted as an alternative to mass tourism (Fusté-Forné, 2023; Mavric et al., 2021), while others suggest that the growing demand for high-quality services and the focus on experiences has driven the interest in slow travel, focusing on high quality experiences that promote local culture, sustainability and zero-kilometre products (Valls et al., 2019) however, despite being widely discussed, there is no consensus on a definition of this concept (Manthiou et al., 2022; Mavric et al., 2021).

Serdane et al. (2020) state that slow tourism is not a distinct form of tourism but rather a mindset, a way in which tourists approach their travels with a "slow" perspective, prioritising quality over quantity in their travel experiences, encouraging longer stays with deep cultural immersion, shorter travel distances, meaningful interactions with hosts and locals and a shift away from overcrowded locations, all framed by an individual's sense of time rather than rigid schedules or the need to meet travel expectations. The authors identified four key dimensions of slow tourism: economic, environmental, ethical, and experiential, with the last one standing out as the most significant. This experiential focus aligns with the motivations for practising slow tourism identified by Oh, Assaf & Baloglu (2016), which include self-reflection, relaxation, escapism, the search for novelty, engagement, and discovery.

Valls et al. (2019) conducted a study in Madeira, Portugal, a region where tourism practices are aligned with slow tourism, even without consciously applying the concept. In interviews with local entrepreneurs, it was found that they believed that these longer and more personalised trips often lead to higher spending, which supports the idea that one consequence of slow tourism is its contribution to local economic development.

Another aspect found in the literature is the connection between slow tourism and sustainable development (Agapito & Guerreiro, 2023). However, some studies suggest that sustainability does not always emerge as a primary motivation for the practice of slow tourism; instead, sustainable behaviours are naturally promoted through the practice of this type of tourism (Manthiou et al., 2022; Serdane et al., 2020). Slow tourism allows tourists to explore relationships with the local people, places and practices in a manner that is sustainable and regenerative, as it integrates the concept of regenerative tourism (Fusté-Forné, 2023).

Tourism is one of the industries with the most significant ecological footprint (Dolnicar, 2020). To address the environmental and societal challenges it faces and contribute to the UN´s Sustainable Development Goals(United Nations, 2024), the tourism industry should move beyond sustainable tourism and embrace a regenerative tourism paradigm, shifting the focus from merely mitigating adverse impacts to actively creating positive ones (Duarte et al., 2024). While sustainable tourism only tries to reduce social-ecological damage, regenerative tourism goes further and tries to create positive effects on social-ecological ecosystems, building their capacity for regeneration (Bellato et al., 2023). For example, the seasonal availability of food products allows the destinations to offer contextualised experiences through the year (Fusté-Forné, 2023). According to Mathisen, Søreng & Lyrek (2022), a practical example of regenerative tourism is “The Harvesting Project”, an initiative developed by a company in northern Norway, in which guests actively participate in the planting and harvesting of seasonal crops, followed by activities involving the preparation of meals using the harvested produce. Furthermore, Duarte et al. (2024) highlight that this approach emphasises the value of a destination´s social, natural and cultural capital, creating enduring benefits for both people and the planet. However, the successful implementation of regenerative tourism also depends on raising awareness and building a shared understanding of the concept among tourists, employees and other stakeholders. This requires clear communication, education, and the use of

engaging tools such as storytelling and digital platforms to foster connection, shift mindsets and encourage active participation (Hajarrahmah, McGehee & Soulard 2024).

2.3 Smart and Wise Destinations

The other two concepts related to the tourism industry are smart cities and smart destinations. The term ‘smart’ is often used as a marketing label for anything integrated with or improved by technology (Boes, Buhalis & Inversini, 2015). According to Cerdá-Mansilla et al. (2024) the smart city was initially defined as a city with a long-term vision, but it was later expanded to address social and economic issues, being used as a strategy to combat poverty, inequality, and unemployment. Recently, the concept has typically been defined as an urban development strategy centred on applying information and communication technologies (ICT) across multiple sectors to improve the residents´ quality of life and the efficiency of city operations (Wang et al., 2025). However, some perspectives emphasise the role of human capital rather than focusing solely on technology, recognising the need for “smart citizens" to drive and sustain smart city initiatives (González-Reverté, 2019; Meijer & Bolívar, 2016).

Building upon the concept of smart cities, Buhalis and Amaranggana (2013) introduced the notion of smart destinations as a comprehensive framework that integrates key principles of competitiveness, sustainability, and inclusion. This concept encompasses both urban and rural areas and considers not only residents but also tourists, so the objectives of a smart destination extend beyond improving the residents ‘quality of life and also involve increasing the quality of tourist experiences (Gretzel, Sigala, et al., 2015). Addressing the lack of consensus around a holistic definition incorporating various stakeholder perspectives, Cerdá-Mansilla et al. (2024: 5) proposed defining a smart destination as: “a space in which all the agents involved in the destination collaborate in the efficient management of infrastructure and use technology to increase the quality of life of both locals and tourists”. Other authors also reinforce the idea that stakeholder collaboration is essential for the smart destination (Baggio, Micera & Chiappa, 2020; El Archi, Benbba, Nizamatdinova, Issakov, Vargáné & Dávid, 2023). Smart destinations encourage the development of two key elements: smart experiences and smart business ecosystems (Jovicic, 2019). Together, these elements enhance the efficiency and effectiveness of tourism operations and provide opportunities to identify and study new interaction paradigms and forms of value co-creation (Gretzel et al., 2015).

Given that many cities depend on tourism, the sustainable use of natural resources has become crucial, and one solution for concentrating sustainability efforts could be the creation of smart destinations (Sorokina, Wang, Fyall, Lugosi, Torres & Jung, 2022). Some defend that sustainability and smartness share numerous common elements (González-Reverté, 2019) and can evolve into “sustainable smart destinations” (Shafiee, Ghatari, Hasanzadeh & Jahanyan, 2019), offering significant potential to contribute to sustainable development by fostering economic growth through job creation and increased tourist spending, promoting efficient resource management and involving residents (El Archi et al., 2023). On the contrary, others argue that sustainability is not integrated into the planning of smart destinations, even though it is considered an important factor in theory (Cerdá-Mansilla et al., 2024) and that local communities are not included (Pranita, 2023).

Grossi & Pianezzi (2017) argue that the smart cities paradigm prioritises technological solutions driven by companies, often at the expense of political and long-term urban management, resulting in social inequalities and polarisation while reducing democratic accountability.

In addition, it is essential to consider a new need for tourists and residents to disconnect from digital media to preserve their mental health. (Coca-Stefaniak, 2020) This is not merely a perception; empirical research by Díaz-Meneses & Estupinán-Ojeda, (2022) identified a clear demand for "digital detox" among tourists, driven by intrinsic motivations like the desire to relieve stress and improve well-being. This aligns with broader findings that constant connectivity can lead to exhaustion and social media burnout (Egger, Lei & Wassler, 2020). Influenced by these factors, many tourists now wish to only connect with the destination's natural attractions (Jovicic, 2019), fuelling the rise of "digital-free tourism" or "digital detox tourism," a trend focusing on travel experiences designed to facilitate temporary disconnection (Hassan & Saleh, 2024). Furthermore, destinations will face new strategic challenges, such as overtourism, an ageing population and increasing inequality (Coca-Stefaniak, 2020).

In 2020, J. Andres Coca-Stefaniak introduced the concept of a wise destination, similar to the smart destination concept, it values the use of technology, but this concept goes further by promoting the creation of moments of disconnection, proposing a more humane and responsible use of technology to combat the growing levels of loneliness in an

increasingly connected world. Loneliness has been recognised as a growing trend influencing tourism (Gössling, Cohen & Hibbert, 2018), aggravated by the use of technology. (Jaradat, Jibreel & Skaik, 2020) Although smart technologies hold the potential for addressing well-being issues, they have not yet been fully utilised to mitigate loneliness effectively (Stankov et al., 2022). While leveraging the various advantages of technology, the wise destination concept also actively promotes digital detox initiatives. By striking a balance between connectivity and disconnection, this approach enhances the appeal of destinations, making them more attractive to both short-term visitors and prospective residents (Coca-Stefaniak, 2020). Building on this emerging concept, recent research has begun to develop models for what a wise or post-smart destination looks like in practice. This post- smart or wise approach represents an evolution from the traditional smart paradigm by repositioning technology from the central focus to a tool that serves a destination's unique identity and sustainability goals (Pranita, 2023; Kusumastuti et al., 2024). These models have emerged from the Indonesian context. Pranita, (2023), through a qualitative methodology combining a bibliometric analysis with case studies of destinations in Indonesia, proposes a post-smart tourism destination model that strategically places core tourism resources and significant local aspects at its heart. This framework argues that a destination's unique identity must be the foundation of its development, with a sense of place, humanistic approach, and sustainable practices, as a surrounding layer and digital and relevant technology positioned as the outermost, enabling layer rather than the central focus (Pranita, 2023). Reinforcing this perspective, Kusumastuti et al. (2024) developed a similar model through a mixed-methods study. Their framework also places core resources and local values at its centre, followed by locality and sustainable practices, and, at the outer layer, digital competence. In this model, creative events were identified as catalysts, fostering digital skills, encouraging sustainable practices, and delivering more memorable and distinctive tourism experiences. These empirically grounded frameworks argue that a truly post-smart or wise destination must be built upon its authentic local strengths, with technology serving these foundational elements, not defining them.

2.4. Emerging Technologies

In this context of smart and wise destinations, emerging technologies play a key role. Fassoulas et al. (2022) state that technologies are adaptable tools, easily modified and updated, accessible to all, user-friendly and easily accepted by younger generations,

which makes them great for training and education. Smart technologies, in particular, integrate hardware, software and network technologies with travel services and information and communication technology (ICT) to provide real-time data, facilitating smarter decision-making for all destination stakeholders (Pai, Kang, Liu & Zheng, 2021). Smart technologies effectiveness can be evaluated through four core attributes: accessibility, informativeness, interactivity and personalisation (Sustacha, Bãnos-Pino & Del Valle, 2023). These smart technologies encompass a range of solutions, including the Internet of Things (IoT), cloud computing, artificial intelligence (AI), mobile communication, mobile devices and apps, big data, Wi-Fi and other networks, virtual reality (VR), augmented reality (AR), chatbots, wearable devices and beacon network (Shen, Sotiriadis & Zhang, 2020). Suanpang & Pothipassa (2024) state that tourists value the improved and more personalised experiences provided by smart technologies and that these technologies increase visitor satisfaction and loyalty. To get a brief, not exhaustive, overview of the use of new technologies across UNESCO Global Geoparks, a brief analysis was carried out of the 112 UNESCO Global Geoparks in Europe, based on those listed in the official (UNESCO, 2025b) map. The analysis was conducted using information from the geoparks' official websites (UNESCO, 2025a) and Geoparks annual reports (Global Geoparks Network, 2024), the findings show that all European Geoparks have websites and use social media, while some even offer online booking platforms and interactive maps (appendix 1). In addition, a collaborative application called Geotours has been developed, which includes 12 Atlantic coast geoparks (GVAM, 2021).

Virtual reality (VR), for instance, has been widely recognised as an emerging technology with a high potential impact on the tourism sector, being able to positively influence visitor attitudes (Alyahya & McLean, 2022; Tussyadiah et al., 2017). Lin, Huang & Ho (2020) research demonstrated the potential of VR to trigger potential visitors' intention to practice sustainable tourism. It is also recognised for its capacity to replace physical visits, contributing to the sustainable management of sites and territories with conservation objectives, for example, by limiting the number of on-site visitors while offering unlimited opportunities for mass virtual visitation (Tussyadiah et al., 2017). The Origens Geopark in Spain is part of a project led by the University of Barcelona (2024), that aims to develop an open natural museum with high-quality virtual and augmented reality, allowing visitors to explore the evolution and changes of the planet and its inhabitants through detailed visualisations of geological, paleontological, and historical sites.

Regarding accessibility, technologies can provide significant benefits for people with disabilities. For instance, VR can help users detect and avoid obstacles during activities (Ozdemir, 2021). Beck et al. (2019) state that VR reduces environmental strain and enhances accessibility, replacing or complementing physical visits with immersive experiences. Another example is an app which reads coloured codes similar to QR codes, enabling people who are blind or visually impaired to access information and real-time navigation instructions even from a distance, and has already been implemented in natural parks (NaviLens, 2025).

Artificial intelligence is also increasingly used to create content, build personalised itineraries and even develop realistic virtual reality environments that allow tourists to experience places before they even visit them (Suanpang & Pothipassa, 2024). Furthermore, by analysing large databases, artificial intelligence can predict trends, demand patterns and behaviour, creating more personalised experiences (Shin, Ryu & Jo, 2025). This is achieved by processing detailed, real-time customer insights to develop customized digital experiences that can influence a consumer's decisions (Rabby, 2025).

