Smart and Slow Tourism in Protected Natural Context

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Abstract. The manuscript comes from the interdisciplinary research carried out in the field of tourism in Sardinia, with particular attention to elements such as the environmental pressure of the sector, the drive towards slow tourism and sustainable mobility which, even in areas with even in highly urbanized areas, it can represent a different and seasonally adjusted way of appreciating, safeguarding and experiencing a territory.

The opportunity is to unite different observation points, from the land and sea sides of Sardinia, in the northeastern part already widely characterized by over tourism and take advantage of geographical information tools such as GIS and WebGIS, for sharing information and the enhancement of slow tourism.

Case studies are presented in the manuscript in the Tavolara Punta Coda Cavallo protected marine area and in the La Maddalena Archipelago National Park, where the perspective of active under tourism is privileged as an alternative to over tourism, for the sustainable use of landscapes unique. Furthermore, the case studies constitute experiences to discover landscapes through the integration of mobile spatial geographic tools (smartphones). Finally, through ad hoc applications (weather and atmospheric conditions, as well as apps for enjoying outdoor activities), a sharing map was created, also with external users, through the MyMaps platform, to support sustainable tourism.

Keywords: Protected natural areas · Smart and slow tourism · Smart Community

1 Introduction

In[1] the context of different spatial scales, achieving the sustainability goal of the 2030 Agenda emerges as both a necessary, and in some respects restrictive, policy to transform and improve the landscape balance of the regions involved. This need is strongly

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emphasized in the United Nations Environment Programme (UNEP) report 'Making peace with nature' (2021) [1] in which biodiversity loss, climate change and pollution are the most urgent environmental problems that require addressing. The idea therefore seems to be emerging that more careful planning of territories, with particular regard to the expansion and valorization of protected areas, is an essential element in improving the use of resources and avoiding uncontrolled over-exploitation. The UN definition, contained in the Convention on Biological Diversity (CBD) that came into force on 29 December 1993, emphasizes the importance of preserving natural balances, but at the same time consolidates the intention to also safeguard and enhance cultural and economic resources [2, 3]. Within the European community, the most recent interest and actions aimed at protecting fragile ecosystems stem from the 'Biodiversity strategy for 2030', which aims to increase protected areas by approximately 30 per cent of the land surface and 30 percent of the marine areas by 2030 [4]. The restoration of biodiversity is based on the active involvement of multiple local actors (resident communities, businesses, researchers, public institutions) who are motivated to create collaborative networks capable of reducing the gaps in the territory. Biodiversity restoration relies on the active involvement of multiple local actors (communities, businesses, researchers, public institutions) who are motivated to create collaborative networks capable of reducing the gaps in the territory. Considering data from the World Database of Protected Areas (WDPA) as of April 2023, there are 176,550 protected areas in Europe covering a land area (including inland waters) of 3,805,373 square kilometers and a marine area of 1,572,026 square kilometers [5]. An important tool devised by the EU authorities to guide protection actions on the territory is the Natura 2000 Network. The ecological network was established by the Habitats Directive 92/43/EEC and together with the Birds Directive 79/409/EEC (amended by Directive 2009/147/EEC) ensures the balance of natural habitats of threatened or rare species of flora and fauna. The Network consists of Sites of Community Interest (SCI), Special Areas of Conservation (SAC) and Special Protection Areas (SPA) [6, 7].

In Italy (December 2022) there are 2,639 sites belonging to the network, which guarantee the protection of approximately 132 habitats, 92 species of flora and 120 species of fauna [7]. In addition to the areas falling within the scope of this ecological network, the classification of Italy's protected areas is regulated by Law No. 394/1991 in Article 2, which identifies them as: National Parks; Regional Natural Parks; Nature Reserves; Protected Marine Areas and Other Protected Natural Areas. These areas cover 20% of the land surface and 11% of the sea surface and specifically there are 843 protected areas of which: 25 National Parks, 148 State Nature Reserves, 134 Regional Nature Reserves, 365 Regional Nature Reserves and 171 other Protected Areas of different classifications and denominations.

In order to respond to the stimuli of Community policies and strategies, Italy too is oriented towards activating 'new' economic models starting from the most vulnerable areas in which tourism can act as a valid support to the valorization, not only of the natural component, but also of the economic, social and cultural one [8, 9].

