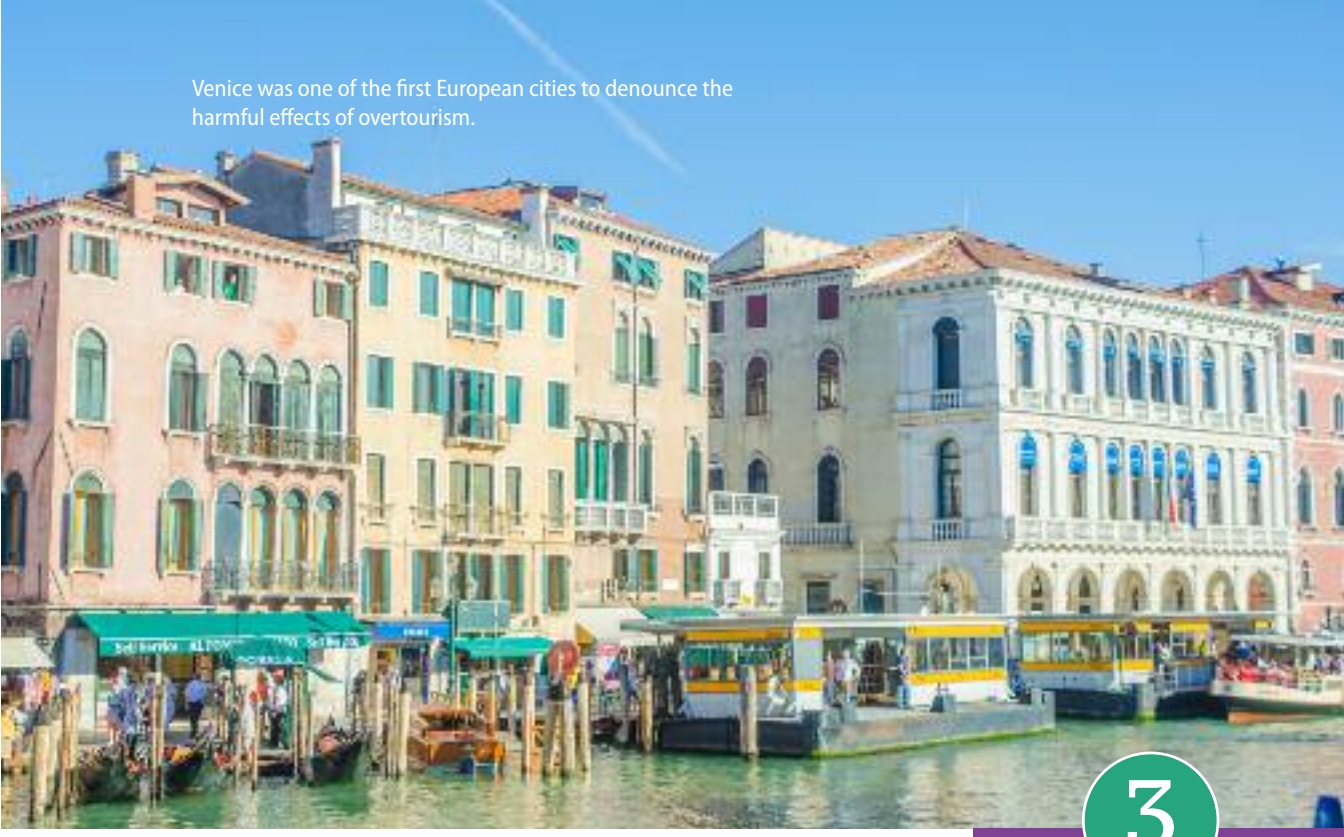


Venice was one of the first European cities to denounce the harmful effects of overtourism.

3

Overtourism and undertourism:

ICT in island development policy

GIOVANNI RUGGIERI
Palermo University

PATRIZIA CALÒ
Observatory of Tourism for Islands Economy

KOULLA ORTHODOXOU
Observatory of Tourism for Islands Economy

ABSTRACT

Tourism represents a relevant source of income and employment, especially for islands and coastal areas. At the same time, it can have unexpected detrimental impacts on environments and local communities. This discussion has been widely argued in the international literature. The attention should now focus on tourism effects, as it can bring development and wellbeing, but also negative aspects if not managed and planned properly. The need to address a sustainable approach and to consider new available tools, such as information technologies, has also

emerged. Destinations, indeed, can suffer from two relevant problems linked with tourism: overtourism, defined as the excess of tourism flows over the carrying capacity limit, and undertourism, or the existence of a lower level of tourism flows in respect of the potential and existing resources of a destination. This latter outcome may lead to an underdevelopment of local economies compared with that which could be derived from tourism. This chapter reviews overtourism and undertourism and proposes emerging potential tools and strategies related to these outcomes. This effort could help to define specific and tailored policies and strategies to address these issues, as well as contributing to filling the existing research gap.

