

Can Lesser-Known Points of Interest (Pois) Be a Solution for Mitigating Overtourism? The Case of Val Gardena, Italy

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Abstract. *Overtourism refers to an imbalance between the volume of tourist flows and the carrying capacity of a destination. Currently, mountain environments are facing this phenomenon as visitors tend to concentrate through fragile valleys with limited infrastructures. This concentration affects both the local quality of life and the tourists' satisfaction. In this context few hotspots suffer from overcrowding, while lesser-known Points of Interest (POIs) remain neglected. Academic literature often mentioned slow tourism as an alternative to overtourism, however it frequently overlooks how to operationalize territorial redistribution, particularly considering carrying capacity. Our research addresses this gap proposing a framework designed to identify, characterize and promote lesser-known POIs through a four-phase pipeline: from data collection to a final application. Our framework combines geospatial data, digital footprints, and stakeholder interviews to evaluate the territory through two perspectives: macro-regional and micro-individual level. Taking Val Gardena in the Dolomites as a case study, our research demonstrates how overcrowded POIs, such as Mount Seceda, can be assessed across these two levels, considering four dimensions (general information, infrastructures, tourism demand, digital marketing) to determine the valley's and the POI's carrying capacity. Whereas conventional algorithms depend on popularity-based methods, our framework focuses on ecological conservation and create the basis for future recommender systems to helps Destination Management Organizations (DMOs) restoring the balance of tourism towards sustainable lesser-known destinations.*

Keywords: overtourism, slow tourism, lesser-known points of interest, territorial marketing strategies, decision support systems.

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Introduction

As stated by UNWTO overtourism occurs when the volume of visitors surpasses what a location can reasonably handle. This imbalance negatively affects residents' quality of life and quality of visitors' experience (World Tourism Organization UNWTO et al., 2018).

Recent technological advances, easier access to information, and low-cost mobility have increased tourist flows, raising sustainability concerns (Bertocchi et al., 2021; Capocchi et al., 2019; Rogowski et al., 2025). Literature has investigated the impact of anthropogenic pressure on natural heritage (Bertocchi et al., 2021; Knight, 2022; Rogowski et al., 2025; Senetra et al., 2020) underlining how uncontrolled tourism growth compromises the destination through resource depletion, environmental degradation, increased waste, negative attitudes among residents (Capocchi et al., 2019; Fidelus-Orzechowska et al., 2021).

Slow tourism has emerged as an alternative paradigm, encouraging a shift toward quality experiences favoring green mobility (e.g., hiking and cycling) and longer stays to reduce carbon emissions (Zago, 2011, in Casti & Burini, 2015, p. 14; Paul, 2014), rediscover the value of time and reconnect with nature, such as in mountain landscapes (Matos, 2012).

To illustrate this imbalance in tourist flow, Bertocchi et al. (2021) and Rogowski et al. (2025) show that tourism pressure in mountain regions tends to concentrate in well-known sites, technically defined as Points of Interest (POIs). As a result, other locations with low visibility and a lack of accessible data called *hidden gems* or *lesser-known POIs* remain unexplored (Pradipta et al., 2021; Rajaonarivo et al., 2023a).

Based on this approach, this work proposes a holistic framework integrating marketing, management, and computer science, to identify, characterize and promote diverse types of POIs. Our objective is to provide the basis for future recommender systems that can help DMOs to balance visitor traffic prioritizing under-visited POIs and encouraging eco-friendly sites. Compared to existing literature, our contribution is threefold.

Firstly, by considering a wide variety of heterogeneous tourism data, including Volunteered Geographic Information (geographic data voluntarily shared by online users) from OpenStreetMap¹ (OSM), Open Data, statistical sources (e.g., INSEE² in France, ISTAT³ in Italy), and stakeholders' interviews, we propose a methodology to aggregate data and categorize POIs in mountain environments.

Secondly, based on such data, we offer a holistic framework that follows a pipeline, from data acquisition to valorization, based on sustainable marketing approaches to promote lesser-known POIs.

Thirdly, we introduce a dual approach that considers the territory at both *macro*-regional view and *micro*-Point of Interest (POI) view. To identify and recommend secondary sites, we focus on four dimensions: general information, infrastructure and accessibility, tourism demand, and digital marketing. This process will help tourism professionals highlight the hidden gems by considering the carrying capacity of the destination. At the macro level, the framework combines information about the region, while at the micro level, information about individual POIs.