The manuscript, after a review of the literature concerning the combination of protected areas and slow tourist use in an intelligent perspective, aims to analyze using hybrid maps (traditional and digital) of two areas under protection in the north-east area:

the National Park' La Maddalena Archipelago and Tavolara-Punta Coda Cavallo Marine Protected Area.

In addition to the Introduction, the paper consists of four other paragraphs: 2. Related works; 3. Materials and methodology, 3.1. Study area and 3.2 Methodology; 4. Results and Discussion and 5. Conclusions and future developments.

2 Related Works

The interaction between tourism and biodiversity conservation in protected areas is complex. It is well-established that organizing spaces in a sustainable tourism way using ecotourism or slow tourism implies a low-impact use of resources while creating 'new' employment, better infrastructure and more socio-economic opportunities for local communities. Certainly, in addition to the positive aspects, when a destination experiences increased intensity of tourism development, pressure on ecosystems increases and negative externalities (ex: pollution, loss of biodiversity, land use change etc.) become evident if it is not effectively managed and monitored [10]. Thus, the increased potential conflict between maintaining a healthy natural environment and economic development pushes different local actors to formulate a sustainable offer, but also to adopt an innovative approach to strike a balance between tourism and nature conservation [11].

Concerning the first aspect, i.e., formulating a sustainable supply of tourism goods and services, the drives from globally adopted policies and strategies are many. Among the various indications, the input of the World Tourism Organization through the publication of the report "Rethinking Tourism: from Crisis to Transformation" in 2022 [12], pushes different countries to seek 'new' economic models to improve the resilience of territories [13]. This vision has also been contributed to by recent (post-Covid era) changes in the demand of tourists more inclined to experience places of 'proximity' motivated mainly by the need to find new balances, to undertake outdoor vacations based on the enjoyment of the natural resource [8, 14, 15]. The contemporary tourist shows increasing fascination with living 'non-ordinary' experiences, but which allow one to slowly traverse different landscapes [16]. This slow philosophy of travel combined with the visit of protected areas induces a non-invasive fruition of the territory, choosing low environmental impact modes of travel on specially created or 'recovered' routes that represent the essence of the place [17–19]. Sustainability is also prefigured in the different interaction with the indigenous community that is experienced by guests with greater awareness and a stronger thirst for knowledge of identities [20, 21].

Moving through protected landscapes slowly must also be planned through the adoption of an innovative approach (second aspect mentioned above). The smart paradigm offers an interesting choice of useful technological solutions to create a better balance between tourism practices and area protection. Trends in future technological transformation for the purpose of optimal management of protected areas include the use of Artificial Intelligence (AI), Big Data, Internet of Things (IoT), Augmented Reality (AR) and Virtual Reality (VR). These technologies can help the protected areas to improve methodologies regarding, for example, the management and monitoring of natural and cultural resources, tracking the movement of wildlife or tourist flows within the considered area [22]. The use of Geographic Information Systems (GIS), GPS, and public

participation to collect geographic information can support local agencies to plan and manage recreational routes and different transportation patterns useful in predicting and mitigating potential impacts generated by increased visitation [11, 23, 24].

3 Materials and Methods

In the context of the outlined tendencies, the article aims to present some experiences of slow fruition in Sardinia (Region of Italy) and in particular the Tavolara-Punta Coda Cavallo Marine Protected Area and the National Park of the La Maddalena Archipelago in the northeast area of the Island will be considered.

3.1 Study Area

The Region of Sardinia in Italy, the Mediterranean's second-largest island, is a well-established tourist destination on a national and international scale that attracts tourists seeking a primarily seaside vacation [25]. Thus, the coastal landscape is the island space most traversed, consumed and transformed by a significant flow of guests who count in 2021 2,500,000 arrivals and 10,600,000 stays [26]. In particular, it is northern Sardinia, that is the historical region of Gallura, that polarizes supply and demand. The area with a surface area of 2,442.16 sq. km has 460 km of coastline consisting of a succession of cliffs alternating with fine sandy beaches. These beaches present a scarce width that makes them unsuitable to bear the tourist load that is concentrated almost exclusively during the summer season with negative consequences especially for the natural environment. A coastal heritage rich in biodiversity and cultural values that has been under a protection regime through the establishment of several Protected Areas (PAs). The ecological network officially managed to conserve nature, ecosystem services and cultural values is configured in a National Park of the La Maddalena Archipelago (1994) and a Tavolara-Punta Coda Cavallo Marine Protected Area (1997) to which is added the 'Natura 2000' network with eight Sites of Community Interest (SCIs), four Special Protection Areas (SPAs), eight Special Areas of Conservation (SACs), two Important Bird Areas (IBAs) and four Natural Monuments.

