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# Integrating statistical and sentiment data analytics for sustainable tourism management: The case of Piraeus, Greece

This study presents a statistical framework developed within the TouKBaSEED (Tourism Knowledge Base for Socio-Economic and Environmental Data Analysis) research project to support sustainable tourism planning in the port city of Piraeus, Greece. It integrates quantitative and qualitative methods, combining survey data from returning tourists, new arrivals, and residents with sentiment analysis of over 25,000 user reviews from platforms such as Google Maps, TripAdvisor, and Booking.com. The analyses include descriptive statistics, factor analysis, and regression modeling to examine visitor satisfaction, sustainability perceptions, and resident attitudes toward tourism development. In parallel, social media reviews were analyzed to explore traveler sentiment, seasonal patterns, and concerns regarding infrastructure. Findings reveal a complex interplay between tourism impacts and sustainability. Visitor satisfaction is most influenced by perceptions of environmental quality, followed by social and economic sustainability. Tourists who viewed Piraeus as environmentally responsible reported higher levels of satisfaction. Similarly, residents who perceived tourism as supporting the environment and social cohesion were more likely to view its economic effects positively. Social media reviews reinforced these findings, frequently highlighting gastronomy, culture, and accessibility as strengths, while noting recurring issues with cleanliness, pricing, and congestion. Overall, the study demonstrates the value of integrating traditional statistical methods with digital analytics to capture the full spectrum of tourism impacts. This approach provides a comprehensive understanding of how sustainability perceptions influence visitor and resident attitudes, offering a data-informed foundation for inclusive and resilient tourism strategies in urban destinations.

## Special/ Invited session

## Classification

Both methodology and application

## Keywords

Sustainable tourism, Tourism impact assessment, Visitor satisfaction

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