The following sections explore the theoretical background through a literature review, followed by an explanation of our methodology. Finally, we use a real-world example in Val

¹ <https://www.openstreetmap.org>

² <https://www.insee.fr>

³ <https://www.istat.it>

Gardena to demonstrate how a dual micro-macro perspective helps identify and assess lesser-known locations.

Literature review

Academic literature characterizes overtourism as a failure in managing a destination's carrying capacity (Capocchi et al., 2019). Once the level of tourists passing through an area is beyond the carrying capacity, it is impossible not to experience some negative impacts, especially where the environment in question is vulnerable due to its mountainous nature (Tsypko, 2024; Knight, 2022; Senetra et al., 2020; Fidelus-Orzechowska et al., 2021). The slow tourism approach may provide a possible solution, emphasizing quality, meaningful experiences, local engagement, and responsible mobility (Paul, 2014).

Overtourism has been widely studied in metropolitan areas for many years (Alonso-Almeida et al., 2019; Dragan & Camară, 2022; Yu & Egger, 2021), whereas the environmental vulnerability of mountain regions has historically meant that this area of study has received little attention. However, new studies have documented overtourism issues in natural environments including the Galapagos Islands, Iceland, Norwegian fjords, and the Dolomites (Bertocchi et al., 2021). Data-based assessments find that overtourism in mountain environments occurs due to a combination of total number of arrivals as well as ineffective spatial and temporal management of consumer flows at the site, causing sustained congestion at particular POIs during certain time frames (Bertocchi et al., 2021; Rogowski et al., 2025). As a response to address these inequities arising from overtourism, slow tourism has become an alternative behavior to help better distribute visitor flows.

Mountain areas are ideally suited for this paradigm, as they provide opportunities for engaging with slow mobility by letting tourists enjoy the pleasure of natural landscapes and targeting visitors looking for quiet and serenity. As such, slow tourism provides an important role that expands the offerings available within the mountain tourism market as well as significantly supports the conservation of the natural resources. Nevertheless, the success of slow tourism relies on the active participation of local partners (i.e., mountain guides, hotel/restaurant operators) and the establishment of a coordinated effort (Matos, 2012). A dedicated information system, considering mountain POIs, should help in such context.

This transition requires a careful evaluation of carrying capacity, to ensure that new visitors do not reproduce overtourism dynamics. Carrying capacity refers to the maximum number of visitors a destination can accommodate without compromising the environmental and social integrity of the territory (Bertocchi et al., 2021). In mountain areas, carrying capacity represents a balance between environmental protection (Knight, 2022; Senetra et al., 2020), and social carrying capacity (Gogonea et al., 2017; Baloch et al., 2023), aiming to preserve the natural heritage and the cultural identity.

A marketing point of view analyzes the extent to which overtourism affects the way tourists perceive their experiences while visiting overcrowded locations (Yu & Egger, 2021). Additionally, there are a number of studies concerning the impact of social media on tourists' decision-making (Alonso-Almeida et al., 2019; Song & Wondirad, 2023). In this regard, while some sources state that social media speeds up the saturation of well-known sights, others affirm that with proper implementation, these instruments can be employed as tools to mitigate overtourism (Pradipta et al., 2021; Bordogna et al., 2015). Some of these studies have proposed operational tools, such as

Journee or Unexpected Italy⁴ to counter overtourism by connecting tourists with locals (Buranasing et al., 2021; Pradipta et al., 2021).

However, existing applications rarely consider mountain contexts, therefore, tourists rely on platforms such as *AllTrails*⁵ or *Komoot*⁶ to identify hiking paths in nearby areas. Many of these systems use algorithms based on popularity, historical trends and ratings from other users to provide recommendations. As such, they foster a cycle in which tourists head towards destinations that are already overcrowded. On the contrary, alternative options are not often represented due to their low visibility in the algorithmic systems used to recommend them. Existing platforms provide important insights as they can serve as a starting point for designing an information system that will address the particularities of mountain regions.

In computer science these systems are commonly referred to as recommender systems. Recommender systems have been the subject of extensive research in the area of how they can be used to direct tourist flows to less congested areas (Buranasing et al., 2021). There is current literature discussing how these systems have been applied to the problem of overtourism by providing alternatives to overcrowded destinations (Masson & Mine, 2025).