Examples of AI-enabled technologies include booking systems that can also help reduce costs, automate tasks, minimise errors and optimise resource allocation; automatic translation tools that facilitate tourists' navigation of the destination and encourage participation in a wider range of activities and QR codes (Sousa, Cardoso & Dias, 2024). Despite these advantages, there are concerns related to homogenised experiences, privacy issues, data security, and the potential loss of jobs due to automation (Suanpang & Pothipassa, 2024).

Social media is another important tool for developing smart destinations that can reach a global audience without a big budget. According to Jovicic (2019), social media accompanies tourists throughout the entire travel journey, from the decision-making and planning stages to sharing their experiences. Simultaneously, it allows destination managers to promote the destination, conduct research, and establish communication with tourists, who can actively contribute as co-creators of the destination's offerings.

Pradhan et al. (2023) highlight gamification as another promising use of technology in tourism, which can be defined as the use of game mechanics and design elements in other non-game contexts, aiming to stimulate user engagement and interaction. Gamification has the potential to promote behavioural change by encouraging tourists to participate in

activities through rewards and incentives, thereby improving the tourist experience, increasing engagement and loyalty, and promoting value creation through the co-creation of innovative experiences between tourists and service providers. Its effectiveness as a learning tool has already been widely recognised in various sectors such as education (Nacional, 2024), health (Johnson, Deterding, Kuhn, Staneva, Stoyanov & Hides, 2016) and culture (Wu, Chao, Xiong & Luh, 2023). The TERRA.Vita Geopark (2025) in Germany already has an app that integrates gamification with augmented reality features, to improve the visitor experiences during hiking activities (appendix 1).

However, the mere availability of these technologies does not guarantee their adoption and effective use. The Technology Acceptance Model (TAM) suggests that technology adoption is primarily influenced by perceived usefulness and perceived ease of use (Davis, 1989). In tourism contexts, Social Influence Theory also plays a crucial role, as social norms and peer influence significantly impact stakeholders' willingness to adopt new technologies (Kelman, 1958).

2.5. Conceptual framework

Although the relationships between slow tourism, regenerative tourism, and smart and wise destinations remain largely unexplored, these concepts share significant commonalities that can be investigated, particularly within geoparks and geotourism.

Both slow tourism and smart and wise destinations need robust stakeholder collaboration (Agapito & Guerreiro, 2023; Baggio et al., 2020; El Archi et al., 2023). In the geopark context, this collaboration becomes particularly crucial, aligning with (UNESCO, 2025c) requirement for stakeholder participation in geopark management to cultivate regional pride. This collaborative approach strengthens the connection between local communities and their geological heritage, fostering a sense of ownership and responsibility.

Traditionally, technology has been associated with fast-paced travel and mass tourism (Mavric et al., 2021). However, even within slow tourism contexts, visitors continue to use technological devices associated with their daily lives (Agapito & Guerreiro, 2023) so there is a need to conceptualize new ways to harmonise the slow philosophy with modern technologies normally associated with fast practices (Serdane et al., 2020). As mentioned before, the Technology Acceptance Model demonstrates that successful implementation depends on perceived usefulness and ease of use (Davis, 1989) while Social Influence Theory highlights how community values and social norms shape

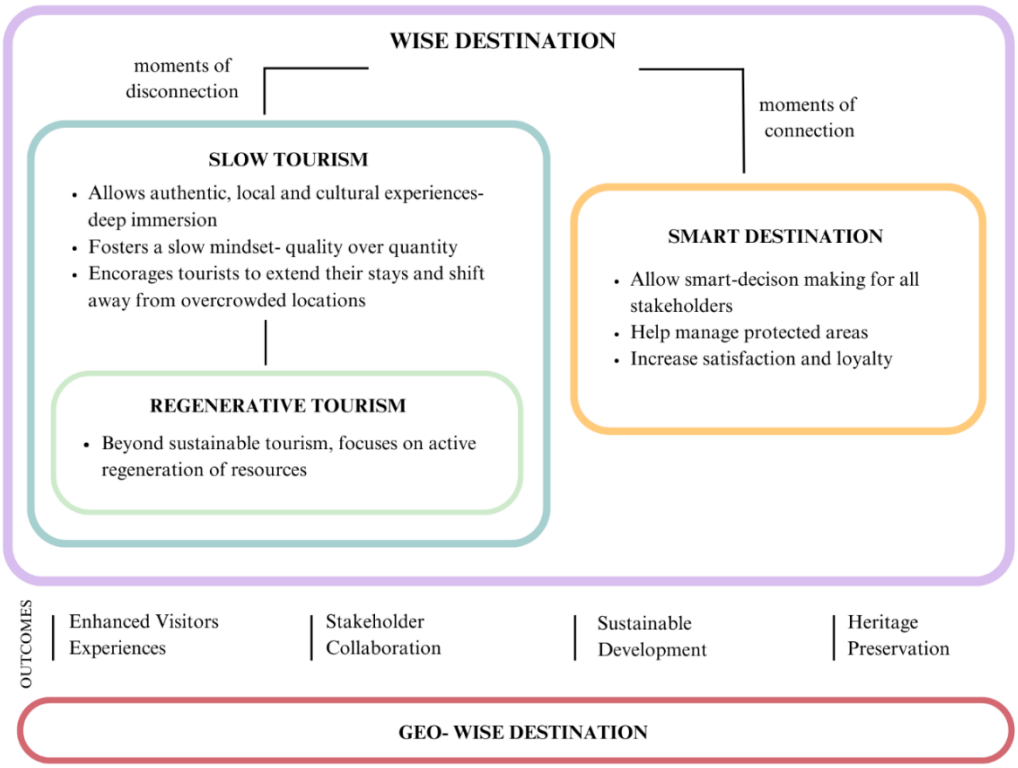
acceptance patterns (Kelman, 1958). As proposed by Coca-Stefaniak (2020), the wise destination concept advocates rethinking the implementation of smart technologies addressing tourism-related challenges while adopting slow tourism strategies to prioritise human connection and sustainable development. Both concepts are a response to the extremes of mass tourism and propose a more conscious and responsible approach (Coca-Stefaniak, 2020; Klarin, Park, Xiao & Kim, 2023). For example, virtual reality, one of the smart technologies, has been shown to significantly influence tourists' intentions to engage in slow tourism, particularly in heritage settings, while also enhancing nostalgic connections with destinations (Lin et al., 2020), similarly, gamification is increasingly recognised as a valuable approach to educating tourists about heritage and natural environments, stimulating interest in complex topics such as geoheritage and thereby contributing to conservation efforts (Ferdowsi & Ilkhechi, 2025).These findings suggest that advanced technologies when properly implemented, can serve as catalysts for slower, more meaningful tourism experiences. Also, according to Fassoulas et al. (2022), many geoparks have already implemented innovative strategies, such as using interactive digital maps or hybrid environments that combine virtual and augmented reality, in the specific case of the Psiloritis UNESCO Global Geopark (UGGp), the use of these tools doubled its visibility during the COVID-19 pandemic. Besides, the Arouca Declaration (2011) also reinforces this direction because it encourages using new technologies to appreciate geological heritage.

Also, all of these concepts have been connected with sustainable development (Agapito & Guerreiro, 2023; Buhalis & Amaranggana, 2013; Manthiou et al., 2022; Serdane et al., 2020; Sorokina et al., 2022), which is also one of the key goals of a geopark (United Nations, 2024). As stated before, technologies such as virtual reality (VR) have shown potential to manage conservation-oriented territories by limiting onsite visitors while enabling unlimited virtual visitation (Tussyadiah et al., 2017), reducing environmental strain, enhancing accessibility (Beck et al., 2019), and encouraging sustainable tourism intentions (Lin et al., 2020). However, according to some authors (Cerdá-Mansilla et al., 2024; Gelter et al., 2022; González-Reverté, 2019), there is a need to better understand how to integrate sustainability into smartness and also explore the use of more emerging technologies such as artificial intelligence (El Archi et al., 2023). As for slow tourism, according to Fusté-Forné, (2023), who studied how the concept of slow tourism manifests in the Basque Coast UGGp in Spain, the relationship between geotourism and slow

tourism, though barely explored in the literature, presents compelling opportunities for sustainable tourism development. The study concludes that when implemented in geotourism destinations, slow tourism can contribute to various sustainability objectives, such as fostering respect for local culture, strengthening regional identity and increasing tourist satisfaction, factors crucial for maintaining destination appeal. Furthermore, it states that the motivational factors of slow tourism defined by Oh et al., (2016) are accentuated when viewed from the perspective of a geotourism destination. However, Fusté-Forné (2023) emphasizes the need to analyse, through both qualitative and quantitative methods, other geoparks that apply this concept. As previously discussed, due to the environmental damage caused by the tourism industry (Dolnicar, 2020), the transition towards regenerative tourism can significantly advance beyond traditional sustainability (Duarte et al., 2024). This approach, encompassed in the slow tourism concept (Fusté-Forné, 2023), can be integrated into the geopark, promoting the preservation and active regeneration of natural and cultural resources.

This conceptual framework, presented in Figure 2.2 highlights how the wise destination concept integrates these diverse elements. It harmonises the technological aspects of smart destinations with the mindful approach of slow tourism and the restorative principles of regenerative tourism. This synergy can be particularly relevant in geoparks and in the geo-destination, where preserving geological heritage must be balanced with visitor experience and community development. Through this integrated approach, geoparks can effectively leverage smart technologies whilst maintaining their commitment to slow, meaningful tourism experiences and regenerative practices. This balance ensures that technological advancement enhances rather than detracts from the authentic, sustainable nature of geotourism.

Figure 2.2. Conceptual Framework



Source: Own elaboration based on the authors cited in the literature review

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Setting of the study: Algarvensis Geopark, Portugal

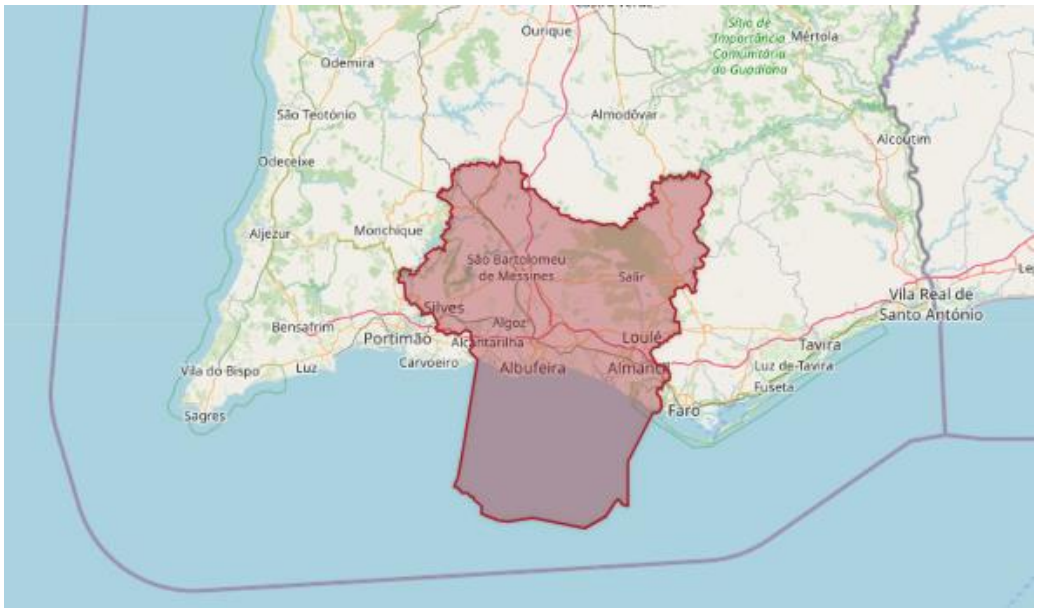
The Algarvensis Geopark is located in the south of Portugal, covering an area of 2,426 km², which includes both land and sea, as shown in Figure 3.1. It covers the municipalities of Loulé, Silves, and Albufeira and is distinguished by its geological heritage of significant national and international importance (Algarvensis Geopark, 2024).

Its mission is centred on the protection, enhancement, and promotion of natural and cultural heritage, with particular emphasis on geological heritage. Through the generation and dissemination of scientific and educational knowledge, the geopark aims to boost the socio-economic development of the region, foster a greater appreciation of its territory, and contribute to improving the quality of life of local communities (Algarvensis Geopark, 2024).

In September 2025, the UNESCO Global Geoparks Council approved, at a meeting held at the Kütralkura Geopark in Chile, the Algarvensis Geopark's application to join the

Global Geoparks Network. With this decision, the Algarvensis Geopark becomes the seventh UNESCO Global Geopark in Portugal and the first in the Algarve. The final step before formal inclusion is ratification by UNESCO's Executive Board, scheduled for spring 2026 in Paris (UNESCO, 2025d).