INTRODUCTION

Tourism is an important source of revenue and employment for islands, those special clusters and fragile contexts independent from mainland countries (Ruggieri & Vázquez, 2017). But growth and development brought to an island by tourism could unexpectedly reach an excess known as *overtourism*, to the detriment of its local community and environment. Many factors explain why overtourism impacts the environment. A new sustainable approach to development is necessary, based on quantitative and qualitative indicators and a broad awareness of the need to preserve and value local resources (Ruggieri & Vázquez, 2017). This should consist of tools and strategies aimed at reaching a level of optimal development, avoiding the negative effects of tourist flows, and encouraging a new tourist distribution in underused periods of the calendar year. Technology is a key tool for analysis and goal-directed methods. Information and communications technology (ICT) can help the tourism industry improve its management and promotion of destinations, especially regarding issues of tourist flows and sustainable development, for example, in cities such as Venice (Seraphin et al., 2018) and Dubrovnik (Carić & Mackelworth, 2014). Monitoring tourism impacts and characteristics is of prime importance when considering and maintaining the correct pressure, avoiding the detrimental effects of tourist flow, and finding new opportunities for a local industry's expansion (Chen, 2006; Craigwell & Maurin, 2007; Griffith, 2002; Sharpley, 2003). While a destination's transformation from luxury to mass tourism may benefit some businesses, it could have a negative impact on locals and their environment if not managed well, since all of the same products available to tourists are available to locals. At the same time, this creates a favourable environment for tourism expansion and a high percentage of repeat visitors.

During the first phase of this process, countries may not take advantage of the favourable international environment for tourism expansion. Over time, most countries see growth taking place once they realize the importance of tourism's role in their economy (Ruggieri & Calò, 2018). This is how technology and innovation could be considered the main forces in sustainability and important catalysts of tourism innovation

(Hjalager, 2010; Scheel & Vázquez, 2011). ICT can be employed to drive tourists to alternative paths, promote other sites, and monitor the number of tourists visiting or passing through a specific destination site, increasing data normally lacking in traditional surveys due to their administrative nature. Several devices with useful monitoring and analysis functions are available with the correct tools.

In this chapter, we present specific island contexts and compare them to mainlands. We examine how certain technologies and methods used in monitoring and evaluating the state of a destination's tourism may also show how ICT tools can support either an expansion or a reduction of flows in time and space. The need to reduce the negative impacts on destinations is related to the preservation of local heritage, material and immaterial. The ultimate goal is to promote a positive exchange between locals and tourists based on a mutual respect defined by a shared appreciation of local identity and heritage (Vázquez & Ruggieri, 2011).

Our main objective is to review studies on undertourism and overtourism and, in so doing, introduce the potential tools and strategies concerning these two scenarios. Such an overview could help define specific and ad hoc policies and strategies to confront these issues.

LITERATURE REVIEW

Seasonality is a significant concern in tourism (Petrevska, 2013) and initiates constant debate among researchers (Bar-On, 1993, 1999; Baum, 1999; Chung, 2009; Higham & Hinch, 2002; Jang, 2004; Lundtrop, 2001; Rodrigues & Gouveia, 2004; Yacoumis, 1980). There is disagreement on the disproportion in flows that result in demand oscillation: first, natural (e.g., summer, winter); second, institutional (e.g., religious, corporate); and third, all others (e.g., events, tastes) (Petrevska, 2003). Thus, seasonality is an extended issue for the tourism industry due to its demand's uneven nature and its supply's comparatively static nature in capacity and resources (Connell et al., 2015). According to Bar-On (1973), one may understand seasonality as a factor triggering incomplete and unbalanced financial prosperity. Demand's uneven nature and supply's static nature produce two opposite situations for a given destination. Furthermore, while a destination's peak season can have an increased flow and overtourism, its off-peak season can have a decreased flow and undertourism. Because of this, Butler (1994) proposes that destinations tackling demand seasonality should focus on developing diverse forms of tourism. It is characteristic of this process to highlight the potential of explicit products and experiences through product improvement and diversification to increase demand in low seasons (Connell et al., 2015). As a result, a destination's appeal is generally increased in existing and new markets (Getz, 1989).

Many acknowledge tourism as a producer of benefits for visitors, such as relaxation, and the host community, such as earnings (Briguglio & Avellino, 2019). Briguglio and