While there have been advancements in these topics, research currently conducted rarely discusses aspects of land management (e.g., carrying capacity, availability of infrastructures). Additionally, there continues to be a disconnect between the marketing research, which deals primarily with motivations of and types of audiences, and the computer science approaches to implementing technical solutions. Thus, we propose a multidimensional framework that integrates computing tools, environmental constraints, redistribution of visitor flows and responsible marketing strategies. The multidimensionality of the proposed framework will allow for a macro and micro-level perspective to further enable a more granular analysis of carrying capacity and establish consistency across components. Table 1 summarizes the strengths and weaknesses of the existing approaches and presents how we positioned ourselves relative to the existing literature.

Table 1. Synthesis of literature review

Domain	Author(s)	Key advantages	Critical challenges	Context
Marketing and management				
Overtourism	Capocchi et al. (2019)	Overtourism as governance failure.	Lack of practical indicators.	Generic
Slow tourism	Matos (2012);	Revitalization of mountain areas; visitors-community interaction.	Requirement of stakeholder coordination; lacks operational tools.	Mountain
Carrying capacity	Senetra et al. (2020); Knight (2022);	Multidimensional carrying capacity: environmental protection, social well-being.	Complex economic-ecological balance; Fragmented indicators.	Mountain
Visitors' perception and social media	Yu & Egger (2021); Alonso-Almeida et al. (2019); Song & Wondirad (2023)	Sentiment analysis (UGC); identification of hotspots based on digital traces.	Focus on famous sites, doesn't consider lesser-known POIs and resident perspectives.	Generic

⁴ <https://unexpected-italy.com>

⁵ <https://www.alltrails.com>

⁶ <https://www.komoot.com>

Domain	Author(s)	Key advantages	Critical challenges	Context
Computer science				
Flow analysis	Bertocchi et al. (2021); Rogowski et al. (2025)	Big Data flow monitoring; spatial/temporal pressure mapping	Reliance on expensive proprietary data; restricted to already saturated POIs	Mountain
Hidden gems and Lesser-known POIs	Pradipta et al. (2021); Buranasing et al. (2021); Rajaonarivo et al. (2023a; 2023b); Masson & Mine (2025)	algorithmic discovery such as few-shot learning and proximity-based approaches.	Dependence on digital traces; Disregard for infrastructure readiness; low accessibility for non-computer science experts.	Generic

Source: Authors' own research.

Methodology

This research is undertaken in an interdisciplinary and holistic manner, combining computer-based analyses with destination marketing and territorial management. We propose a framework, designed to use data sources relevant to mountain contexts (e.g., interviews with mountain hut managers, trail maps, cable car ticket sales, etc.), combining heterogeneous data types such as numerical, textual, within geospatial contexts. The case of mountain environments versus urban environments will necessitate specific types of data, such as elevation, measurement of snow cover, as mountain regions are geographically fragmented and have limited data available on them. It is proposed that by integrating a variety of sources of data and data types there is potential to identify unexplored and lesser-known POIs and promote them through more sustainable marketing strategies. This proposal is the basis for the use of both qualitative (i.e., stakeholder interviews) and quantitative (i.e., digital footprints and geospatial data) methods of capturing both local knowledge and measures of the tourist flow and characteristics of sites. Based on the above, this work addresses four main challenges: (i) collection of heterogeneous data from limited sources, (ii) analysis of multi-level data to identify lesser-known POIs, (iii) building and implementing sustainable marketing strategies, and (iv) generalizability of the framework across different mountain environments.

The proposed framework: a four-phase pipeline

The framework is organized into four phases (Fig.1): *POIs Collection*, *POIs Analysis*, *Sustainable Marketing Strategies*, *Application*, and it includes three types of data sources.

The first type of source is *geographic data* including spatial attributes of POIs and trail networks, which have been derived from OpenStreetMap. Secondly, we have *digital insights* which represent a layer of digital footprints collected through Wikidata⁷ database. Digital insights use online resources to provide quantitative measures of digital visibility and the reach of specific locations. At this level, information will also be derived from statistics made available by governments. Thirdly, we have *local stakeholder insights* which include a qualitative part that involves face-to-face interviews with mountain hut managers, tourism offices, DMOs, etc. Consulting these stakeholders will enable us to validate our recommendations and make sure they comply with the local constraints.