Figure 3.1. Map of the Algarvensis Geopark



Source: (Algarvensis Geopark, 2025a)

3.2. Research Goals

The primary objective of this research is to explore paths towards a wise destination in the context of UNESCO Global Geoparks, focusing on the Algarvensis Geopark. The specific research objectives include:

- Identify which smart technologies can be implemented in the Algarvensis Geopark to effectively communicate its brand and enhance the visitor experience.
- Analyse how technology can contribute to sustainable, accessible, inclusive tourism and better land management;
- Identify the barriers that hinder the adoption of smart technologies in the Algarvensis Geopark
- Explore how the wise destination concept can be designed for the Algarvensis Geopark.

3.3. Research Design, Sampling and Data Collection Procedures

This research adopts a qualitative approach to ensure an in-depth and contextualized understanding of how technologies can be integrated into this territory. Qualitative methodologies encouraged participants to share their experiences and opinions (Babbie, 2016; Bender, Guerreiro, Agapito, Sequeira & Mendes, 2024; Bender, Guerreiro, Sequeira & Mendes, 2022; Czernek-Marszałek & McCabe, 2022).

The research design is exploratory. The exploratory nature of the study is particularly appropriate (Babbie, 2016; Bender et al., 2022) because, to the best of the authors' knowledge, there are no prior studies examining the integration of the wise destination concept into geoparks. The data collection technique chosen was the focus group. Focus groups are a data collection method in which a small group of participants discuss selected topics for one to two hours with the intervention of a moderator (Tynan & Drayton, 1988). It is an informal but structured method that allows for an in-depth exploration of the topic in order to understand the participants' perceptions and attitudes (Campos et al., 2023).

In "Shaping the Future: Strategic Insights for Geotourism Development in the Aspiring Geopark Algarvensis" aiming at generating strategic contributions to the development of geotourism in the Algarvensis Geopark", participatory methodologies were used by holding four focus groups with various stakeholders in the territory, namely residents, local associations, regional tourism and environmental entities, and tourism operators (Guerreiro et al., 2024). The data collection protocol (Bender et al., 2022; Blumenthal & Jensen, 2019; Chen et al., 2020) was divided into three main topics, with the third further divided in two subtopics: 1) exploring the potential of geological resources (georesources) to inform stories and storyworlds to build destination storytelling; 2) uncovering the georesources' role in the sustainable and competitive development of the destination, 3.1) identifying smart technologies that can enhance the visitor experience and effectively communicate the geopark's brand and 3.2) analysing how smart technology can contribute to sustainable, accessible, inclusive tourism and better land management.. This study focuses on data generated from topic number three – 3.1) and 3.2) – to clarify contributions to the smart destination stage.

The analysis of the data generated by the four focus groups led to the inductive identification of barriers to the implementation of smart technologies, particularly the persistence of network limitations in certain areas of the territory. In addition, participants

emphasised the value of disconnection, recommended the adoption of regenerative practices, and highlighted the importance of avoiding a mass tourism model. Together, these insights reinforce the relevance of further examining the geo-wise destination concept as a key differentiating factor for a UNESCO Global Geopark. A fifth focus group was held with the Algarvensis Geopark team to also explore their visions on (1) identifying smart technologies that can enhance the visitor experience and effectively communicate the Geopark's brand, (2) analysing how smart technology can contribute to sustainable, accessible, inclusive tourism and better land management but also (3) identifying barriers to technology adoption and (4) exploring how to design the wise destination concept for the Algarvensis Geopark. On Table 3.1., the Focus Groups Script is presented.

Table 3.1.- Focus Groups Script

	Objective	**Topics for discussion**	**Author(s)**
Smart destination	Identify smart technologies to enhance the visitor experience and communicate the geopark's brand	• What technologies are you considering implementing or would like to see implemented in the Algarvensis Geopark? • In your opinion, what technological solutions can help improve the visitor experience (e.g. augmented reality, virtual reality, apps, artificial intelligence, social networks, gamification...)? • How can technologies help communicate and enhance the geopark's brand?	(Alyahya & McLean, 2022); (Lin et al., 2020); (Beck et al., 2019); (Tussyadiah, 2020); (Suanpang & Pothipassa, 2024); (Jovicic, 2019); (Pradhan et al, 2023); (Sorokina et al., 2022); (González-Reverté., 2019); (El Archi et al., 2023); (Cerdá Mansilla et al., 2024); (Fernandes et al., 2020).
	Analyse how technology can contribute to sustainable, accessible, inclusive tourism and better land management.	• Do you think technology can contribute to sustainable, accessible tourism and better land management (e.g. managing visitor numbers or reducing environmental impact)?	
	Identify barriers to technology adoption *	• What barriers do you identify to the integration and use of technology in the Geopark?	

Wise destination	Explore how the wise destination concept can be designed. *	• Do you think it's important to have moments without technology? How do you think the balance should be achieved between technological innovation and the need for disconnection? • What initiatives could be implemented to involve visitors more deeply and bring benefits to the community? • Do you think that the use of technology can help avoid problems of mass tourism/overtourism in the Geopark? In what way?	(Coca-Stefaniak, 2020); (Hassan et al. 2024); (Fusté-Forné, 2023); (Jovicic, 2019); (Serdane et al., 2020); (Manthoiu et al., 2022); (Valls et al., 2019); (Kusumastuti et al., 2024).

*Questions only asked in the fifth focus group

Source: Own elaboration

A total of 36 individuals participated in these five focus groups, 19 men and 14 women, aged between 30 and 75, grouped in groups of 6 to 8 participants with similar functions or relationships to the Algarvensis Geopark territory. In order to organise and identify the participants, a code was created to associate them with the groups to which they belong: "R" for residents, "E" regional and environmental entities, "A" for local associations, "TO" for tourism operators, and "T" for technicians from the Algarvensis Geopark team. A sequential number was also assigned to each participant within their group (e.g., FGH2), which allows for accurate identification and pattern recognition while maintaining anonymity. The detailed characteristics of the participants are presented in Table *3.2*.

Table 3.2. Participants' characteristics

Context unit		FG**R**	FG**E**	FG**A**	FG**TO**	FG**T**
Group		Residents	Regional tourism and environmental entities	Local Associations	Tourism operators	Technicians from the Algarvensis Geopark team
Total of participants		8	6	8	6	8
Gender	**Male**	4	3	5	5	2
	Female	2	3	2	1	6

Source: Own elaboration

All participants signed a consent form (appendix 2) authorizing the data collection process described in this study. With the informed consent of the participants, the focus groups were recorded. The selection of participants for the five focus groups was based on an intentional non-probabilistic sample (Bryman, 2012). Thus, the participants chosen for the five focus groups were purposefully selected for being stakeholders of the Algarvensis Geopark territory. Each focus group had an approximate duration of 2 hours. It should be noted that this approach is particularly suited to the context of UNESCO Geoparks, where the involvement and empowerment of local communities is one of its structuring principles (UNESCO, 2025c). By integrating different voices from local actors to technicians from the geopark itself, the research seeks to contribute to a more complete diagnosis in line with the values of sustainability, participation, and innovation.

3.4. Data Analysis

A thematic analysis was carried out in order to group the results into categories and sub-categories aligned with the research objectives (Bryman, 2012). The process followed the six stages proposed by Braun & Clarke (2006): familiarization with the data through immersion and transcription of the information, generation of the first codes, searching for themes, reviewing the themes, defining and naming the themes, and finally writing up the analysis. The categories and subcategories emerged using both a deductive (Fife & Gossner, 2024) and an inductive approach (Thomas, 2006). The deductive approach was informed by the research objectives and the key concepts found in the literature. Simultaneously, the inductive approach allowed new categories and subcategories to

emerge from the data (Braun & Clarke, 2006). This process was validated by experts in the marketing, tourism, sociology, and geoparks fields.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Geo-Smart destination

A smart destination uses smart technologies to increase the quality of life of both locals and tourists (Cerdá-Mansilla et al., 2024) and encourages the development of smart experiences and smart business ecosystems (Jovicic, 2019). With this in mind, considering the fact that the study was set in a geo-destination and considering the discourses of the study participants, the first major theme of the content analysis was designated geo-smart destination. From this emerged three categories - *smart technologies; geo-smart experiences; and geo-smart business ecosystem*- with the complete analysis presented in the appendix 3.

Smart technologies are a fundamental element in the development of smart and wise destinations and, as previously noted, they integrate digital infrastructure (hardware, software and networks) with tourism services and ICT, enabling real-time data flows that support more informed decision-making for all destination stakeholders (Pai et al., 2021). For this reason, the first question asked of participants was about which smart technologies could be implemented in the Algarvensis Geopark. Participants identified a wide range of technological solutions, the most mentioned were virtual reality, a booking platform, followed by QR Codes, augmented reality, 3D reality, website, social media, the geopark app, an app with offline navigation and artificial intelligence.

Regarding *geo-smart experiences***,** which are technology-mediated experiences that consume and produce data to improve the quality of experiences (Jovicic, 2019), twelve sub-categories emerged: Virtual tours; Interpretive centre; Gamification; Geocatching; Immersive experiences; Holograms, Interactive spaces with giant screens; Globe-shaped screen; Narrator on all equipment; Tactile sensors with sound feedback; Virtual museums and Sounds of the territory. The most frequently mentioned proposal was the implementation of virtual tours, which would be especially interesting for places that are hard-to-reach, vulnerable or even inaccessible, such as some of the territory's caves, while also enhancing accessibility. The second most highlighted proposal was the creation of an interpretive centre "*would be very important... with a participatory and appealing role.*

People want to take an active part (...)with technology that leads to participation" (FGTO2)

Other suggestions included the use of gamification, for example by using QR codes to reveal the coordinates of other points to visit, creating a puzzle or treasure hunt experience, encouraging visitors to complete the route in a playful and motivating way, similar to a "Pokémon hunt", with rewards at the end. Geocaching was also mentioned, " *is an activity that has many fans and would help people discover the whole territory of the geopark, it doesn't require a lot of investment and it's a way of taking people to the interior*" (FGR5), geocaching is an outdoor activity that uses GPS coordinates to challenge participants to find hidden containers (geocaches), constituting a form of gamification applied to tourism (Geocaching Portugal, 2025). Immersive experiences featuring interactive elements were also mentioned, for example, "*they might even get splashed with water*" (FGE3), 3D holograms, such as dinosaurs, and interactive spaces with giant screens, which would enrich the experience, especially for young audiences.

An innovative suggestion was "*It's a screen in the shape of a globe, and you can see, for example, the earth at a certain time, when it had all the continents together, and then you move it and see it change over time*" (FGT2). Another significant proposal was the inclusion of a narrator in all the equipment, to humanise the information and create a coherent and continuous narrative during the visit. Tactile sensors with sound response were also mentioned, "*When we touch the stone, it says, "I'm a sandstone*" (FGT1), the creation of virtual museums was seen as an added value for the Geopark and another innovative suggestion involved using the sounds of the territory, such as birdsong, traditional music or even expressions and ways of speaking from the region, to bring visitors closer to the local culture through auditory experiences.

Reflecting the concept of the *geo-smart business ecosystem*, a collaborative ecosystem of local actors that is fundamental to the implementation of smart destinations (Gretzel, Sigala, et al., 2015) and for the management of geoparks (UNESCO, 2025c), participants also mentioned the opportunity to use technologies to strengthen links with local partners and foster collaboration and joint initiatives within the geopark, it was said that "*it's possible, through new technologies, to create some matches here, some Tinder matches between partners. We could bring in some joint work between partners applying new technologies*" (FGT6).

4. 2. Brand Communication

Brand Communication was also identified as a major theme for analysis. When asked how technology can help communicate the brand of the Algarvensis Geopark, the technicians (FGT) identified various contributions that can be grouped into three categories: *advantages*, *objectives* and *approach*, with the complete analysis presented in the appendix 3.

Starting with the *advantages* that technologies offer in the communication process, six sub-categories emerged: explaining geology, real time communication, communication with accessible language, multilingual communication; attractive presentation of the territory and synthesise information. One of the most mentioned was the ability of technologies to help explain complex geological concepts, "*A picture is worth a thousand words, an animation is worth ten thousand"* (FGT2), demonstrating the perception that digital tools can make content more accessible and attractive.