In our study we will consider the first two PAs mentioned above.

The La Maddalena Archipelago National Park, falling within the municipality having the same name, covers a land area of 5,134 ha and a sea area of 15,046 ha (Fig. 1). In 2021, the 10,687 residents [27] were joined by 203,981 presences and 52,212 arrivals attracted not only by the beauty of its seaside resources, but also by its rich biodiversity and sites of historical and artistic cultural interest. The institution of the Tavolara-Punta Coda Cavallo Marine Protected Area, consisting of 15,000 ha of sea and 40 km of coastline, is also part of the safeguarding and sustainable development of the area. The management of the area has involved since 2004 the coastal municipalities of Olbia, Loiri Porto San Paolo and San Teodoro with a predominantly seaside tourist vocation in which resides a population of 69,363 inhabitants [27] that in 2021 hosted 271,236 arrivals for a total of 1,115,127 presences [28].

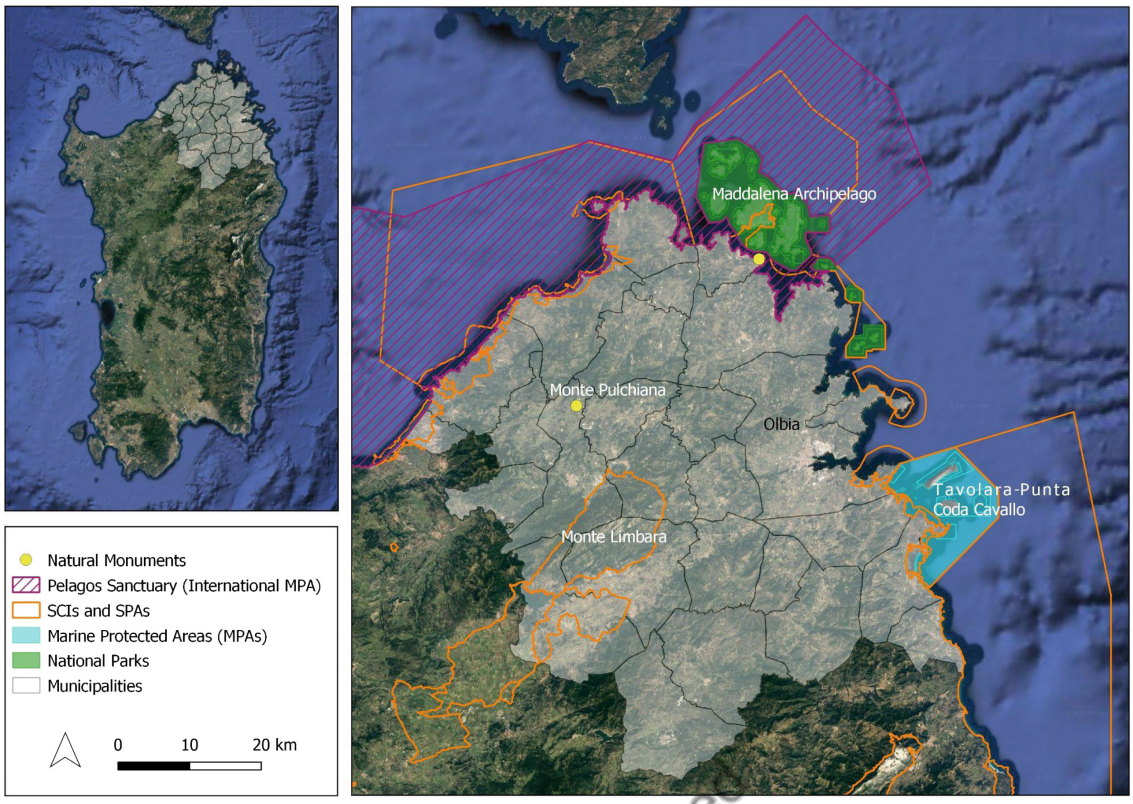

Fig. 1. The protected areas of northern Sardinia (ex-Province of Olbia-Tempio).