⁷ <https://www.wikidata.org>

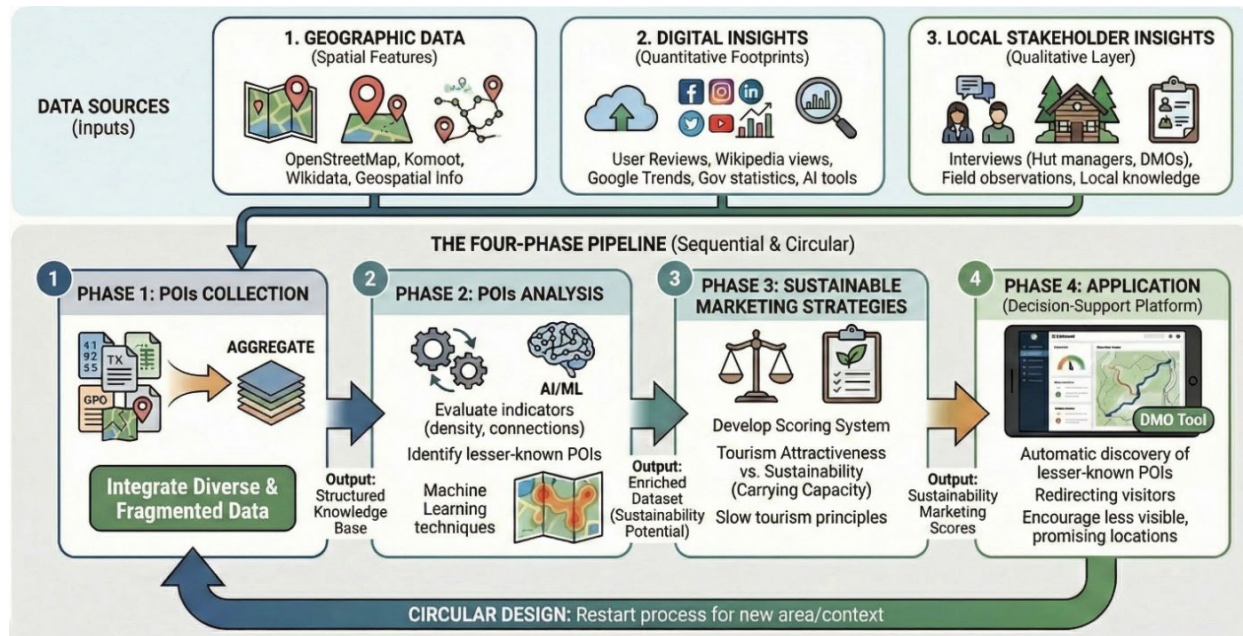


Figure 1. Framework: a four-phase pipeline for sustainable territorial marketing

Source: Authors' own research.

The first phase, *POIs collection*, involves acquiring raw data from different sources, such as OpenStreetMap, Wikidata, social media and field observations, to address the lack of information on POIs. The collection of information enables the development of a comprehensive knowledge base. This structured data foundation will support the creation of indicators and perform computational analyses (Phase 2) for determining lesser-known POIs and assessing their sustainability potential (Phase 3) based on real-world geographic data.

The second phase, *POIs analysis*, relies on the structured knowledge base of POIs from the first phase to create an evaluation of POIs indicators (e.g., density, capacity and popularity).

Drawing on the previously established overtourism index for small municipalities (Burlando et al., 2025) and multidimensional carrying capacity models (O'Reilly, 1986; Senetra et al., 2020), indicators will be primarily selected from publicly available data such as OSM and Wikidata. For example, for measuring the infrastructure capacity, we will include the bed capacity, for digital visibility, we will measure the number of POIs that have a website. Lastly, while improving on existing indicators of lesser-known POIs in mountain environments, the lack of data can be viewed as an additional indicator for increasing the level of promotion.

Considering incomplete data typical of hidden gems, techniques commonly available in deep learning and large language model (LLM) technologies, such as Gemini AI, can be used to characterize attributes related to the POIs with a low degree of visibility. Machine Learning techniques can also be used to perform sentiment analysis of available reviews about POIs to provide qualitative input for assessing the visitors' perceptions of lesser-known POIs despite sparse quantitative data existing about them. By performing these analyses, the output generated from this phase is an enriched dataset of POIs that forms the basis for creating marketing and management strategies.