Besides the advantages, the participants emphasised how technology can play an important role in achieving the *objective* of cognitive learning. In the context of destination image, cognitive learning relates to the formation of an individual's beliefs and knowledge about the attributes of a destination (Agapito, Valle, & Mendes 2013), in the context of brand communication, its crucial for creating brand awareness, understanding, and informing targets about the Algarvensis Geopark values and purpose (Batkoska & Koseska, 2012; Ahn & Back, 2018). Several participants emphasised that technology is "*a good way of highlighting our contribution and what the Geopark is doing, developing and offering*" (FGT7), presenting the territory and its inhabitants and explain with this territory is so unique, "*So that it is not just demagoguery or something abstract, but that we can use these tools to explain in a very, very concrete way, in the areas focused on in the various sites and when these tools are applied, what are we really working on in terms of sustainable development? Where does sustainability come in here?*" (FGT3). In addition, the technicians recognise that the use of technologies can help overcome a common challenge to many geoparks: the difficulty of explaining the very concept of a geopark to the public, as they mention "*I think this whole application of these kinds of tools is vital here, because it's not always easy to understand what a geopark is (…) Geoparks are still struggling today, even those that have been in the network for more than 20 years, to convey the concept of a geopark to those who visit them and those who*

live in them"(FGT3). It was suggested that new technologies could be used as educational tools at fairs and events, making it easier to promote the geopark and its knowledge in a lighter and more accessible way to the general public.

Finally, the ability of technologies to contribute to the communication *approach* by creating an integrated marketing communication, which involves the planning and execution of the brand's various communication channels in order to convey a clear, consistent and compelling message (Kotler & Armstrong, 2020), highlighting the role of artificial intelligence "*Artificial intelligence can create a homogeneous, simple way of communicating here. But one that identifies us immediately*" (FGT3).

4.3. Sustainability

Sustainability emerges as another theme for content analysis. In general, the participants in the different focus groups agree that technologies can make a positive contribution to more sustainable and accessible tourism and to better management of the territory. Three categories emerged from the analysis: *monitorisation, conservation, and accessibility* (appendix 3). Accessibility was integrated into the sustainability analysis, bearing in mind that Sustainable Development Goal 10 (SDG 10) calls for the reduction of inequalities, including equitable access to information and heritage.

In the *monitorisation* category, two sub-categories emerged: objectives and tools. Participants say that these smart technologies make it possible to achieve objectives such as counting visitors, which helps to manage the territory's load capacity, "*so there are several things that new technologies can help us with and I think this one goes hand in hand with load capacity, which in turn goes hand in hand with sustainability*" (FGA1) and are useful for "*being able to see the profile of those who visit us*" (FGT4). They even mentioned specific tools for counting the number of visitors such as meters, radio technology, triangulation of the mobile phone network and screens with the number of visitors in real time.

The participants also attributed an important role to smart technologies in the *conservation* of the territory, four sub- categories emerged: virtual tours, create alternative sites for in situ visits, creating awareness and regenerative tourism. One of the ideas that emerged from the discussion was that "*the technologies themselves can lead to changes in behaviour*" (FGT3), by making visitors aware of the importance of protecting the sites.

In risk zones, where a physical visit could jeopardise the safety of the visitor or the preservation of the site, smart technologies were seen as useful tools for creating alternatives. Participants suggested the creation of interpretive centres with technology to encourage participation and to serve as alternative sites for in situ visits. One participant gave an example of a nature park in Belgium where throughout the visit no one enters the park core natural area, as all the infrastructure are built around it. Another participant also suggested that these centres could be developed near sites of palaeontological or geological interest, allowing visitors to get to know the site without damaging it, similar to what is done in the Caribbean, where artificial reefs are created to divert divers away from the most fragile sites:

"*To relieve the pressure on divers in sensitive dive sites. Where biodiversity, because of the carrying capacity of the people diving there, can be jeopardised, many sites are creating artificial reefs with structures that are then naturalised with new corals and will attract more fish, more biodiversity and ultimately become an alternative place for people to watch and dive and observe biodiversity. I'm using this parallel because perhaps new technologies can be used to create new spaces that can somehow be an alternative to on-site visitation… So here the new technologies can be used to create a virtual reality or an interpretive centre. That's next to the site, the person ends up going to the site, they've been to the site, they haven't visited, it's the site itself of palaeontological or geological interest (…)*(FGT4).

From this perspective, smart technologies act as mediators of the experience, offering alternatives that maintain the informative and emotional value of the visit, while reducing the physical impact on the sites, keeping visitors safe and helping to control visitor expectations, avoiding disappointment.

Other participants pointed out virtual tours as an effective tool for avoiding access to dangerous or sensitive sites and as an instrument of inclusion, for example by allowing people with reduced mobility or physical limitations to experience the territory.

Finally, a concern expressed by several participants was the need to allow species to regenerate, demonstrating an environmental awareness that goes beyond mitigating impacts and points towards a more proactive logic of regenerating the territory "*We could go beyond the logic of rehabilitating the existing heritage but also, from the point of view*

of ecosystems, be able to contribute to the regeneration of certain fundamental elements and specific contexts."(FGTO3).

All the focus groups also addressed the topic of *accessibility*, recognising the importance of integrating technological solutions to include audiences with specific needs. Specific solutions were suggested, leading to the emergence of the sub-category tools. Among the most mentioned tools were audio guides and braille. The potential of photogrammetry, modelling and 3D printing to make sites more comprehensible to visually impaired people was also highlighted. In addition, it was mentioned that the geopark's website already includes an accessibility module, demonstrating a growing concern with digital inclusion. The technicians emphasised that the accessibility of the territory is not only desirable, but mandatory, in the context of the commitments made by geoparks to UNESCO principles, and they assume that technologies can be tools for achieving this goal.

4.4. Barriers of implementation

Barriers to technology implementation is one of the themes of the content analysis. When asked about the barriers to the implementation of technology, the technicians (FGT) focused on three main categories**:** *economic, operational and social* (appendix 3).

As for the *economic* barriers, three subcategories emerged: high investment, return on investment and maintenance and upgrading costs. The technicians emphasised the need for a large investment and spoke of the difficulty of measuring the return on investment in two ways; the value for the user, questioning "*whether the way we present it is worth the investment*" (FGT1) and the return for the geopark "*what is the return for the people who consult it, but also what is the return for the Geopark, always with the aim of improving and extending the use of these technologies to other facilities*" (FGT3). Additionally, they spoke of the costs of maintenance and updating "*Because these structures then remain in the territory and obviously have to be maintained and updated... it has to be sustainable in the long term*" (FGT5).

In terms of *operational* barriers, six sub-categories emerged: places without internet, need of training, lack of know-how, dependency on external companies, unfamiliarity with the technologies of other geoparks and risk of not working outside. In terms of implementation in the field, it's important to note that, besides the technicians, participants in the other focus groups, even without being directly asked about the barriers, mentioned the urgent need, first and foremost, to improve internet access in the

territory "*because on the coast they have internet access but from Salir to the north they no longer do*" (FGR1) since there are still several areas without coverage, which constitutes a structural barrier to the implementation of the technological proposals presented. The geopark's technicians emphasised the critical need for training for the team and identified their lack of know-how, "*it's not always easy to understand which ones and how to use them"* (FGT3). On the other hand, they said that dependence on other companies raises concerns, "*But when it depends on outside organisations, it becomes really quite difficult. Because we also have to provide content and there you go, we often don't have that kind of time, or even know-how*" (FGT3). Furthermore, they emphasised the importance of getting to know the solutions implemented in other geoparks. The technicians also expressed concerns about implementing the technologies outdoors "*if it's implemented outdoors, it's no longer functional, ...outdoors, it leaves a lot of doubts, and I think there should be a company that does this study and evaluation*" (FGT8).

Finally, the *social* barriers are related to the visitors, participants pointed out that some visitors don't use digital technologies, some because they don't know how to use them, while others deliberately choose to disconnect from technology during their visit.

4.5. Impacts of technologies on tourism

The impacts of technologies on tourism were also considered as a theme of content analysis. The technicians (FGT) were asked if they believed that technologies could help avoid problems such as overtourism. The answers revealed an ambivalent perception, recognising two categories: *negative and positive* (appendix 3).

On the *negative* side, two sub- categories emerged: overtourism and encouraging visits to dangerous places. Regarding overtourism, "*On one hand, we publicise, promote... but on the other hand we also want to be careful*" (FGT3). Although participants from the other focus groups weren´t directly asked this question, overtourism emerged as a common concern, since this challenge is already being felt on the territory's coasts *"The main concern here is that we don't apply the mass tourism model of the coast, but try to create a different, quality form of tourism." (*FGA1). Participants expressed their desire for the implementation of a more sustainable and balanced tourism development strategy, *"We want to transform our offer and add certain characteristics that will allow us to reach a type of tourist who is more sensitive to environmental issues, with a more appropriate behaviour, with a different purchasing power and a different sensitivity to culture*"

(FGTO3).They specifically mentioned the case of the Benagil caves and the seven hanging valleys, sites that have been heavily promoted and are facing problems with visitor overload "*if we want a good strategy to reduce the load, we have to promote other lesser-known sites so that the load isn't all there*" (FGA4).

Furthermore, the technicians highlighted another concern, the curiosity sparked by the technologies could lead people to want to visit dangerous sites, for example the Arrifes site of international interest " *because it could have the effect of, for example, the site of dinosaur footprints in the Arrifes. I don't want people to go there because it's a dangerous place and I can put a 3D model of the site available online but that might stop people needing to go there, or it might make people want to go there*" (FGT2).

However, the participants recognised several *positive* impacts and eight sub- categories were defined: alternatives for in situ visits, online booking, real time visitors' numbers, identifying the profile of visitors, influence visitors ´attitudes, strategies for retention in safe places, transmitting security to local communities and effective brand communication. As mentioned under the topic of sustainability, participants highlighted the benefits of these tools to create alternatives for in situ visits The implementation of an online booking system was also suggested, and an example was used of the Arouca Geopark, which adopted a model where access to the walkways was only possible by booking online for a symbolic fee, which made it possible to limit the number of visitors: "*And I'll give you a practical example, Arouca, when it opened the walkways (...) It was only online that people could visit the walkways for one euro. That controlled the number of people, because it's on the platform, it reaches a certain number and then it closes, that day there's no chance*." (FGT3). As previously mentioned also in the topic of sustainability technology can help monitor the territory by managing the number of visitors in real time, identifying the profile of the visitors and influencing visitors´ attitudes, in addition, it was suggested to apply technology to create retention strategies in safe places "*Yes, we could put it in this model. "don't go if the tide is high, 'be careful the tide may be high*", *use strategies to retain the person there in some way*" (FGT1), and use it as a communication tool with local communities to ensure that they understand that the Geopark does not intend to follow a model based on mass tourism or promote a 'tourist invasion'. As mentioned under the topic of brand communication, these tools can also contribute to building a more effective communication strategy.

4.6. Geo-wise destination

Two major categories emerged in the geo-wise destination theme: *well-being and places to disconnect* (appendix 3). Regarding *well-being*, technicians shared the idea that *"a healthy lifestyle also involves switching off. Recovering energy and our territory offers that possibility*" (FGT3) and participants from the other focus groups, even without being asked about disconnection, defended the importance of preserving spaces and moments to disconnect in the territory, emphasising that "*Nowadays we feel that people have more and more problems with human connection... New technologies help to publicise, promote and so on, but then when you get to the place I think there has to be contact with people*" (FGA2) and that many visitors today are looking for an authentic immersion in the culture and don't want to be constantly on their mobile phones.

In the category of *places to disconnect*, three sub-categories were identified: no wi-fi zones, villages without mobile phones and non-technological accommodations. A particularly relevant proposal emerged from a weakness in the territory: areas without internet access. Participants suggested that this limitation could be turned into an attractive point for visitors, turning these places into no wi-fi zones to connect with nature, culture and people "*perhaps even turning this weakness into a strength. To use precisely those places as places to switch off, to enjoy a little*" (FGT2). Examples were also given of villages where cell phones are left at the entrance, allowing visitors to immerse themselves completely in the experience the village has to offer, as well as accommodation units that are beginning to emerge with the concept of zero-technology accommodations.