3.2 Methodology

The aim of the paper is to consider these protected spaces, not as physical support to the organization of recreational activities, but as a primary resource capable of attracting an 'alternative' demand. In fact, the safeguard itineraries of these areas are born to preserve the landscape, but at the same time contribute to strengthening the identity and promotion of the places [29]. Enhancement from a sustainable tourism perspective is achieved by integrating interactive geographic data acquisition and mapping tools (MyMaps platform) to create a multimedia cartography aimed at sustainable tourism enjoyment. In particular, digital tracks (GPS tracks classified according to walking, biking, kayaking, swimming, etc.) left by the smart community moving, presumably with greater awareness, through different areas and sites of natural and cultural interest are to be analyzed. There are many websites (ex: strava.org; trekkingitalia.org, Escursionismo.it etc.) or applications for mobile devices (ex: Viewranger; Wikiloc; Map My Tracks; Oruxmaps; Bergfex etc.) that allow users to upload their hiking or training activities and share their experiences. The visualization of the tracks, single or as heatmaps, is made possible by the different platforms that are thus configured as interesting tools capable of providing appreciable insights into the different phenomena observed for better planning and management of protected areas included [30]. These traces represent voluntary geographic information (Volunteered Geographic Information - VGI), the production of which over the years has become a phenomenon that has aroused the interest of the scientific community, due to the bottom-up geographic and cartographic contribution.

Digital traces thus contribute to implementing territorial knowledge, thanks to the smart community, producer and user of geographical information. In particular, digital traces assume a progressive role in the planning and also in the management of protected areas. In particular, the qualitative information of the heatmaps (raster images), i.e. without associated metadata, provides important insights for the representation of the observed phenomenon. Table 1 shows the methodological framework.

Table 1. Methodological framework. Source: All authors.

Step	Phenomenon - Digital track	Spatial Dimension - Park and protected areas	References
01	Input - Observation	Digital track (GPS) and Heatmap	Malek et al. (2010) Criscuolo et al. (2014) Ladu et al. (2019) Tarachucky et al. (2021)
02	Representation of the phenomenon in the spatial dimension	Overlapping Layers	
03	Output - Hybrid Map	Traditional Thematic Cartography and Volunteered Geographic Information (VGI)	

Table 2. Methodological framework of acquisition - processing - return of data.. Source: All authors.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Data acquisition hardware device/platform/app identification - tracking software	Tracking routes	Route correction in GoogleMaps / QGIS environment	File processing in kml format for sharing on Google MyMaps platform - Google Earth web	Google MyMaps platform deployment and integration with additional multimedia information

The authors then investigated and then tested the density of the digital traces of the smart community (Strava community) and the relative spatial distribution of the complex protected environmental system of the La Maddalena National Park, obtaining the following hybrid maps (Fig. 2).

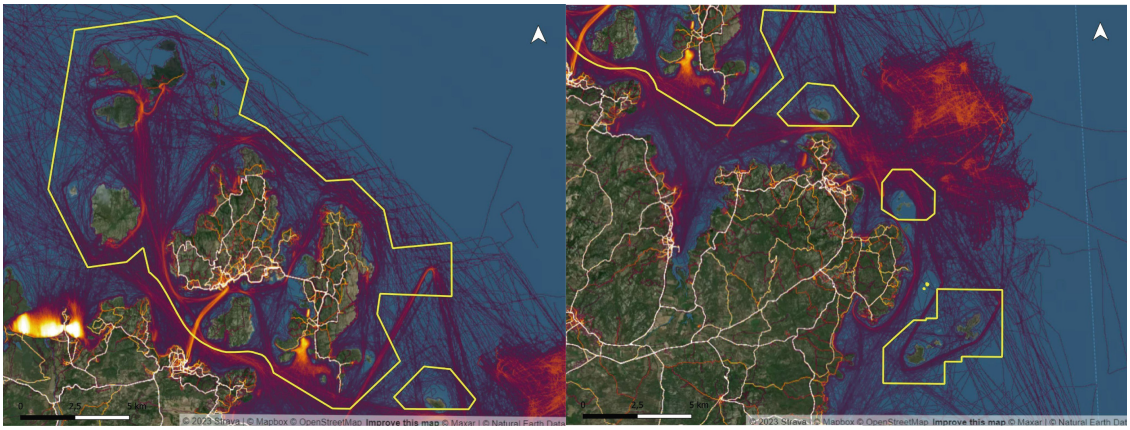

Fig. 2. La Maddalena National Park and digital traces of the smart community. Source: Strava.org.

The method used for the elaboration of Fig. 2 therefore consists in a hybridization of the traditional thematic cartography with the voluntary digital one, which constitutes the sensitive part of the data, because it is imbued with significance, enriching the map with contents.