The third phase, *sustainable marketing strategies*, builds on the enriched dataset from the previous phase. Analytically derived results will first be converted to management-related metrics for the sustainable marketing strategies. As part of the development of this framework, a process

will also be established to evaluate how and if the promotion of different POIs is aligned with the carrying capacity of the site and the priorities of the local community through a scoring system. The measurement outcome of Phase 3 will be the calculated sustainability marketing scores (i.e., carrying capacity scores), which will serve as direction for promoting lesser-known POIs in accordance with slow tourism principles. The sustainability marketing score will consider all four dimensions (general information, infrastructure, tourism demand, and digital marketing) and provide symmetrical application at both macro and micro levels. Although the conceptual framework is logically defined, the real weights to be used for each of the dimensions would be determined through the process of qualitative validation by stakeholders. For instance, hut managers and DMOs can offer practical inputs into how the indicators can be calibrated: this will be established through qualitative interviews to provide a score that reflects operational reality.

The final phase, *application*, uses the enriched POIs dataset from Phase 2 and the sustainability marketing scores from Phase 3, to propose a decision-support platform combining the automatic discovery of lesser-known POIs and the marketing score system. This platform should help DMOs, and tourism professionals better identify where to redirect visitors in mountain environments, encouraging them to choose less visible but promising locations while respecting carrying capacity. In addition, this pipeline follows a circular design as it incorporates a feedback loop that allows the re-initiation of the framework in response to user insights or in case of a new selection of a geographical area.

The case of Val Gardena

To provide evidence of the framework's validity, we will illustrate how Phase 1 can be applied to a real-world site: The Dolomites of Val Gardena in Italy. Recently, Mount Seceda (Val Gardena) has been popularly deemed an example of overtourism (Gasca, 2025; Cupellaro, 2025) illustrating how a single viral photo can transform a natural peak into an overcrowded POI.

The efficacy of our proposed framework arises from its dual scale (Figure 2) integrated across all the framework's phases, from data collection to final application. This structure simplifies the calculation of carrying capacity and the formulation of sustainable marketing plans.

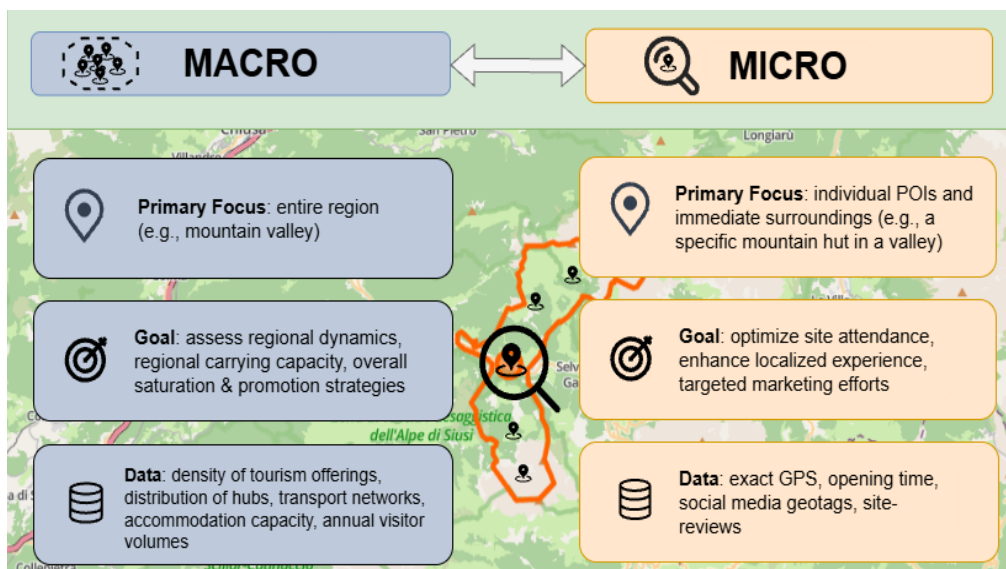


Figure 2. Macro & micro analysis: a dual-scale approach

Source: Authors' own research.

On the macro-level, an analysis of the entire territory is undertaken to examine aspects related to the dynamics within a particular region, which can include issues such as the intensity of tourism in the region or its accommodation capacity. Such approach is crucial when trying to determine infrastructural networks and a particular region's ability to receive visitors. According to Casti (2015), such knowledge of territorial networks is central to regional regeneration.

On the other hand, on the micro-level, the focus shifts to the individual POIs where specific attributes such as geographic coordinates, local infrastructure and opening hours are analyzed to optimize site attendance.

This dual-scale approach is structured around four dimensions of analysis that apply to both scales: *general information*; *infrastructures, accessibility and activities*; *tourism demand and mobility* and *digital marketing* (Fig. 3).