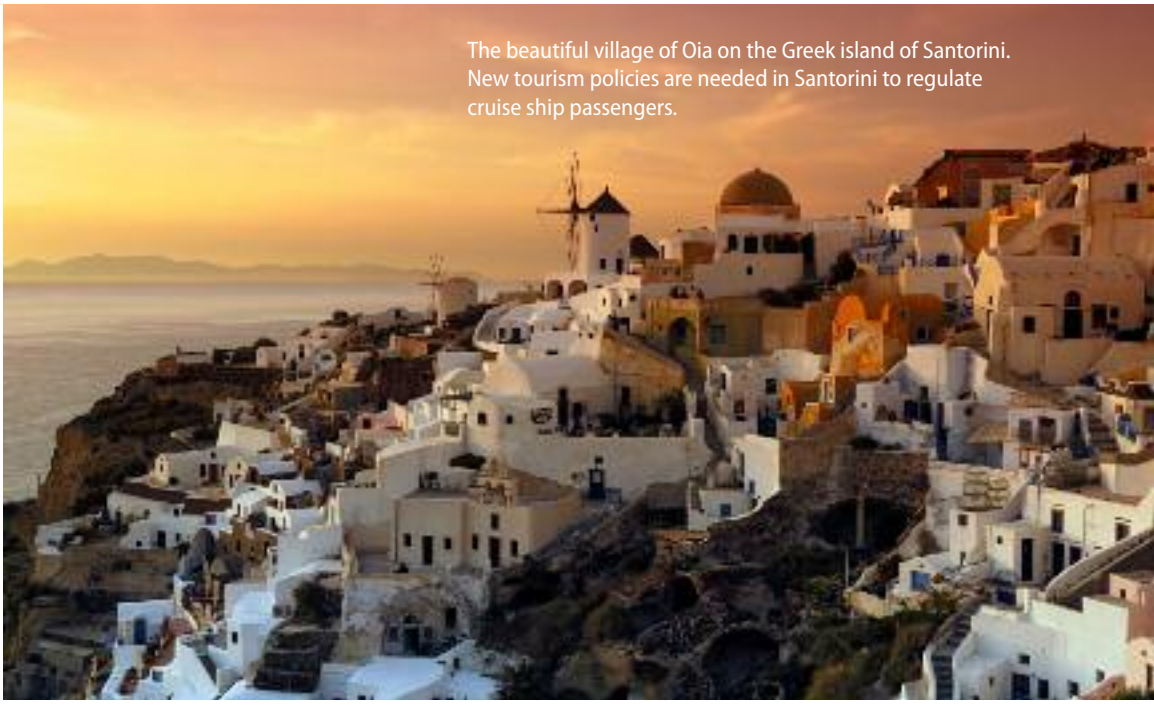
Park Guell in Barcelona was designed by Antonio Gaudi. Barcelona is experiencing the impacts of overtourism.

Avellino refer to studies in support of tourism as a creator of economic and social benefits outperforming other industries because of the increased income multiplier and external industry connections. Furthermore, various studies focus on the financial returns and drawbacks of tourism (e.g., Ahmad et al., 2018; Archer et al., 2005; Bryden, 1973; Diedrich et al., 2009; Tribe, 1999; Vogel, 2001). However, a recent exponential increase in tourist traffic has led host communities to experience undesirable consequences, such as overpopulation, traffic jams, and environmental destruction (Briguglio & Avellino, 2019). Thus, overtourism is defined as that phenomenon in which flows surpass a destination's natural capacity limit. A recent study views spoiled tourist experiences, overcrowded infrastructure, and environmental and cultural harm as risks related to overtourism (McKinsey & Company and World Travel & Tourism Council, 2017). Today, an increasing number of cities are being impacted by overtourism's phenomena (such as Berlin, Prague, Hong Kong, Venice, Rio de Janeiro, Barcelona, Shanghai, Amsterdam, Palma de Majorca, and Dubrovnik (Milano, 2017, 2018; Novy, 2016). However, a comparative study of destinations in and outside Europe as diverse as Baku (Azerbaijan), Cozumel (Mexico), Juist (Germany), Kasane (Botswana), Lombok (Indonesia), Muskoka (Canada), Rigi (Switzerland), Soweto (South Africa), and Vienna (Austria) explains how the emergence of overtourism has various causes (Peeters et al., 2018). According to Goodwin (2017, pp. 5-6), these are multifactorial:

- Travel: low-cost airfares and reduced flight duration
- Real estate: issues and cheaper rents due to sharing economy platforms (e.g., Airbnb)
- Volatility: seasonal concentrations of unsustainable tourism flows
- Job market: uncertainty in tourism employment
- Changes in tourism: domestic and foreign markets

Furthermore, overcrowding and a lack of space to meet increasing demands are the core roots of 'tourismphobia' (Briguglio & Avellino, 2019). Milano (2018) provides examples of this when examining Hong Kong, Rio de Janeiro, Malta, Barcelona, Dubrovnik, and Venice. This author explains how the lagoon city of Venice—which in 2017 had 261,321 total residents, 53,799 residents in the historic centre, and 11,685,819 overnight stays—was one of the first European cities to denounce the harmful effects of the increase in visitors. Milano uses the term 'Venice syndrome' to indicate the phenomenon of a city's depopulation of the historic centre and its inhabitants' movement to the periphery.

'Carrying capacity' is a term that defines tourism limitation as it suggests how economic gains may be overshadowed by negative externalities, mainly social and environmental (Briguglio & Avellino, 2019). The World Tourism Organization (1981) defines carrying capacity as the maximum number of people that may visit a destination at the same time without causing the destruction of the physical, economic, and socio-



The beautiful village of Oia on the Greek island of Santorini. New tourism policies are needed in Santorini to regulate cruise ship passengers.