4.7. Discussion

The results of this study reveal the perspectives of the various stakeholders in the Algarvensis Geopark territory regarding the role of new technologies. Several benefits were recognised, and tools were suggested in line with the definition of smart technologies (Shen et al., 2020). All proposed solutions were therefore classified as smart technologies because they can satisfy the four-core attributes: accessibility, informativeness, interactivity and personalisation (Sustacha et al., 2023), in this sense, for example a website is considered a smart technology when it moves beyond static information to offer personalised content, instant access to relevant data and interactive features such as user profile based recommendations. The findings also resonate with the

concepts of smart experiences (Jovicic, 2019) and smart business ecosystem (Gretzel, Sigala, et al., 2015). Virtual reality emerged as one of the most frequently mentioned solutions, echoing previous studies that highlight its potential to enhance immersive experiences (Lin et al., 2020; Tussyadiah et al., 2017; Beck et al., 2019) and confirming its effective implementation in other geoparks, such as Psiloritis Geopark (Fassoulas et al., 2022). A booking platform was also identified as a priority, reinforcing the importance of digital infrastructures for destination management (Buhalis & Amaranggana, 2013). Within the scope of smart experiences (Jovicic, 2019), virtual tours were the most frequently mentioned, a finding that resonates with the literature on their capacity to improve accessibility and foster slow and sustainable tourism practices (Lin et al., 2020; Sorokina et al., 2022). Gamification was also referred to by participants, with emphasis on its potential to stimulate interest and engagement in local activities, aligning with Ferdowsi & Ilkhechi's (2025) conclusions on the role of gamification in heritage education. These findings go beyond what has already been implemented in other geoparks, as identified in the brief analysis of European UNESCO Global Geoparks (appendix 1), which underscores the richness of stakeholders' contributions to build on imaginative and innovative applications in drawing (smart) geo-wise destinations. In particular, the suggestions for smart experiences resonate with Kusumastuti et al. (2024) perspective of creative events as catalysts that promote digital skills while maintaining a connection to local culture.

Regarding the communication of the Algarvensis Geopark as a geo-destination brand, in line with Dowling's (2011) findings, participants highlighted the complexity of communicating geological concepts. However, participants went beyond emphasizing the complexity of communicating the geopark concept itself, believing that technologies are tools capable of overcoming these difficulties, enabling concepts to be conveyed in a clearer, more appealing, and accessible way. Also, it was highlighted that these smart technologies can contribute to achieving the goal of cognitive learning (Agapito, Valle & Mendes, 2013), considered a priority in the current stage of settling the Algarvensis Geopark, given that the geopark is in the early stages of its development. From a brand communication perspective, cognitive learning plays a crucial role in shaping how potential visitors perceive and internalize the geopark's brand attributes (Batkoska & Koseska, 2012; Ahn & Back, 2018). By engaging users through interactive digital tools, such as virtual tours or gamified experiences, smart technologies can enhance awareness

and knowledge of the geopark, ensuring that key messages are effectively communicated and retained. This approach aligns with the three main stages of learning used to understand how consumers learn about a product or brand, as described in the Cognitive-Affective-Conative (CAC) model of destination image, which outlines a hierarchical process where an individual's journey toward loyalty begins with the cognitive component, progresses to affective responses, and culminates in behavioural intentions such as visiting, recommending, and positive word-of-mouth (Agapito et al. 2013).

Regarding sustainability, participants perceived technology as capable of contributing to more sustainable, accessible, and inclusive tourism. They emphasized its role in supporting more informed and preventative land management, allowing access restrictions during overload periods, flow redirection to areas with less tourist pressure, and the creation of alternatives to on-site visits through virtual experiences. These findings are consistent with Tussyadiah et al. (2017) research, which investigated how virtual reality experiences can influence travel decision-making through a study with 202 participants who experienced virtual walkthroughs of real tourism destinations (Tokyo and Porto). The authors identified VR's potential both as a substitute for actual visitation and as a management tool, enabling limitations on tourist numbers and contributing to sustainability through mass virtual visitation alternatives. Participants complemented this perspective by not focusing exclusively on virtual reality but emphasizing a broader range of technological applications, including the creation of alternative technology-equipped sites near the most fragile geosites to provide in-person visits that do not damage the original locations. The identification of technology's capacity to enable a better understanding of visitor profiles represents a particularly important contribution, as Amaro et al. (2023) highlighted that there are few studies addressing the motivations and characteristics of visitors to geosites, especially within European geoparks. The results reinforce previous findings in the literature, highlighting the usefulness of technology to positively influence visitors' attitudes towards sustainable tourism (Lin et al., 2020).

However, as Coca-Stefaniank (2020) argues, wise destinations should look beyond sustainability and address long-term challenges. The findings support this perspective as participants recognise the importance of adopting a regenerative approach, creating opportunities for tourists to contribute positively to ecosystems, which aligns with the principles advocated by Bellato et al. (2023) and Duarte et al. (2024). This vision was accompanied by a preference for a more sustainable development model, an alternative

to mass tourism, consistent with the principles of slow tourism defined by Fusté-Forné (2023) and Mavric et al. (2021).

Participants identified economic barriers related to implementation costs and operational barriers, including lack of technical know-how and training needs, representing coincident challenges across digital adoption studies (Schoepp, 2005; Kandasamy, Vimal, Sivakumar, Vaibhav & Raghuraman, 2023). One of the difficulties pointed out by the technicians was the lack of information about technologies in other geoparks. The brief analysis of the European UNESCO Global Geoparks (appendix 1) reveals a technological landscape that complements and validates many of the suggestions identified by participants in the focus groups.

In terms of social barriers, visitors' unwillingness to adopt digital tools is coincident with digital detox trends (Egger et al., 2020; Hassan & Saleh, 2024). It should also be noted that many of the technologies mentioned follow the bring your own device (BYOD) model (Disterer & Kleiner, 2013), depending on visitors' personal equipment. The provision of equipment by the Algarvensis Geopark could, in some places, help to overcome this social barrier.

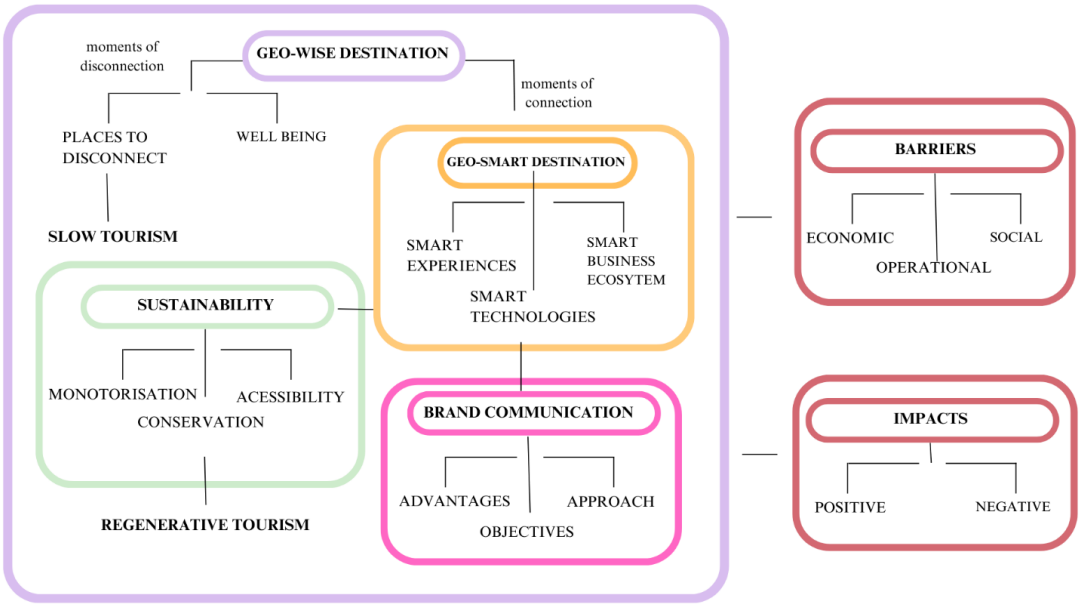
Regarding the impacts of technology on tourism, there are still reservations about its potential to mitigate problems such as overtourism, which aligns with Coca-Stefaniak (2020), who acknowledges that technologies have not yet been fully explored for this purpose. Participants also noted that technology can stimulate curiosity, potentially encouraging visits to dangerous areas if such locations are shown.

A limitation was later reinterpreted as an opportunity to create areas of disconnection, taking advantage of network failures in the territory to foster experiences of contemplation and reconnection with nature, while resorting to technologies in places where they can be effectively used. This perspective is in line with the concept of wise destination (Coca-Stefaniak, 2020). By transforming a potential weakness of the territory into a differentiating factor, it is possible to offer authentic experiences that are in line with the expectations of visitors seeking genuine contact with the territory. Finally, the results also align with Kusumastuti et al. (2024) and Pranita (2023) models for post-smart destinations, in which core resources and local values are prioritised, supported by locality and sustainable practices, and complemented by digital competence. Participants' emphasis on preserving geological heritage while using technology strategically reflects

this hierarchical approach, where digital tools enhance rather than replace authentic territorial values, particularly relevant in geopark contexts, in which the governance model places local communities and local resources at the centre of the development process.

To synthesize the main results of the research, Figure 4.1. presents a summary of the themes and categories identified in the thematic analysis. This representation highlights not only how the empirical results are structured, but also how they align with the conceptual framework presented in the second chapter.

Figure 4.1. Themes and categories



Source: Own elaboration

CHAPTER 5: CONCLUSIONS

5.1. Conclusion

This research aimed to explore paths towards a wise destination in the context of UNESCO Global Geoparks, focusing on the Algarvensis Geopark. The results directly answer the first objective of the study by providing a comprehensive set of suggestions for smart technologies that can be implemented in the geopark. The identification of these technologies by stakeholders in the territory fulfils UNESCO's fundamental principle of including local communities in geopark management (UNESCO, 2025c), while the brief analysis of implementations in other European geoparks serves as a repository of practical

examples. Significantly, participants did not limit themselves to listing tools, but outlined smart experiences, demonstrating a clear perception of how technology can enrich the visitor experience. In addition, they identified the potential to create a smart business ecosystem, benefiting local partners and strengthening the geopark's collaborative network. This vision aligns with post-smart and wise models (Pranita, 2023; Kusumastuti et al., 2024), as technology is understood not as an end in itself, but as a means to communicate the values of the territory and simplify complex geological concepts (Dowling, 2011). Thus, the strategic use of technology is fundamental to consolidating the image of the destination, focusing initially on the cognitive learning phase, which corresponds to the formation of beliefs and knowledge that visitors develop about the territory (Agapito et al., 2013).

The second objective allowed us to analyse the role of technology as an ally in the geopark's mission of sustainability and accessibility (United Nations, 2024). Participants recognised digital tools as relevant instruments for monitoring visitor flows, protecting vulnerable sites through technology-based alternatives (Tussyadiah et al., 2017), and enhancing accessibility (Beck et al., 2019). In addition to these solutions, smart technologies can bring additional benefits, such as helping to detect and avoid obstacles during activities (Ozdemir, 2021), while some existing applications already offer real-time guidance for blind or visually impaired visitors (NaviLens, 2025). These advances represent promising developments that can be implemented in geoparks, and the Algarvensis Geopark could take on a pioneering role in this area.

There was also a desire to go beyond sustainability, often considered insufficient because it only focuses on mitigating damage (Duarte et al., 2024), advocating the adoption of a regenerative tourism approach, whose purpose is to create positive effects for ecosystems (Bellato et al., 2023). The participants also emphasised the need to reject the mass tourism strategy, already present on the territory's coastline, and adopt a sustainable development strategy aligned with the principles of slow tourism (Fusté-Forné, 2023; Mavric et al., 2021; Oh et al., 2016; Serdane et al., 2020; Valls et al., 2019). As demonstrated in the conceptual framework, the concept of wise destination precisely integrates the concepts of slow tourism and regenerative tourism.

Regarding the third objective, economic, operational and social barriers were identified. However, within the scope of a wise approach, these barriers can be strategically

reinterpreted. Economic constraints can encourage the choice of more sustainable solutions in the long term and their selective implementation only in strategic areas. It is known, that not all solutions involve high costs, as is the case with social media (Jovicic, 2019), and the Geopark could create an implementation plan that considers costs, applying the technologies gradually or only at strategic points, which is also in line with the wise concept, allowing a balance between innovation and responsible management (Coca-Stefaniak, 2020). The return on investment can be assessed after implementation, based on online evaluations and satisfaction surveys, given that studies have already shown that technologies contribute to increasing visitor satisfaction (Suanpang & Pothipassa, 2024). Operational difficulties can be overcome through continuous training of the team and key agents who, by acting as early adopters, demonstrate the benefits of the technology, influencing the rest of the ecosystem (Kelman, 1958). This model of influence applies both internally, among Geopark partners and communities, and externally, through the sharing of good practices with other geoparks. Areas without internet access, also identified as an operational barrier, have been reinterpreted in light of the wise destination concept as an opportunity to create digital detox zones, responding to the growing demand for experiences of disconnection (Díaz-Meneses & Estupinán-Ojeda, 2022; Hassan & Saleh, 2024). Visitors' desire to disconnect is not an obstacle to be overcome, but an opportunity to be embraced, creating value through authenticity and well-being (Coca-Stefaniak, 2020).