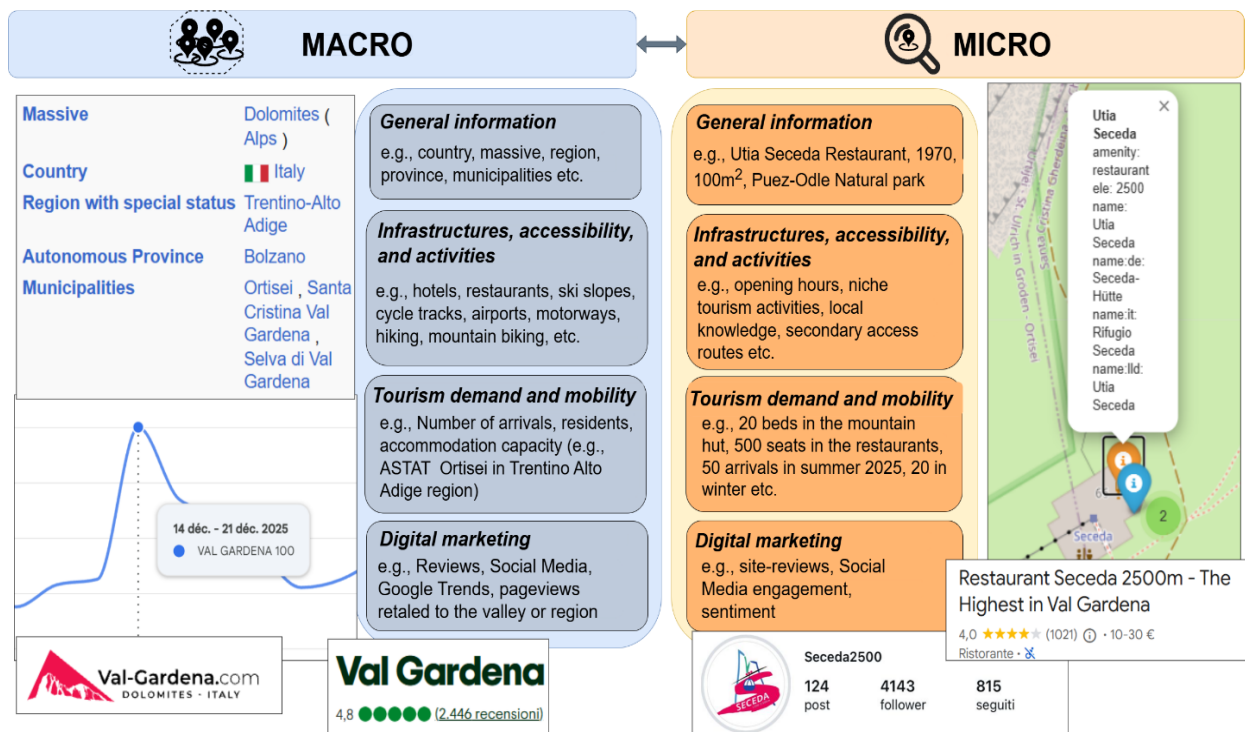


Figure 3. A symmetrical dual perspective

Source: Authors' own research.

Macro level - represented by the entire Val Gardena region.

The first dimension, *general information*, includes the valley's basic information, such as its name (Val Gardena), the country (Italy), municipalities (Ortisei, Santa Cristina and Selva), the municipal surface (109 km² comprising Ortisei, Santa Cristina, and Selva) and the geographic coordinates (46.5580° N, 11.7280° E). This information can be easily extracted from publicly available metadata, such as Wikipedia and OpenStreetMap (OSM) or local websites (Val-Gardena.com⁸).

Based on this context, the dimension *infrastructures, accessibility, and activities* assess the facilities distribution. For example, one of the main indicators at this level is the density of the infrastructure per municipality, e.g., in Ortisei there is a high density of hiking trails (61.69 km/km²)

⁸ <https://www.val-gardena.com>

and cycling paths (31.70 km/km²). Moreover, the data collected show predominance of apartments over hotels, along with predominance of clothing shops in commercial activity, as well as 12 restaurants and 15 rentals for sporting activities (skiing and biking). The accessibility hub mapping will reveal 5 ski lifts and 48 bus stops, as well as the lack of airports and train stations nearby.