A ferry brings tourists to the village of Manarola, Cinque Terre, Italy.

cultural environment and an unacceptable decrease in the quality of visitors' satisfaction. Middleton and Hawkins (1998) define it more simply as a boundary outside which an area may suffer from the opposing effects of tourism. Similar definitions are also given by Getz (1983), O'Reilly (1986), Coccossis et al. (2001), and Nghi et al. (2007). This concept describes how destinations have utilization boundaries beyond which negative outcomes triggered surpass the positive ones (Williams, 2009). Carrying capacity emerges in insular destinations (Briguglio & Briguglio, 1996; Hampton & Hampton, 2009; Marsiglio, 2017; McElroy & de Albuquerque, 2002). As tourism plays a key role in economic growth of insular destinations, smaller islands' territory and ecosystems are more vulnerable due to their size and fragility (Briguglio & Avellino, 2019).

Tourism landmarks are present in every destination, and overtourism may appear depending on the level of their carrying capacity and seasonality (Weber et al., 2017). As a result, carrying capacity has important management implications (Jovičić & Dragin, 2008; Mexa & Coccossis, 2004; Zelenka & Kacetl, 2014). While undermanagement causes overtourism, anti-tourism protests call for decreases and restrictions on inbound tourism in popular destinations such as Venice, Dubrovnik, Santorini, Barcelona, and Amsterdam (Alexis, 2017). A destination's carrying capacity needs to be accounted for in tourism's spatial arrangement (Milano, 2017; Milano et al., 2018). Similar views are shared by Stanchev (2018), who suggests that policymakers must adopt new tourism policies, regulating cruise ship passengers in the case of Santorini and road access in the case of Cinque Terre, while also using new technology to monitor

Tourist photographing Machu Picchu, illuminated by the last sunlight from above. Machu Picchu is an example of poor tourist policy implementation.

congestion in the case of Amsterdam and Venice. Santorini and the Balearic Islands tackle seasonality by focusing on their off-season attractions; Barcelona, Venice, and Amsterdam monitor the cruise ship routes; and Barcelona, the Balearic Islands, and Amsterdam monitor Airbnb's platform (Stanchev, 2018).

There are several cases in which destinations are able to tackle overtourism successfully (Peeters et al., 2018). Cinque Terre established policy measures for sustainable tourism. Copenhagen created an aggressive allocation strategy to distribute tourists across the city, forbid food establishments in certain parts, created 'silent areas' in residential neighbourhoods, and improved the tourism industry's sustainable green initiatives. Riga's city centre has been considered the cleanest in Europe due to its new environmental policy and specific interventions to reduce overtourism's impacts (e.g., stricter regulations against alcohol abuse and prostitution).

In Stockholm, local stakeholder involvement, effective public transportation development, private accommodation regulations for tourism purposes, and a recycling and environmental plan were all successfully implemented. In 2012, Vilnius promoted its public transportation and bicycle systems by launching its smartphone app, Vilnius Mobile Tourism, to inform tourists through interactive maps, featured sites, and transportation options. On the contrary, destinations such as Bucharest, Dublin, Santorini, Warsaw, and Machu Picchu have been documented as examples of poor policy implementation.

Opposite of overtourism is undertourism, the existence of a lower level of flows related to existing and potential resources. Benavides and Perez-Ducy (2001) argue

A fire truck at Banjul Airport in The Gambia. Tourism in Gambia is uneven, largely restricted to its Atlantic strip.

that services and tourism have some of the best potential for destination development. Lejarraga and Walkenhorst (2006) explain that 'tourism-led growth' is a reality that often outperforms industrial and farming sectors' economic output. Encontre (2001) states that tourism has become one of the major sources of GDP growth in many underdeveloped destinations.

Many less-developed countries that are popular destinations often have unequal tourism allocation, preventing unbiased expansion even on a national scale (Britton, 1982; Jenkins, 1982; Opperman, 1993). For example, in The Gambia, tourism development is largely restricted to the Atlantic strip (Sharpley, 2000).

Another example of regionally uneven tourism development is China, where there is a concentration on the three coastal areas of Shanghai, Beijing, and Guanzhou (Sharpley & Telfer, 2015). However, in both industrialized and less-developed countries, tourism has become an "important and integral element of their development strategies" (Jenkins, 1991, p. 61).

In these contexts, tourism development is a valid vehicle for an independent economic growth and an increase in living standards. It is an opportunity for the local population to improve its income, employment opportunities, and infrastructure (e.g., roads, airports, utilities). Tourism's positive and negative impacts on islands can have

a greater effect than that on the mainland (Croes, 2006, 2011). The magnitude of the economic benefits depends on the quality of the destination's local government and its policies.

In this context, it becomes necessary to pay particular attention to carrying capacity, community involvement, political environment, and special interest activities (Lim & Cooper, 2009). But the benefits will also depend on three elements: geographic proximity to major global markets, early postwar development of international tourism, and longer and more intense periods of colonization that led to the early establishment of basic infrastructure and market institutions (Parry & McElroy, 2009).