Finally, social barriers, such as some visitors' resistance to technology, can be mitigated with the provision of equipment by the Geopark, avoiding reliance on a ‘bring your own device’ model (Disterer & Kleiner, 2013) and ensuring that even visitors who do not have devices, or who choose to remain disconnected during their holidays, can access technology only at strategic points, in a controlled and guided manner to enhance their experience. Furthermore, according to the Technology Acceptance Model (TAM), perceived usefulness and perceived ease of use enhance technology adoption, even among initially reluctant visitors (Davis, 1989). For this reason, it is essential to ensure both factors in the implementation of digital solutions.

Finally, the fourth objective allowed us to understand how to design the concept of wise destination in the Algarvensis Geopark, creating a geo-wise destination. A clear example, suggested by stakeholders, was the proposal to reinterpret areas without internet connection not as a deficiency, but as an opportunity to create intentional digital detox

zones, promoting well-being and a genuine connection with the territory. Based on this concept, geoparks can implement technology selectively, taking advantage of its benefits to reinforce sustainable development and mitigate the negative impacts of mass tourism (Coca-Stefaniak, 2020), while at the same time fostering innovation in the promotion of geotourism (Arouca Declaration, 2011). Although some possible negative impacts of using technology were highlighted, most of the impacts mentioned by participants were positive. Considering that technology was perceived as a resource with significant benefits for monitoring and managing the territory, effective control mechanisms could prevent or minimise these negative effects. The preference for this model becomes evident throughout the research, and the conceptual framework developed in this study explicitly demonstrates the synergy between the concept of wise destination and the principles of slow, regenerative and smart tourism.

In summary, this research reinforces the idea that the concept of wise destination is the appropriate and holistic model for the implementation of technologies in the Algarvensis Geopark, creating a geo- wise destination, by systematically integrating technological innovation with sustainability, regenerative practices, slow tourism philosophies, active community participation, and valued moments of disconnection, the wise paradigm offers a comprehensive vision. This approach is uniquely suited to respond to the contemporary challenges of tourism in geoparks, ensuring that development enhances, rather than diminishes, the authentic natural and cultural value of these protected international territories.

5.2. Theoretical and Practical Implications

This study makes a relevant theoretical contribution by proposing an integrative conceptual framework that links the concepts of smart destination, slow tourism sustainability, regenerative tourism and wise destination in the context of UNESCO Global Geoparks. By exploring the interrelationships between these approaches, the research creates a link between these concepts that has not yet been explored in the literature and contributes to the theoretical development of the wise destination concept, which is still little explored, considering that most studies still focus predominantly on the smart destination concept. While the literature on smart destinations focuses predominantly on technology-driven efficiency and competitiveness, this study demonstrates, through the case of the Algarvensis Geopark, the importance of integrating

human dimensions such as well-being, sustainability, and community participation. The research solidifies the wise paradigm as a more holistic and resilient response to contemporary tourism challenges. The study also demonstrates its particular relevance to UNESCO Global Geoparks, where the balance between conservation, education, sustainable economic development, and innovation is imperative. Ultimately, this study provides a theoretical contribution by defining the concept of a geo-wise destination, understood as a territory that leverages technology strategically to enhance its unique identity, address tourism-related challenges, promote better territorial management, enrich visitor experiences, deepen understanding of local geology, and create a harmonious balance between digital connection and disconnection.

From a practical point of view, the results suggest that the Algarvensis Geopark has favourable conditions for implementing a territorial strategy based on the principles of the wise destination. The concept of geo-wise destination, together with the proposed conceptual framework, can serve as a theoretical roadmap to guide the implementation of technologies by geopark teams.

In addition, the findings gathered in the comparative analysis of the European geoparks provide a useful guide of replicable good practices, while the focus group results add innovative solutions that could be adapted to the local context.

Altogether, this approach can position the Algarvensis Geopark as a reference of innovation within the UNESCO Global Geoparks network, fostering the exchange of knowledge and experiences among territories, while also supporting regional development and addressing the challenges posed by mass tourism on the coastal areas.

5.3. Limitations and future research

Despite the relevant contributions of this study, it is important to recognise some limitations. The research focused exclusively on the case of Algarvensis Geopark, which, although it allows for an in-depth and contextualised qualitative analysis, limits the generalisation of the results to other geoparks or territories with different characteristics. In addition, it would be interesting to gather the perspectives of other audiences, such as young people.

The comparative analysis carried out on the European geoparks was brief and based on information available online, mostly on institutional websites or UNESCO reports, which

may not reflect all the technological practices in place, particularly those not communicated online or still in the pilot phase, as well as restricting the study to the European context. The limited scientific literature on the concept of wise destination was also a limitation, conditioning the theoretical foundation.

For future research, it would be pertinent to include other audiences in focus groups and to explore the wise destination in different contexts, such as other UNESCO Global Geoparks or tourism destinations, enhancing the generalisability and applicability of the findings. Moreover, future studies should analyse the real impact of adopting the wise destination concept on the transformation of territories and adopt mixed-method approaches combining qualitative and quantitative data to measure variables such as visitor satisfaction, reduction of the ecological footprint, and the effectiveness of digital communication strategies.

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APPENDIXES

APPENDIX 1- Technologies in UNESCO Global Geoparks

UNESCO Global Geopark	Location	Smart technologies	Smart experiences
Arouca	Portugal	Website, Social Media, App, Geotours app	
Naturtejo	Portugal	Website, Social Media	
Terra de Cavaleiros	Portugal	Website, Social Media	Interactive Map
Estrela	Portugal	Website, Social Media	
Oeste	Portugal	Website, Social Media, QR Codes	Interactive Map; Travel Planner
Açores	Portugal	Website, Social Media, Geotours app	
Basque Coast	Spain	Website, Social Media, Geotours app	
Cabo de Gata Nijar	Spain	Website, Social Media	
Sierras Subbéticas	Spain	Website, Social Media	
Las Loras	Spain	Website, Social Media	
Central Catalonia	Spain	Website, Social Media, Web app	
Molina- Alto Tajo	Spain	Website, Social Media	
El Hierro	Spain	Website, Social Media	
Lanzarote and Chinijo Islands	Spain	Website, Social Media, Geotours app	
Origens	Spain	Website, Social Media, Virtual reality and Augmented reality	Vigeocult project
Courel Mountains	Spain	Website, Social Media	
Granada	Spain	Website, Social Media	
Maestrazgo	Spain	Website, Social Media	

Calatrava Volcanoes. Ciudad Real	Spain	Website, Social Media	
Villuercaas-Ibores-Jara	Spain	Website, Social Media	
Sierra Morena de Sevilla	Spain	Website, Social Media	
Sobrarbe-Pirineos	Spain	Website, Social Media	
Costa Quebrada	Spain	Website, Social Media	
Cabo Ortegal	Spain	Website, Social Media	
Ore of the Alps	Austria	Website,Social Media	
Styrian Eisenwurzen	Austria	Website,Social Media	
Famenne-Ardenne	Belgium	Website,Social Media	Virtual tour 360
Papuk	Croatia	Website,Social Media	Virtual tour 360
Biokovo-Imotski Lakes	Croatia	Website,Social Media	
Vis Archipelago	Croatia	Website,Social Media	
Troodos	Cyprus	Website,Social Media	
Bohemian Paradise	Czech Republic	Website, Social Media, Smart guide app	
Odsherred	Denmark	Website, Social Media	
The South Fyn Archipelago	Denmark	Wesbite, Social Media,App	
Vestjylland	Denmark	Wesbite, Social Media,App with offline navigation	
Rokua	Finland	Wesbite, Social Media,App	
Lauhanvuori-Hämeenkangas	Finland	Website, Social Media, Online booking platform	
Saimaa	Finland	Website, Social Media	Virtual tour, virtual reality
Impact Crater Lake - Lappajarvi	Finland	Website, Social Media	Virtual tour
Salpausselka	Finland	Website, Social Media	

Armorique	France	Website, Social Media, Geotours app	
Beaujolais	France	Website, Social Media, App	
Causses du Quercy	France	Website, Social Media	
Chablais	France	Website, Social Media	
Haute-Provence	France	Website, Social Media	Interactive map
Luberon	France	Website, Social Media	
Massif des Bauges	France	Website, Social Media	
Monts d'Ardèche	France	Website, Social Media	
Normandie-Maine	France	Website, Social Media	
Bergstrasse-Odenwald	Germany	Website, Social Media	
Vulkaneifel	Germany	Website, Social Media, Augmented reality, 360º videos, app	
TERRA.Vita	Germany	Website, Social Media, Online shop, Geopark game app	
Swabian Alb	Germany	Website, Social Media	
Harz, Brawschweiger Land	Germany	Website, Social Media, App with offline navigation	
Thuringia Inselsberg – Drei Gleichen	Germany	Website, Social Media	Interactive map, hologram exibithion
Ries	Germany	Website, Social Media	
Lesvos Island	Greece	Website, Social Media, App	
Psiloritis	Greece	Website, Social Media, Virtual reality	Interactive map, Storytelling map, virtual reality tour for Nida Geosite, Virtual tour along the summits of Psiloritis
Chelmos Vouraikos	Greece	Website, Social Media	
Vikos- Aoos	Greece	Website, Social Media	Virtual Tour, Visitor counting System

Sitia	Greece	Website, Social Media	Interactive map
Grevena- Kozani	Greece	Website, Social Media	
Kefalonia - Ithaca	Greece	Website, Social Media	
Lavreotiki	Greece	Website, Social Media	
Meteora Pyli	Greece	Website, Social Media	
Bukk Region	Hungary	Website, Social Media	
Bakony - Balaton	Hungary	Website, Social Media, App	
Katla	Iceland	Website, Social Media	Virtual Tour, Science Driven Expeditions
Reykjanes	Iceland	Website, Social Media; Webshop	Online game
Copper Coast	Ireland	Website, Social Media, Geotours app	Interactive map, virtual tour
Burren and Cliffs of Moher	Ireland	Website, Social Media, App, Geotours app	Virtual tour
Adamello-Brenta	Italy	Website, Social Media, App	Virtual tour
Alpi Apuane	Italy	Website, Social Media, App	
Aspromonte	Italy	Website, Social Media	
Beigua	Italy	Website, Social Media	
Cilento, Vallo di Diano e Monti Alburni.	Italy	Website, Social Media, App with offline navigation	
Madonie	Italy	Website, Social Media	
MurGEopark	Italy	Website, Social Media	
Pollino	Italy	Website, Social Media	
Rocca di Cerere	Italy	Website, Social Media	
Sesia Val Grande	Italy	Website, Social Media	
Tuscan Mining Park	Italy	Website, Social Media	

Majella	Italy	Website, Social Media	Interactive map
Mellerdall	Luxembourg	Website, Social Media	
Dehondsrug	Netherlands	Website, Social Media	
Gea Norvegica	Norway	Website, Social Media	Digital guided tours
Magma	Norway	Website, Social Media, Online booking platform	
Trollfjell	Norway	Website, Social Media	
Sunnhordland	Norway	Website, Social Media	
The Fjord Coast	Norway	Website, Social Media	
Holy Cross	Poland	Website, Social Media	
Land of Extinct Volcanoes	Poland	Website, Social Media	
Hateg	Romania	Website, Social Media	
Buzau Land	Romania	Website, Social Media	
Yangan Tau	Russia	Website, Social Media	
Djerdap	Serbia	Website, Social Media	360° virtual tours
Idrija	Slovenia	Website, Social Media	Virtual tour of the exhibition
Platabergen	Sweden	Website, Social Media, QR codes, app	
Mourne Guiillon	UK of Great Britain + Northen Ireland	Website, Social Media	Virtual education tours, Interactive map
North Pennines	UK of Great Britain + Northen Ireland	Website, Social Media, Geotours app	
North-West Highlands	UK of Great Britain + Northen Ireland	Website, Social Media, Geotours app	Integrative tours,Rock route podcasts
Fforest Fawr	UK of Great Britain + Northen Ireland	Website, Social Media, Geotours app	

English Riviera	UK of Great Britain + Northen Ireland	Website, Social Media	
Geomôn	UK of Great Britain + Northen Ireland	Website, Social Media	
Shetland	UK of Great Britain + Northen Ireland	Website, Social Media	
Black Country	UK of Great Britain + Northen Ireland	Website, Social Media	3D interactive model of the Black Country Geopark headquarters
Arran	UK of Great Britain + Northen Ireland	Website, Social Media	
Karawanken | Karavanke	*Austria + Slovenia - Transnacional	Website, Social Media, Geoapp	Geogame, GeoPulse, trilingual interactive web viewer
Muskaver Faltenbogen	*German + Polish - Transnacional	Website, Social Media	Interactive map
Novohrad-Nógrad	*Hungary + Slovakia - Transnacional	Website, Social Media, App Guide@Hand	
Schelde Delta	*Belgium + Netherlands - Transnacional	Website, Social Media	
Cuilcagh Lakelands	*Irish + UK + Northern Ireland - Transnacional	Website, Social Media	Geopark digital poetry map

APPENDIX 2- Consent Form

Formulário de Consentimento

Eu, Sofia Soeiro, estudante do Mestrado em Gestão de Marketing da Faculdade de Economia da Universidade do Algarve, no âmbito da dissertação que visa explorar como é que as tecnologias podem ser integradas na estratégia do Geoparque Algarvensis, seguindo o conceito de *wise destination*, gostaria de convidá-lo a participar num Grupo de Foco a realizar no dia 26 de maio às 10:30h, a decorrer em formato online. O participante poderá esclarecer quaisquer dúvidas ou preocupações que possa ter antes, durante ou após o estudo, através do e-mail a71634@ualg.pt ou contacto +351 912 253 629.