Furthermore, the analysis considers the *tourism demand and mobility* dimension, which includes the number of arrivals, seasonal stays, accommodation capacity (gathered from official governmental databases such as ASTAT⁹). In the case of Ortisei, in relation to 2025, we counted 187.187 visitors against 5.356 beds available. With the help of these exact data, demand predictions can be made, thus indicating low-season periods optimizing sustainable promotion.

Lastly, the framework measures *digital marketing* to check how the valley is represented on the web. Using Google Trends¹⁰ or Pageviews¹¹, we measured peaks of interest in Val Gardena between 14 and 21 December 2025. The digital representation of the valley can be assessed through the density of POIs having an official website (e.g., 28.53% in Ortisei). Local stakeholders may be involved to obtain more promotion-related data (e.g., the number of events, total budget for tourism promotion). To obtain the full picture of the macro profile at the whole valley level, the framework aggregates the above information for each municipality (Ortisei, Santa Cristina, and Selva).

Micro level - represented by Utia Seceda restaurant.

Following the macro-regional analysis, the focus changes to the micro level *zooming* into specific Points of Interest (POIs). In this level, the same four analytical dimensions are applied, but targeted with site-specific data.

Regarding the *general information* dimension, foundational information such as the POI's name (Utia Seceda Restaurant), address (Cable car station Seceda, 39046 Ortisei BZ, Italy), type of cuisine (regional) and year of opening (1984) are collected. Information about the location of POI such as its geographical coordinates (46.597919, 11.72458) and the surrounding environment (location near Puez–Odle Natural Park) are also collected.

With regard to the *infrastructure, accessibility, and activities*, information at the micro-level includes operation-related data such as open days and tours offered by the POI (for example, honey-tasting sessions and wood carving).

In terms of *tourism demand and mobility*, the research looks at POI visitors' numbers for instance in mountain huts, as well as seating and bed capacities. Since such data are normally not publicly disclosed, it is necessary to work with local partners and stakeholders.

Finally, *digital marketing* is evaluated based on the availability of a dedicated website¹² and social media presence. Other elements will be analyzed such as the review numbers (e.g., 3.9/5 in Google Reviews) and analysis of sentiment. The framework analyzes the engagement of each POI through the number of reviews (e.g., 3.9 stars on Google Reviews). Another key role is played by stakeholders who can provide internal performance measures, such as activity rate on social networks and visualizations of the official website.

Such multidimensional approach may be used as a foundation for estimating the carrying capacity score, which will help in developing marketing strategies to increase the visibility of lesser-known POIs while ensuring the sustainability of the territory.

⁹ <https://home.provincia.bz.it>

¹⁰ <https://trends.google.com>

¹¹ <https://pageviews.wmcloud.org>

¹² <https://www.restaurantseceda.com>

Conclusion

In this work, we proposed an interdisciplinary framework for mitigating overtourism in mountain regions through the promotion of lesser-known POIs. Theoretically, our research contributes to the existing literature on tourism management by merging different disciplines that have rarely been considered together. Where recent literature concentrates on providing theoretical definitions of overtourism (Capocchi et al., 2019) or identifying its indicators (Burlando et al., 2025), and developing the concept of carrying capacity (O'Reilly, 1986, Senetra et al., 2020), we present a new dual-scale approach that merges all these elements into a holistic framework compliant with territorial management needs. The innovation in methodology is the symmetrical use of four dimensions (general information, accessibility, tourism demand, and digital marketing) at both macro and micro scales. This provides a consistent approach for designing future recommender systems favoring ecological conservation over popularity. Our aim is to test this model empirically as a decision-support system for DMOs to redistribute the flows to marginal areas, without exceeding territorial carrying capacity. Highlighting POIs with high sustainability and low digital presence, our framework could help tourism agencies calibrate their promotional campaigns, making sure the promotion of lesser-known POIs aligns with the carrying capacity of the site. In other words, this approach transforms purely territorial data into concrete decisions, such as the creation of slow tourism itineraries which alleviate pressure on overcrowded POIs, while fostering economic growth in marginal locations.

However, there are still a number of issues that must be addressed in future studies. Firstly, collaborative fieldwork will be necessary to determine whether the developed framework has operational validity in diversifying tourism offerings. Secondly, an analysis is required on the willingness of tourists to be directed to secondary sites. Thirdly, the technical task will be to automate the data process with a dedicated application. Though currently working on the Dolomites, our ultimate goal is to scale this model in other areas such as the Pyrenees or the Carpathians.

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