Schubert, Brida, and Russo (2011) study the relationship between the growth of tourism demand and that of the economy: an increase in tourism demand leads to an increase in economic growth, as confirmed by the tourism-led growth hypothesis (Durbarry, 2002). Seetanah (2011) finds a two-way relationship between growth in tourism and growth in the economy. Another peculiarity is the focus on sustainable tourism linked to an island's natural environment and the lack of tourist attractions built (e.g., theme parks and museums). Researchers highlight the importance of managing the negative social and environmental impacts of tourism (Chen, 2006; Craigwell & Maurin, 2007; Griffith, 2002; Sharpley, 2003).

While a destination's transformation from luxury to mass tourism may benefit some businesses, it could have a negative impact on locals and their environment if it is not managed well. All of the same products available to tourists are made available to the locals, resulting in a favourable environment for tourism expansion and a high percentage of repeat visitors.

According to Sharpley (2003), mass tourism's promotion has proven to be an effective development vehicle, while promoting sustainable or "quality" tourism might not be as effective as the mass-marketing approach. Kokkranikal et al. (2003) addressed the importance of sustainable tourism development for islands due to their geographic, environmental, structural, and political limitations. This approach proved effective in minimizing tourism's negative impact. Ghina (2003) explored sustainable development's status in small island states, highlighting their challenges such as environmental fragility and economic vulnerability, the former being the main challenge and the latter being dependent on the former.

Tourism planning intends to set policy and budget priorities on issues such as marketing and other common challenges that influence the industry's progress (Crompton & Christie, 2003). Thus, destinations analyze demand and the strengths and weaknesses of their supply, but they rarely explore tourism development's distributional impact or 'what-if' modelling of alternative policy options to propose (Mitchell & Ashley, 2010).

Overtourism is a complex phenomenon strongly affecting the livability of a location and the experiences of various stakeholders (Bellini et al., 2017; McKinsey & Company

and World Travel & Tourism Council, 2017; Milano, 2018; Postma, 2013). Anti-tourism supporters have been predominant in Spain (Milano, 2017, 2018), France (Gravari-Barbas & Jacquot, 2016), Germany (Füller & Michel, 2014; Novy, 2016), and Italy (Vianello, 2016). Consequently, there is no simple solution to tackle overtourism; rather, it requires stakeholders' collaboration and bespoke actions befitting the explicit features of a destination (Milano, et al., 2018).

TOURISM DEVELOPMENT AND INSULAR CONTEXTS

Local development, especially in fragile contexts such as islands, increasingly depends on the tourism industry. Tourism appears the only option for such contexts to overcome the structural constraints imposed by their smaller economies and characteristically difficult conditions of transport connections and supplies. The small nature of these islands means limited natural resources, high propensity to import foreign goods and services, limited opportunities to import substitution options, and an inability for the local population to sufficiently produce the goods and services consumed by its own visitors, neither in quantity nor quality (Sharpley & Ussi, 2014) . Thus, these islands have small markets for domestic products, dependency on export markets, elevated transportation costs, and it is difficult for domestic businesses to take advantage of economies of scale. Furthermore, barriers to economic growth, especially in regards to small island developing states (SIDS), include a significant dependency on foreign aid and cooperation as well as preferential trade agreements.

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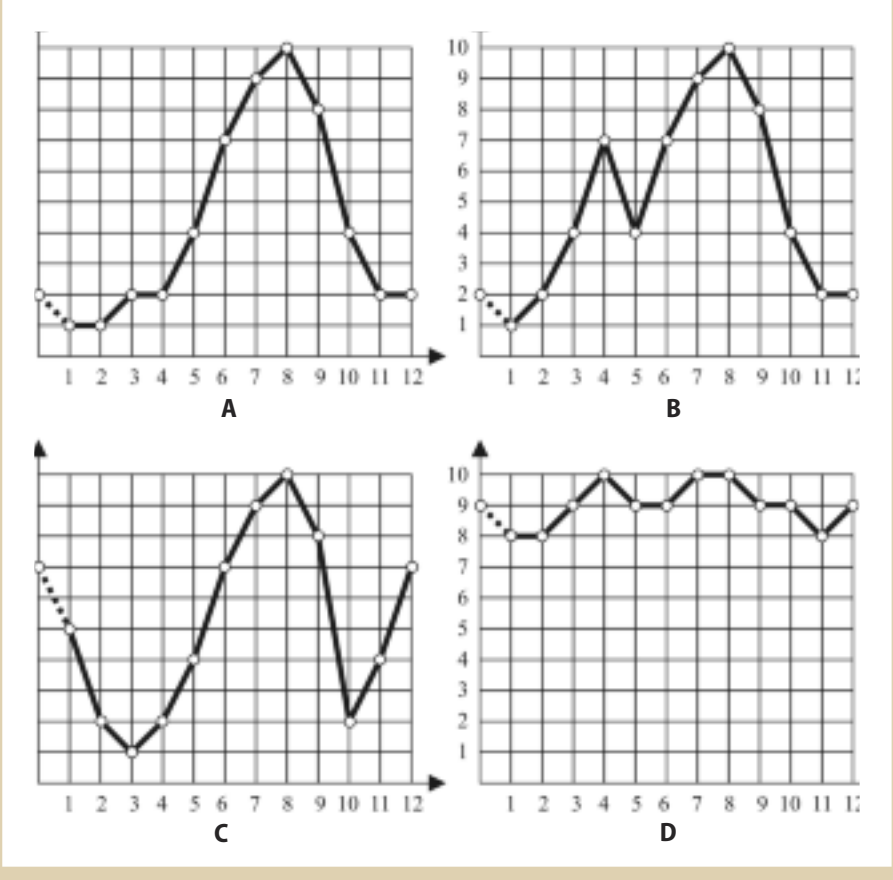
Generally, obstacles to an island's development and economic growth are summarized by four factors (Briguglio, 1995; Hampton & Christensen, 2007; Scheyvens & Momsen, 2008):