Eu _____, aceito participar no estudo descrito nas linhas acima.

Li e compreendi o propósito do estudo. Compreendo que ao consentir participar neste estudo:

1. Aceito participar no Grupo de Foco;
2. Aceito a gravação áudio do Grupo de Foco;
3. Concordo com que a informação disponibilizada no Grupo de Foco possa ser utilizada em publicações e apresentações no âmbito de objetivos educacionais da Universidade do Algarve e/ou Geoparque Algarvensis.

Entendo que a minha participação é voluntária e que posso desistir a qualquer momento do projeto sem ser penalizado ou prejudicado de alguma forma. Entendo que quaisquer dados extraídos, para uso em relatórios ou descobertas publicadas, não irá conter, em hipótese alguma, nomes ou características que identifiquem os participantes. Apenas pessoal autorizado da Universidade do Algarve e do Geoparque Algarvensis têm o direito de rever os registos dos Grupos de Foco, garantindo a confidencialidade dos mesmos na medida permitida por lei.

Participo no estudo tal como descrito acima

Não participo no estudo tal como descrito acima

Assinatura _____ ☐

Data: _____ ☐

APPENDIX 3- Categorization grids

Theme: Geo- smart destination

Category	Sub-category	Recording units	Context units	Count
Smart technologies	Virtual reality (e.g. glasses)	"One thing they have at the Lourinhã Museum, and Geopark Oeste has that I love, is... How do you say it? (..) Virtual reality. With the glasses, it's spectacular."	FGT2	3
		"Virtual reality where we can use our mobile phones. And see what would be the palaeoenvironment or a narrative of cultural history or what happened"	FGT4	
		"Virtual reality glasses that now feel like you're actually there"	FGE3	
	Online booking platform	"A good online platform for making bookings in a simple way"	FGTO5	3
		"Being able to book online (...) for some activities, such as making bread, which are difficult to programme"	FGTO3	
		"And I'll give you a practical example, Arouca, when it opened the walkways (…) It was only online that people could visit the walkways for one euro. That controlled the number of people, because it's on the platform, it reaches a certain number and then it closes, that day there's no chance."	FGT3	
	QR codes	"Virtual tours, QR codes, things that allow people to visit places without actually going there."	FGE5	2
		"A QR Code that can be used to add more information to the site"	FGT4	
	Augmented reality	"We've been thinking about an app, augmented reality, virtual reality."	FGT1	2
		"Things to implement would be augmented reality."	FGT2	
	3D Reality	"3D (...) there are fabulous technological dynamics."	FGTO3	2
		"For the exhibition "Memories of the Sea", we intend to bring a bit of these new technologies, such as 3D reality, the interactive panel (…) So, of the four stations it will have, three have this more technological component"	FGT5	

	Website	"We had the need here, and we made an investment a few years ago in a new website, there it is, it has to be responsive, it has to adapt easily to the phone. We felt the need to put it in several languages, so we have it in Portuguese, English, French, German, Dutch, and I hope that from October it will also be in Spanish."	FGA1	2
		"We also have the website that is already implemented"	FGT1	
	Social media	"On social media, there are young people travelling around villages(...) in the country and talking to people, it's about looking at social media to collect stories, this in the geopark's networks would create a very interesting dynamic and sharing"	FGE6	2
		"We already have active social media"	FGT1	
	Geopark app	"We've been thinking about an app, augmented reality, virtual reality."	FGT1	2
		"A platform of the geopark itself where everyone is integrated and demonstrates what the geopark offers"	FGTO5	
	App with offline navigation	"And so we felt the need here, and it's also something we were asked to do, to create an app where we have all the information that's on the website, we have all the routes and here we have an issue that was the most complicated for us and that we had to combine with these new technologies, which is offline navigation."	FGA1	1
	Artificial intelligence	"Artificial intelligence can create a homogeneous, simple way of communicating here. But one that identifies us immediately."	FGT3	1
Smart experiences	Virtual tours	"We could make a 3D survey of that coastline, specifically of the footprints, and on some support. That person can make a virtual journey, as if they were walking from the beach, over the rocky area and go exactly to the footprints and visualise them."	FGT4	3
		"Virtual tours, QR codes, things that allow people to make some kind of visit without going to the actual sites, again the question of caves, caves can't be visited, but there can be virtual tours of interesting aspects of these caves and then you get a set of elements that are worth visiting, you don't even need to say where the caves are."	FGE5	

		"If there's a site that's difficult to access or a site that's very vulnerable and we shouldn't have too many people there, there could be augmented reality, or whatever technology allows us to show this place without having to put people in dangerous places or without having to expose the place to a large number of people who could perhaps damage the place."	FGT2	
	Interpretive centre	"An interpretive centre would be very important with a participatory and appealing role, people want to take an active part. (…) with technology that leads to participation."	FGTO2	2
		"Creation of interpretive centres."	FGE4	
	Gamification	"One of the activities that could be interesting, (…) in a place to visit we had a QR code that would give us the coordinates of another place to visit, in other words, to do a kind of puzzle(...) Like a paddy paper.(…) The person is doing it and wants to achieve a final goal, to have all the photos, for example, I think it works because it forces people to finish, it's a bit like going on a pokemon hunt(…) With stamps too (…) And once they've finished, we can give them a booklet about where they went, what they visited, and then it ends up having a different theme, because it encourages them to do it."	FGA7	1
	Geocatching	"Geocatching, which is an activity that has a lot of fans and would help people discover the whole territory of the geopark, doesn't require a lot of investment and is a way of taking people into the interior, I don't know what the community of geocatchers is in the Algarve, I don't know if the trend is continuing, but I think it's one of the ways."	FGR5	1
	Immersive Experiences	"They might even get splashed with water"	FGE3	1
	Holograms (e.g. dinosaurs)	"If we have a hologram of a dinosaur"	FGT4	1
	Interactive spaces with giant screens	"And yes, it would be very interesting to have some of these interactive spaces, with giant screens, where kids can interact, play games, and where technology is seen as a pedagogical	FGT1	1

		material for thinking, knowledge and education.”		
	Globe-shaped screen	“It's a screen in the shape of a globe, and you can see, for example, the earth at a certain time, when it had all the continents together, and then you move it and see it change over time. This is something I've also seen some museums that talk about geology implementing, and I think it's spectacular”	FGT2	1
	Narrator on all equipment (storytelling)	“Since this is a journey through time that our geopark allows, the idea arose of having a narrator, in other words, somehow humanising the information that is made available, but always with a common thread, a storytelling common to all the equipment, because we know that people can only make one stop and therefore have a perspective of the whole and not just the space they are in.”	FGT3	1
	Tactile sensors with sound feedback	“Sensors. The sensory of touching, but then there are sensors that provide information. When we touch the stone, it says, "I'm a sandstone".”	FGT1	1
	Virtual museums	“Virtual museums and things like that, which I think could be of added value here for the Geopark”	FGT2	1
	Sounds of the territory	“I think it would also be very interesting if we could listen. Not just to feel, but also to listen through the use of these tools. Listening to the sounds of our territory, whether it's nature, the singing, the *corridinho*, the way of speaking, the expressions, I think it's very, very funny and it also brings us closer together.”	FGT3	1
Smart business ecosystem		“Because there are partners who already have this vision and know that by using new technologies, they can reach younger audiences (...) I think that in any case it's possible, through new technologies, to create some matches here, some Tinder matches between partners. We could bring in some joint work between partners applying new technologies. Or something we've already thought of as a Geopark, or something they've seen from other experiences and have been inspired by (...) virtual reality, to start bringing in the products they sell as well.”	FGT6	1

Theme: Brand Communication

Category	Sub-category	Recording units	Context units	Count
Advantages	Explaining geology	"Various tools that really give us access and help people to interpret a lot of information that geology has to offer, sometimes with a short video or a small diagram it's much easier to reach people and make them understand what you're really trying to say."	FGT1	2
		"A picture is worth a thousand words, an animation is worth ten thousand. I think that, above all, to explain geological concepts that are very difficult to explain. Sometimes it's one thing to say, look, these continents collided, and a mountain rose up, it's another thing to show an augmented reality in which people are actually seeing something like this happening."	FGT2	
	Real time communication	"Bring information to the person, at the right time and in the right place. "	FGT4	2
		"Explain on a daily basis, I'd say, and that's where social media is extremely important. From the point of view of teasers."	FGT3	
	Communication with accessible language	"The language must be extremely accessible"	FGT3	1
	Multilingual communication	"I think that even these applied technologies help us a lot to uncomplicate things. To communicate very assertively and very objectively in various languages."	FGT3	1
	Attractive presentation of the territory	"I'm not an expert in this, but I believe there are various ways of presenting our territory with images and on social media that are so effective that people become curious and want to know more."	FGT3	1
	Synthesise information	"Everything is important to us. But the truth is that we have to synthesise. And I think that technology will help a lot here."	FGT3	1
Objectives	Cognitive learning	"A good way of highlighting our contribution and what the Geopark is doing, developing and offering."	FGT7	6

		"Presenting people, their faces. The wrinkles, the smiles. What you do here, what you've lost and are trying to reactivate or remember in some way. The memories. Our natural resources. Explain why an application has been submitted here in such a specific territory."	FGT3	
		"We could also explain that the territory is a territory of science, education, culture and tourism, in a light-hearted way. But so that people understand why this place is so unique."	FGT3	
		"So that it is not just demagoguery or something abstract, but that we can use these tools to explain in a very, very concrete way, in the areas focused on in the various sites and when these tools are applied, what are we really working on in terms of sustainable development? Where does sustainability come in here?"	FGT3	
		"I think this whole application of these kinds of tools is vital here, because it's not always easy to understand what a geopark is (…) Geoparks are still struggling today, even those that have been in the network for more than 20 years, to convey the concept of a geopark to those who visit them and those who live in them."	FGT3	
		"Using it as an educational tool. And not just educational, because it also allows you to take it to fairs, to events, to easily take this knowledge of geoparks in a much lighter way."	FGT5	
Approach	Integrated marketing communication	"Artificial intelligence can create a homogeneous, simple way of communicating here. But one that identifies us immediately."	FGT3	1

Theme: Sustainability

Category	Sub-category 1	Sub-category 2	Recording units	Context Units	Count
Monitorisation	Objectives	Counting visitors	"So, there are several things that new technologies can help us with and I think this one goes hand in hand with load capacity, which in turn goes hand in hand with sustainability.	FGA1	2
			"And it can also make it possible to count the number of visitors more efficiently."	FGT4	
		Identifying the profile of visitors	"Being able to see the profile of those who visit us."	FGT4	1
	Tools	Meters	"In our case, the meters, we have eight meters installed, we had this concern, they are a normal signalling beacon. The thing is, they have an infrared system. I access it through a platform we have, I log in and I have the data up to the day before"	FGA1	1
		Radio technology	"For example, on the hiking trails we have the possibility of having a small post with a small radio technology that as people pass along the trail, they pass in front of that sensor and that sensor counts the number of people passing along the trail"	FGT4	1
		Triangulation of the mobile phone network	"There's also the question of the mobile phone network, which if you sign a contract... With MEO or Vodafone, they triangulate and can tell us how many people are or have been in a particular place"	FGT4	1
		Screens with the number of visitors in real time	"We can know in real time who's in the museum, how many there are, how many people are in the Info centre, how many people are at the sites. "	FGT3	1
Conservation		Virtual tours	"We could make a 3D survey of that coastline, specifically of the footprints, and on some support. That person can make a virtual journey, as if they were walking from the beach,	FGT4	3

		over the rocky area and go exactly to the footprints and visualise them.”		
		“Virtual tours, QR codes, things that allow people to make some kind of visit without going to the actual sites, again the question of caves, caves can't be visited, but there can be virtual tours of interesting aspects of these caves and then you get a set of elements that are worth visiting, you don't even need to say where the caves are.”	FGE5	
		“If there's a site that's difficult to access or a site that's very vulnerable and we shouldn't have too many people there, there could be augmented reality, or whatever technology allows us to show this place without having to put people in dangerous places or without having to expose the place to a large number of people who could perhaps damage the place	FGT2	
	Create alternative sites for in situ visits	“A national park in Belgium where no one enters the park, only the staff, and around it there are several areas of great natural interest... with an interpretation centre, with a reception centre where people go, spend the days, have fun, see the animals but never enter the national park...all the infrastructures are built around the park space.”	FGE2	2
		“To relieve the pressure on divers in sensitive dive sites. Where biodiversity, because of the carrying capacity of the people diving there, can be jeopardised, many sites are creating artificial reefs with structures that are then naturalised with new corals and will attract more fish, more biodiversity and ultimately become an alternative place for people to watch and dive and	FGT4	