This hybridization is also reflected in the methods of returning geographic information through different methods and platforms, favoring, in particular, the use of low-cost instruments normally available, such as mobile devices (smartphones) and freely usable apps (such as training apps sports) and popular search engines (e.g. Google Dashboard with location history). In this case, the work developed required the collection of various geographical contents and the creation of ad hoc information layers. In particular, it was necessary to use the GPS tracks relating to the individual routes under study (Table 2).

These traces were recorded using the GPS chipsets present in commercial smartphones, and the traces recorded by them during the various routes. In this case, during the data acquisition operations, various activity tracking apps were used, ultimately focusing on Strava and linking the data collection to the Google profile which, through the 'location history' service, allows observing the places visited and the different routes taken. The 'double tracking' allows, in fact, to activate the systematic acquisition of position data, effectively improving the positioning accuracy. Furthermore, since, in this specific case, we are dealing with routes carried out at sea, therefore outdoors and with a limited, if any, presence of natural obstacles to satellite signals, the positioning of the routes is fairly high for the purposes set by this research, i.e. corresponding to an accuracy of around 5m. As will be evident in the discussion of the case study and the results obtained, during the data processing phase, steps were taken to correct position tracking errors, reconstructing the routes on the basis of the cartography used as backgrounds during processing (e.g. Google Maps; OpenStreetMap; Geoportal of the Autonomous Region of Sardinia).

A phase following the acquisition of geographical data and their correction, concerned the return by means of the Google MyMaps platform.

The use of this platform is useful for a dual purpose. On the one hand, allowing simultaneous and concurrent access to the same data for their processing and cartographic dressing, as well as, on the other hand, representing a starting point for information dissemination activities to a wider audience, given the possibility of inserting and in the

places visited multimedia references, such as images, videos, websites, as well as the possibility of incorporating MyMaps projects into specific web pages.

4 Discussion and Results

The work developed in different directions, aimed at the acquisition of voluntary geo-referenced information. In particular, the coastal and naturalistically protected areas of northern Sardinia constitute the case study. The work involved carrying out field investigation in 2022, as highlighted in Table 3. The field investigation concerned slow mobility in water, by canoe (La Maddalena Archipelago, Tavolara-Punta Coda Cavallo, Teulada) and walk mobility (Valle della Luna, Santa Teresa di Gallura).

Table 3. Data acquisition and field investigation activities

Period	Place	Way of travel
23 april 2022	Maddalena Park	canoe
24 april 2022	Santa Teresa di Gallura - Valle della Luna and Capo Testa	walk
4 june 2022	San Teodoro - Tavolara - Porto Taverna	canoe

In the field activities, the paths were traced using a GNSS receiver mounted on a smartphone in order to trace the paths and subsequently process them in the GIS environment and import them in the Google MyMaps environment, as well as for the subsequent dissemination and dissemination of the results. The work therefore involved tracing the routes using a popular sports activity tracking app (Strava.org), integrated with the mobility data collection system developed by Google (Location History). These systems allow you to acquire and track position data thanks to the GPS chipset present in popular smartphones and to give you a recording cadence useful for carrying out physical activity. Both platforms (Strava and Google) were used in order to integrate the information left out by one of the two systems in conditions of low satellite or mobile network signal coverage. In both cases, in fact, a loss of coverage can result in an incompletely correct recording of the journey undertaken.

In fact, it was necessary to intervene ex post in the elaboration of the sections in the 'Parco di La Maddalena'. This was organized in three different sections (Palau - Santa Trinità beach; Santa Trinità beach - La Maddalena; La Maddalena - Palau). The first required an important reworking, with a reconstruction of the route thanks also to the points acquired, but discarded by the algorithms of the apps and platforms used, for the correct manual reconstruction.

All the above activities were then aggregated in the MyMaps digital environment in order to create a multimedia cartography aimed at the slow tourist use of protected natural contexts (Fig. 3).