- small size
- insularity/remoteness
- environmental vulnerability
- socioeconomic elements

Based on an island's characteristics, one can distinguish between and among four situations where tourism demand oscillation determines different conditions and possible policies in the cases of overtourism and undertourism.

FIGURE 3.1: **Graphs Representing the Different Seasonal Trade Activities in Overtourism and Undertourism**



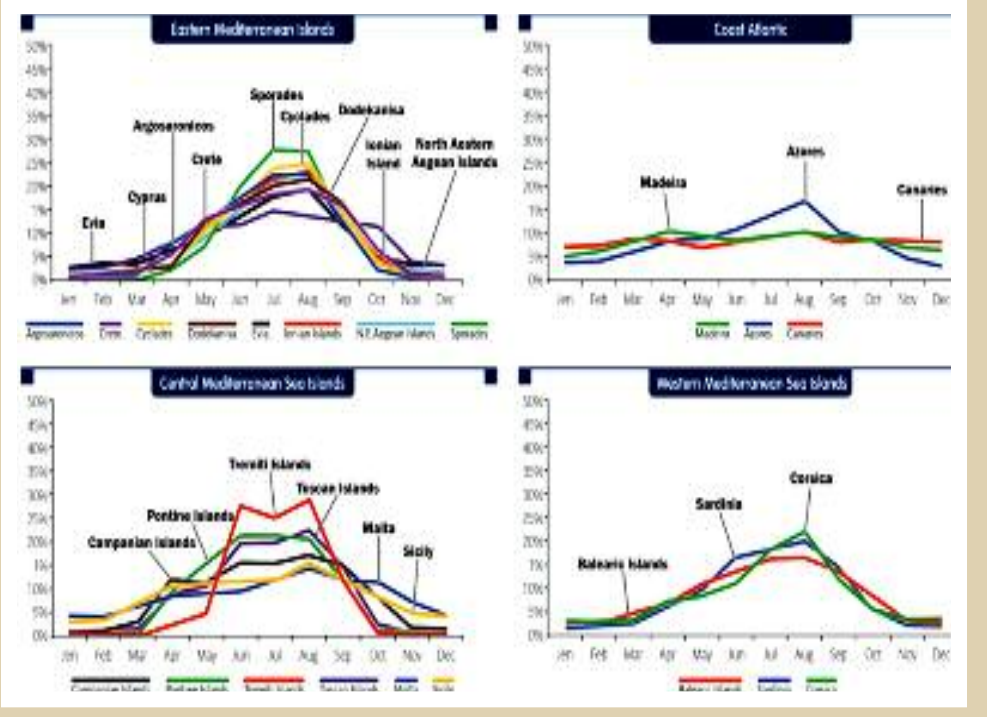
OVERTOURISM = MAXIMUM OCCUPATION IN TOURISM ACCOMMODATION
UNDERTOURISM = MINIMUM OCCUPATION IN TOURIST ACCOMMODATION

Source: OTIE Elaboration (OTIE, n.d.).

In Figure 3.1, Graph A shows overtourism in summer peak season and undertourism in winter off-peak season. Graph B shows an increasing overtourism in spring and summer seasons. Graph C shows the oscillation on overtourism and undertourism with fluctuated peak and off-peak seasons. Graph D shows overtourism and undertourism absence with uniform demand of flows all year round.

These four cases were detected in various groups of islands represented in the following graphs in Figure 3.2

FIGURE 3.2: **Similarities and Differences in Four Regions of the Mediterranean**



OVERTOURISM AND UNDERTOURISM IN THE MEDITERRANEAN

Source: OTIE Elaboration (OTIE, n.d.).

Eastern Mediterranean islands demonstrate a concentration of overtourism in summer peak season and undertourism in winter off-peak season. Western Mediterranean islands show an increase in overtourism in spring and summer peak seasons. Central Mediterranean islands demonstrate an oscillation on overtourism and undertourism in fluctuated peak and off-peak seasons. Coastal Atlantic islands show an absence of overtourism and undertourism with uniform demand of flows all year round.