			observe biodiversity. I'm using this parallel because perhaps new technologies can be used to create new spaces that can somehow be an alternative to on-site visitation. So here the new technologies can be used to create a virtual reality or an interpretive centre. That's next to the site, the person ends up going to the site, they've been to the site, they haven't visited, it's the site itself of palaeontological or geological interest, because we don't want people to visit the site at all, but somehow we're creating an alternative and conditioning access to visit the site in loco but with an explanation and the person isn't disappointed, right?"		
		Creating awareness	"The technologies themselves can lead to changes in behaviour."	FGT3	1
		Regenerative tourism	"We could go beyond the logic of rehabilitating the existing heritage but also, from the point of view of ecosystems, be able to contribute to the regeneration of certain fundamental elements and specific contexts"	FGTO3	1
Accessibility	Tools	Audio guides	"We have a good perspective. We've just started, also as a first approach to inclusive tourism, we have 10 audio-guided tours that people can download in mp3 and mp4. They're always small, themed tours, and what we do is the person downloads the audio guide and easily has a guide by their side who interprets the route, (...) we have a specific audio guide for the visually impaired."	FGA1	2
			"Maybe audio guides too, for those who can't see"	FGT8	
		Braille	"There's also the question of Braille."	FGT8	1

		photogrammetry and 3D modelling	“The very technology of photogrammetry and 3D modelling, as well as 3D printing itself, also makes it possible to have a model of the sites. For example, even for people who can't see, or can't see very well, having 3D prints of certain reliefs or important sites also helps them realise what kind of things there might be.”	FGT2	1
		Website accessibility module	“The website has an accessibility module”	FGT8	1

Theme: Barriers of implementation

Category	Sub-category	Recording units	Context Units	Count
Economic	Return on investment	“Then there's another question at this level, which is whether the public interacts with all this investment. If the way we present it and communicate it, how people interact with this information that we think is valuable, if the way we present it is worth the investment.”	FGT1	2
		“If it works, what's the return for the people who consult it, but also what's the return for the Geopark, even in order to improve. Always with a view to improving and extending the use of these technologies to other facilities”	FGT3	
	High investment	“The financial side is also an added difficulty, because it requires a large investment.”	FGT3	1
	Maintenance and upgrading costs	“it's a financial impact of maintaining and updating (…). Because these structures then remain in the territory and obviously have to be maintained and updated. They're going to get damaged, they're going to have to be updated as a result of programmes, etc(..) it has to be sustainable in the long term”	FGT5	1

Operational	Places without internet	"How do we do it when we don't have internet, we have to have solutions."	FGT4	3
		"Because on the coast they have internet access but from Salir to the north they no longer do"	FGR1	
		"Most of our routes don't have internet"	FGA1	
	Need of training	"It's also good for us technicians to have some training to get to know how to work with it".	FGT2	3
		"Training teams that can use these resources to sell a particular service"	FGT4	
		"The team itself would also need training on these issues to clarify many questions, (…) Of course, if we had more training too... it would be much easier to make decisions and what kind of investment we would really like to make"	FGT3	
	Lack of know-how	"But it's not always easy to understand which ones and how to use them"	FGT3	2
		"We need someone who already has a great deal of expertise in these matters, because we can know what we would like, what we aspire to and what we desire but, truth be told, it's not always possible. And so we also need someone to guide us."	FGT3	
	Dependency on external companies	"But when this depends on external companies, it becomes really difficult, because we also have to provide content, and often we don't have the time or know how."	FGT3	1
	Unfamiliarity with the technologies of other geoparks	"We should also get to know other geoparks, other realities, understand what is already being implemented"	FGT3	1

	Risk of not working outside	"If it's implemented outdoors, it's no longer functional, (...) outdoors, it leaves a lot of doubts, and I think there should be a company that does this study and evaluation"	FGT8	1
Social	Visitors who don't use technology	"People who don't use technology."	FGT1	3
		"And then the users, there's always this barrier that there's always something that somehow isn't included, either because they haven't had access to the technologies, or because they don't feel like using the technologies. "	FGT4	
		"I usually make WhatsApp groups with my clients when I'm out with them for many days, we share photos, we share information, because sometimes there's always someone who hasn't heard, even though the groups are small, so we share everything on WhatsApp. But I've had clients who don't have a cell phone. It's rare, but it happens, there are people who don't have a cell phone. And there are people who really come to immerse themselves in the culture, they have a cell phone, but they don't want WhatsApp"	FGA3	

Theme: Impacts of technologies on tourism

Category	Sub-category	Recording units	Context Units	Count
Negative	Overtourism	"On one hand, we publicise, promote... but on the other hand we also want to be careful"	FGT3	4
		"The main concern here is that we don't apply the mass tourism model of the coast, but try to create a different, quality form of tourism"	FGA1	
		"We want to transform our offer and add certain characteristics that will allow us to reach a type of tourist who is more sensitive to environmental issues, with a more	FGTO3	

		appropriate behaviour, with a different purchasing power and a different sensitivity to culture		
		"If we want a good strategy to reduce the load, we have to promote other lesser-known sites so that the load isn't all there"	FGA4	
	Encouraging visits to dangerous places	"Because it could have the effect of, for example, the site of dinosaur footprints in the Arrifes, I don't want people to go there and if we put the 3D model available online, it might make people no longer need to go there because there's this here or it might make people want to go more"	FGT2	2
		"The fact that in some controlled places we show an image can encourage people to go there (..) We're a territory without ticket offices, without barriers."	FGT1	
Positive	Alternatives for in situ visits	"A national park in Belgium where no one enters the park, only the staff, and around it there are several areas of great natural interest... with an interpretation center, with a reception center where people go, spend the days, have fun, see the animals but never enter the national park...all the infrastructures are built around the park space."	FGE2	5
		"To relieve the pressure on divers in sensitive dive sites. Where biodiversity, because of the carrying capacity of the people diving there, can be jeopardised, many sites are creating artificial reefs with structures that are then naturalised with new corals and will attract more fish, more biodiversity and ultimately become an alternative place for people to watch and dive and observe biodiversity. I'm using this parallel because perhaps new technologies can be used to create new spaces that can somehow be an alternative to on-site visitation. So here the new technologies can be used to create a virtual reality or an interpretive centre. That's next to the site, the person ends up going to the site, they've been to the site, they haven't visited, it's the site itself of palaeontological or geological interest, because we don't want	FGT4	

		people to visit the site at all, but somehow we're creating an alternative and conditioning access to visit the site in loco but with an explanation and the person isn't disappointed, right?"		
		"We could make a 3D survey of that coastline, specifically of the footprints, and on some support. That person can make a virtual journey, as if they were walking from the beach, over the rocky area and go exactly to the footprints and visualise them."	FGT4	
		"Virtual tours, QR codes, things that allow people to make some kind of visit without going to the actual sites, again the question of caves, caves can't be visited, but there can be virtual tours of interesting aspects of these caves and then you get a set of elements that are worth visiting, you don't even need to say where the caves are."	FGE5	
		"If there's a site that's difficult to access or a site that's very vulnerable and we shouldn't have too many people there, there could be augmented reality, or whatever technology allows us to show this place without having to put people in dangerous places or without having to expose the place to a large number of people who could perhaps damage the place"	FGT2	
	Online Booking	"Being able to book online... for some activities, such as making bread, which are difficult to programme"	FGTO3	2
		"And I'll give you a practical example, Arouca, when it opened the walkways (…) It was only online that people could visit the walkways for one euro. That controlled the number of people, because it's on the platform, it reaches a certain number and then it closes, that day there's no chance."	FGT3	
	Real-time visitor numbers	"We can know in real time who's in the museum, how many there are, how many people are in the Info centre, how many people are at the sites."	FGT3	1

	Identifying the profile of visitors	“Being able to see the profile of those who visit us.”	FGT4	1
	Influence visitors´ attitudes	“The technologies themselves can lead to changes in behaviour.”	FGT3	1
	Strategies for retention in safe places	“Yes, we could put it in this model. ‘ don't go if the tide is high, ’be careful the tide may be high´, use strategies to retain the person there in some way.”	FGT1	1
	Transmitting security to local communities	“So, I think that this is also a security that we can give to our local communities. It's that we're guaranteeing that we don't really want this to distort the way of life, the way of being, and cause a sudden invasion.”	FGT3	1
	Effective brand communication	“I think that even these applied technologies help us a lot to uncomplicate things. To communicate very assertively and very objectively in various languages.”	FGT3	1

Theme: Geo-wise destination

Category	Sub-category	Recording units	Context Units	Count
Well-being		“Yes, you have to switch off. Listen to the birds. Being able to relax under a tree, having a nice nap. .. Yes, and our territory has many, many places where it's possible and it's good to be disconnected.”	FGT1	2
		“Nowadays we feel that people have more and more problems with human connection... New technologies help to publicise, promote and so on, but then when you get to the place I think there has to be contact with people (..) And there are people who really come to immerse themselves in the culture, they have a cell phone, but they don't want WhatsApp”	FGA2	
		“That the need for a healthy lifestyle also involves switching off. Unplugging. Recovering energy and our territory offers this possibility.”	FGT3	

Places to disconnect	No Wi-Fi Zones	"For example, in the hills, where internet access is much more limited, for some of these places, perhaps even turning this weakness into a strength. To use precisely those places as places to switch off, to enjoy a little."	FGT2	2
		"We have to turn the points that don't have internet, as has already been mentioned, into attractive points in the same way. In quality, in excellence. It's also not our weakness, but our great potential (…) But we also have to work on the concept and make it attractive from a tourist package point of view. So that it doesn't seem like a contradiction in terms of what's on offer in the area."	FGT3	
	Villages without mobile phones	"There are already tourist villages... where the mobile phone is left at the door. So that you don't have to be tempted and you can really enjoy that time, have time for yourself, have time to enjoy what the area has to offer, without having to be connected to talk to people, to interact with everything that surrounds you. Without being connected to the network. Create another network."	FGT1	1
	Non-technological accommodations	"At the moment there are accommodations that sell for having zero technology"	FGA4	1

Conceptual table

Concept	Definition	Author(s)
Smart destination	A space in which all the agents involved in the destination collaborate in the efficient management of infrastructure and use technology to increase the quality of life of both locals and tourists.	(Cerdá-Mansilla et al. 2024)
Brand communication	Brand communication is the strategic process through which a company conveys messages, values, and its unique identity to a target audience. The primary goal is to inform, persuade, and build a positive, lasting relationship with consumers, ultimately shaping their perceptions and influencing their behavior.	(Ateke & Nwulu, 2017)
Sustainability	In the context of geoparks, sustainability is understood as an integrated strategy that aims to improve the well-being and quality of life of local populations through balanced consideration of economic, social, and environmental impacts.	(Geopark Management Toolkit, 2025)

Barriers of implementation	A barrier is something that prevents something else from happening or makes it more difficult.	(Cambridge, 2025)
Impacts of technologies on tourism	An impact is a powerful effect that something, especially something new, has on a situation or person.	(Cambridge, 2025)
Wise destination	An evolution of the smart destination, it values the use of technology, but this concept goes further by promoting the creation of moments of disconnection, proposing a more humane and responsible use of technology.	(Coca-Stefaniak, 2020)
Smart technologies	Integrate digital infrastructure (hardware, software and networks) with tourism services and ICT, enabling real-time data flows that support more informed decision-making for all destination stakeholders.	(Pai et al., 2021)
Smart experience	Smart experiences are defined as technology-mediated experiences that are distinguished by integrating elements of personalization, adaptation to the context and real-time monitoring.	(Jovicic, 2019)
Smart business ecosystem	The smart business ecosystem is related to the complex ecosystem of local actors.	(Gretzel et al., 2015)
Cognitive learning	In the context of destination image, cognitive learning relates to the formation of an individual's beliefs and knowledge about the attributes of a destination.	(Agapito et al., 2013)
Integrated marketing communication	Planning and execution of the brand's various communication channels in order to convey a clear, consistent and compelling message.	(Kotler & Armstrong, 2020)
Regenerative tourism	While sustainable tourism only tries to reduce social-ecological damage, regenerative tourism goes further and tries to create positive effects on social-ecological ecosystems, building their capacity for regeneration.	(Bellato et al., 2023)