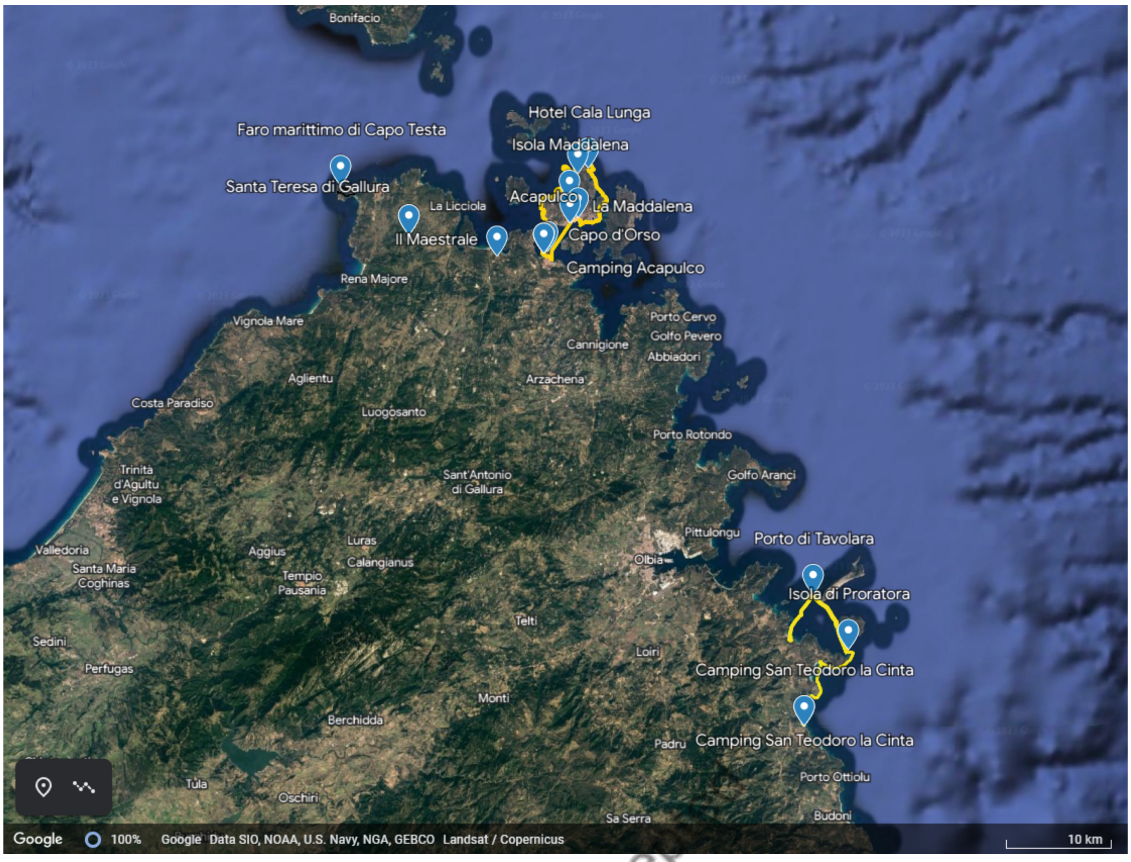

Fig. 3. MyMaps: Slow tourism 2022. Source: All Authors, link: https://bit.ly/Turismo_Lento.

The research carried out therefore represented an opportunity to combine tourist use activities with low environmental impact (walk and canoe) in contact with nature, with opportunities for knowledge and use of the territory, thanks to the privileged observation point characterized by the coastal navigation of proximity, remote shooting integrated with those on the ground (or on the sea), slow pedestrian mobility. This making possible a sustainable tourist use of protected and protected areas and contexts, through participation in initiatives carried out with respect for the environment.

5 Conclusion and Future Developments

The over tourism in Sardinia requires a renewed approach between: governance, innovation, technology, accessibility and sustainability, through active participation, which is the key to building a new way of conceiving travel in a sustainable and safe way, respecting the contexts and appreciating local cultures and traditions and providing proactive economic and social benefits in preserving the environment. In particular, digital tourism services represent the most dynamic component of tourism [31].

Furthermore, the implementation of technologies within reach of 'smartphones' allows tourism - understood as an experiential moment at the service of culture, the territory and its resources - to balance fruition and protection. In particular, hybrid maps, the result of the contribution of voluntary geographical information - bottom-up - through the digital traces of the smart community, understood as producer and user of geographical

information, contribute to spreading knowledge and collective responsibility in sensitive contexts (Natura 2000 sites, protected areas, parks, etc.).

The experience gained in the development of MyMaps slow tourism 2022 can be considered a positive result, which can be deduced from the progressive increase in views. In this framework, future scenarios open up which see the authors engaged in the development and construction of similar voluntary maps in other sensitive contexts of Sardinia to promote a wider project called 'Slow tourism around Sardinia'.

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