Emerging from the relevant international literature, then, is the conclusion that the need for new management methods is strictly linked with island destinations' sustainable development. An improved management of flows focuses on an island's carrying capacity, operating towards a dual objective of time and space distribution of existing flows, thus avoiding congestion and consequent negative externalities due to overtourism. A more efficient management of undertourism stimulates a new demand with new flows while respecting a destination's sustainability requirements.

TOOLS AND POLICIES FOR THE MANAGEMENT OF UNDERTOURISM AND OVERTOURISM

There is a lack of literature on ICT applied to sustainable tourism's management. Melville (2010), Dao et al. (2011), and Bajracharya et al. (2013) comment on how the research gap exists around technology's role in developing enterprises' capabilities in supporting sustainability.

Specifically, existing literature has not yet thoroughly investigated the use of ICT in mitigating the negative impacts of tourism and highlighting its positive outcomes. It offers destinations new distribution channels and increases communication and interaction with and between stakeholders (Buhalis & O'Connor, 2006; Gratzer et al., 2002). Mohammad Shafiee et al. (2013) present a conceptual approach in understanding how ICT could be used in sustainable urban tourism through specific development indicators. Analyzing Åre (Sweden) as a case study, Fuchs et al. (2013) present a knowledge-based destination management information system, which can support sustainable development. It consists of a knowledge destination framework based on a web-based infrastructure that collects data and creates and distributes information, thus fostering large-scale intra- and inter-firm knowledge exchange and learning processes among destination stakeholders. This includes knowledge activities dealing with the extraction of information from different sources and generating relevant information for customers and destination stakeholders. The framework includes a supplier-oriented knowledge application, the destination management information system (DMIS) that requires sophisticated technology applications, in particular demanding the establishment of organizational learning.

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Integrating private and public stakeholders remains crucial in defining the knowledge requirements. Thus, based on literature reviews and stakeholder inputs, the case of Åre presents a set of indicators defined as follows (Pyo, 2005):

- Economic performance (e.g., bookings, overnights, prices, occupancy, sales)
- Customer behaviour (e.g., website navigation, page views, search terms, consumption, conversion rates, stay duration, cancellations, tracking, nationality, age, gender, transportation, purpose of visit)
- Customer perception and experience (e.g., brand awareness and visibility, knowledge of destination, information sources, destination value areas, seasonal activities, attractions, services, features, atmosphere, social interaction)

The ski area of Åre (Sweden) was used as a case study in understanding how ICT could be used in sustainable urban tourism through specific development indicators.

DMIS provides instant reports through dashboards and analyses, granting destination stakeholders real-time access to the Data Warehouse. Chiabal et al. (2013) focus on facilitating stakeholder participation to develop sustainable cultural tourism through website design using tools such as blogs and forums to create a context of electronic participation in cultural tourism. Stakeholders are thus engaged in public debate about sustainable cultural tourism development strategies in forums, blogs, and focus groups. One of the objectives of this study is to identify specific electronic services that facilitate the enjoyment of cultural heritage. 'Blended focus groups' and integrating face-to-face activities with online discussion are adopted to reach this goal.

Ali and Frew (2013) present an overview of ICT sustainable tourism by conceptualizing it from the perspective of a destination, consumer, and business, with a collection of ICT instruments for its development. Technology and innovation are considered to be the main forces in ensuring sustainability (Scheel & Vázquez, 2011). ICT is an important catalyst for tourism innovation (Hjalager, 2010). Through it, new destination management organization (DMO) roles will be defined. Innovation does not exist simply physically but also in habits and customs, providing a framework where people interact. Improving stakeholder partnerships and an engaged community dialogue underlines the importance of ICT in sustainable tourism innovation.

The analysis of tourism's impact on a destination and its actual scenario needs to be defined with a set of tools to reach sustainable development. Integration between

visitors and locals, social responsibility, and carrying capacity are some of the elements analyzed in many indexes to evaluate tourism's impact on a destination over time. In particular, carrying capacity is considered the most relevant indicator and defined by the World Tourism Organization as "the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic and social environment" (1981, p. 4). When the initial framework is set, an efficient and effective strategy needs to be chosen and implemented for either the containment of a negative impact in overtourism or the encouragement of demand in undertourism. New technology plays an important role for its accuracy and global reach in preliminary analyses and flow management.

THE ANALYSIS OF TOURISM'S impact on a destination and its actual scenario needs to be defined with a set of tools to reach sustainable development. Integration between visitors and locals, social responsibility, and carrying capacity are some of the elements analyzed in many indexes to evaluate tourism's impact on a destination over time.

GPS, Wi-Fi, and video are the main technologies used in tools that collect data on tourist behaviour and movement at their destinations. Their functions consist of visitor counts at both destination access points, such as seaports and airports in insular contexts, as well as entrances of specific destination sites such as city centres, archeological locations, and natural and theme parks. The devices can also be set up in specific areas to evaluate the crowd level to support decision-making processes. The quantity of available tools and the quality of their support continues to grow.

A destination is defined as a physical space and geographic area containing products and services consumed by tourists as part of their experience and overseeen by an organization responsible for its management (e.g., DMO). ICT tools supporting a destination's sustainable management of under- and overtourism available are:

1. **Destination management system (DMS)**
   DMO managers view DMS as the most important tool for supporting sustainable development efforts. Its uses are information management, stakeholder exchange, resource management, distribution, tourist education and satisfaction, sustainable consumption, and marketing (Horan & Frew, 2007).

2. **Intelligent transport system (ITS)**
   ITS is an important tool used for tourist satisfaction as it provides energy-saving real-time information and traffic management to identify the safest and quickest routes, assisting navigation and enhancing a destination's enjoyment (Daigle & Zimmerman, 2004).

China is also an example of uneven tourism, with concentration in its coastal areas of Shanghai, Beijing, and Guanzhou. This is the famous Great Wall of China (section Mutianyu), located near Beijing.

3. **Environment management information system (EMIS)**
   Destination managers adopt EMIS as a cost-saving resource and information management tool (El-Gayar & Fritz, 2006). The system reduces the cost of labour due to its automation of previously manual processes. It increases managers' situation awareness of destination managers, allowing them to react more promptly and correctly to scenarios with better decision-making.
4. **Location-based service (LBS)**
   LBS has a variety of functions, including that of providing tourists with real-time geographic location information (Berger et al., 2003; Liburd, 2005). It assists a destination's resource management as it can market and inform users on sites and attractions to visit, and educate them on how to travel and behave in environmentally vulnerable spots to maintain their ecosystem. This helps tourists' decision-making in product consumption (Liburd, 2005).
5. **Global positioning system (GPS)**
   GPS is useful for tracking and analyzing tourist movements and site identification (Shoval & Isaacson, 2006). Managers use its information to develop a destination's site and attraction plans, ensuring an improvement in an environmental impact's management through 'load balancing'.
6. **Geographical information system (GIS)**
   Managers use GIS for a destination's tourist mapping and profiling as they monitor a destination by using the system's information to assist in visitor management techniques (Lau & McKercher, 2007). GIS supports a DMO in transport planning and route identification (Lew & McKercher, 2005). It provides locals and tourists with the best destination routes. Its economic benefits derive from information management and coordination. DMOs also apply it to data integration and mapping as it provides a clearer view of a destination's conditions, thus improving the managers' decision-making processes.

MANAGERS USE COMPUTER simulation (CS) to predict trends through simulated scenarios such as climate change and illustrating environmental changes caused by tourists . . . [then] use this information to make decisions that have the most environmentally favourable long-term effects, increasing a destination development's sustainability.

Furthermore, managers use computer simulation (CS) to predict trends through simulated scenarios such as climate change and illustrating environmental changes caused by tourists (Lawson, 2006). Managers can analyze realistic images of what future tourism development may become under varying conditions, using this information to make decisions that have the most environmentally favourable long-term effects, increasing a destination development's sustainability.

CONCLUSION

Tackling seasonality and extending tourism seasons are essential in the creation of tourism development that is sustainable and competitive (Petrevska, 2013). Areas of high tourism attraction on islands and in seaside cities are reaching their carrying capacity, with direct impacts not only on urban and natural environments but also on key immaterial elements such as social effects on locals and their propensity to interact with tourists. There needs to be a balance between the economic growth source of a tourist attraction on one hand, and preserving what is special about it on the other. The final objective is the local development's improvement through tourism that values and respects local identity and heritage.

A type of tourism that is both sustainable and commercially viable may appear to be difficult to achieve, but numerous policies that detect seasonality make this goal more easily reachable. Efforts to decrease tourism volatility's consequences include reducing the concentration of human activity in hotspots through the diversification and redistribution of products and services offered by a destination, promoting different paths and activities, reinforcing island identity, and enhancing the coordination between public and private stakeholders to develop new business opportunities. Thus, an alternate tourism strategy should act on different levels depending on specific issues confronted:

- land use planning (e.g., built environment, planning methods)
- transportation, mobility, environmental sustainability (e.g., landscape, nature, energy, waste)
- economic sustainability (e.g., growth, measures, services structure, operational environment)
- social sustainability (e.g., housing, well-being, local culture)

Furthermore, advances in ICT help improve destination management and promotion, especially in cases of flow management issues and sustainable development necessities. Managers can apply ICT to promote insular destinations during the low season, map existing hiking paths in an island's currently unpopular central land, measure smart solutions' impact on visitors (e.g., electronic access control and counting equipment), expand and connect tourist areas with other destination zones, and develop a DSS that can identify the optimal tourist pressure level and outline an appropriate strategy. Undertourism and overtourism could appear to be two different complementary aspects of the same issue. There is often a need to transfer overtourism's seasonal and locational flows to other seasons and locations characterized by undertourism. The new ICT tools offer the relevant support to tourism analysts and stakeholders (Ruggieri & Calò, 2018).

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