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The Impacts of Overtourism and Climate Crisis on Tourism Industry in the Island of Crete, Greece

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Abstract

Overtourism and climate crisis have adverse and harmful impacts on popular tourism destinations like the island of Crete, Greece. Crete is located in eastern Mediterranean region being a popular and well-known global vacation spot. Like other Mediterranean islands Crete suffers from climate crisis while an emerging threat nowadays is overtourism due to the increasing number of visitors in the island every year. Both of them threaten the prosperity of the local tourism industry while their combined effect is multiplied. The environmental, social and economic impacts of overtourism and climate crisis in Crete have been studied and their threats to the prosperous tourism industry in the island have been highlighted. The multiple stakeholders of the local

tourism industry should collaborate and develop appropriate policies and measures embracing sustainable practices with resilient infrastructure and balancing economic interests with long-term sustainability issues. The lack of analytical studies regarding the impacts of overtourism and climate crisis on the local tourism industry does not facilitate the development of the necessary policies for the mitigation of their harmful impacts avoiding the future decline of the prosperous local tourism. Our work could be useful to several stakeholders of Crete's tourism industry for the development of policy measures mitigating the undesired impacts of the abovementioned threats.

Keywords: Climate Crisis, Crete-Greece, Impacts, Overtourism, Tourism Industry

1. Introduction

Overtourism is an important contemporary problem reducing the attractiveness of popular tourism destinations ^[1, 2]. Additionally, climate crisis has many undesired impacts affecting the attitude of visitors to spent their holidays in popular and well-known holiday spots ^[3, 4, 5, 6, 7]. The problem of overtourism is complex and it has been extensively studied in recent years ^[8, 1, 9, 10]. The tourism industry in Crete is well developed hosting an increasing number of visitors every year ^[11, 12, 13]. However, climate crisis and overtourism threatens its future competitiveness and prosperity.

The aim of the current research is to study the impacts of overtourism and climate crisis on the tourism industry in Crete.

The text is structured as follows: After the literature review the tourism industry in Crete and the problem of overtourism which affects it are mentioned. In the next two sections the impact of climate crisis on the tourism industry in the island as well as the combined impacts of overtourism and climate crisis on the prosperous tourism industry are mentioned. The text ends with discussion of the findings, the conclusions drawn and the citation of the references used.

The text is innovative since there are limited studies published so far on this issue. It covers an existing gap regarding the combined impacts of two important threats on the main industry of Crete. It could be useful to policy makers as well as to multiple stakeholders of the prosperous tourism industry in the island who should develop appropriate policies and measures to mitigate the effect of these two undesired threats on it.

2. Literature survey

The effect of climate change on the future attractiveness of tourism destinations in Greece has been explored ^[4]. The authors stated that urban tourism may face challenges during the peak summer months due to rising temperatures but the shoulder months (April, May, September and October) will offer improved conditions for tourists. They also highlighted the importance of adaptation strategies to minimize the negative impacts. The climate change impacts on Greece in the near future have been

assessed [7]. The authors stated that climate change in the Mediterranean region, related to significant temperature increase and to changes in precipitation patterns, might affect the local economies. They also mentioned that the increase in the air temperature by about 1.3°C and the decrease of precipitation in the winter by about 15% will adversely affect the tourism sector. The consequences of climate change in Greece have been studied [29]. The author stated that summer will last from May to September while tropical nights will be more frequent. He also mentioned that extreme weather events will be more frequent including heat waves which will degrade the experience of tourists during their summer vacations. The impacts of climate change on the Greek economy have been investigated [6]. The author stated that the temperature is expected to rise on average by 2.5°C compared to the period 1961-1990 while the heatwave days are expected to increase by 15-20 annually by 2050. He also mentioned that the rainfall will decrease annually by about 12%. The decrease will be about 20%-30% in the summer and 10% in the winter. The Bank of Greece has studied the environmental, economic and social impacts of climate change in Greece [5]. It is stated that the coastline in the country is highly vulnerable to climate change since the mean level of the Greece's seas is expected to rise by 0.2-2 meters by 2100. It is also stated that the precipitation will decrease by 5-19% while the mean air temperature will increase by 3°C – 4.5°C until 2100. A report regarding the sustainable tourism in Greece has been published [28]. The report proposed 21 recommendations for the promotion of sustainable tourism. Four (4) of them are related with diversification of the tourism product, twelve (12) with collaborations and dissemination of best practices and five (5) with monitoring and evaluation of Greece's pathway to net-positive tourism. The nexus between climate change and tourism industry in Crete, Greece has been explored [11]. The author stated that climate change and tourism industry are interlinked and interconnected. He also mentioned that climate change alters various climate parameters in the island affecting the local tourism industry while Crete's tourism-related carbon emissions amplify climate change. The carrying capacity of tourism in Crete has been studied [13]. The authors stated that tourism has positive and negative impacts on the island. They proposed several environmental and social measures which would mitigate the negative impacts of tourism in Crete. A report related to tourism in Crete has been published [12]. The report has analyzed the tourism industry in the island separately in northern and southern Crete. It proposes several strategic measures and activities undertaken from public and private bodies which would be beneficial for all the stakeholders of the local tourism. The over-tourism and "tourismphobia" phenomena in tourism destinations have been analyzed [10]. The authors stated that a place which is attractive to tourists should be also attractive to local residents. They mentioned that the recent interest in the adverse impacts of tourism as is implied by the term "overtourism" and "tourismphobia" is related with the multiple undesired impacts of excess tourism in several destinations. The perceptions of residents regarding overtourism in Alcudia, Majorca, Spain have been studied [9]. The authors stated that 65% of the residents perceived that the destination was overcrowded while 57% of them perceived the destination as a good place to live. They also mentioned that the good management of the destination and the positive tourists' behavior reduce the

negative effect on local residents. The accommodation density in coastal tourism areas in insular destinations has been analyzed [25]. The authors stated that excessive tourists' inflows can describe a tourism destination as "saturated" indicating negative impacts to visitors and to residents. They also mentioned that "tourism satisfaction" is a perception factor that can be used to estimate when a coastal tourism area may be considered "saturated" regarding tourism accommodation. The problem of overtourism has been analyzed in an article of National Geographic [2]. It is stated that overtourism is related with the presence of too many people in one place at any given time. Overtourism is an issue for both visitors and local residents which can ruin the experience of sightseeing of tourists. It is mentioned that overtourism is a seasonal issue for a small number of destinations while there are several measures to mitigate it depending on the specific destination. The problem of overtourism has been examined from the "Sustainable Travel International" [26]. It is stated that the capacity of a destination to handle visitors is influenced by many factors such as: Infrastructure, availability of natural resources, environmental resilience, physical space and community perceptions. It is also mentioned that sustainable tourism destinations balance economic growth with resource management, conservation, visitors' enjoyment and residents' satisfaction. Carrying capacity studies and residents' surveys can help tourism destinations to cope with overtourism. The overtourism in Tunisia in relation to the tourism area life cycle concept has been assessed [1]. The authors analyzed the risk of overtourism in Tunisia using the indexes of tourism density and tourism intensity which are related with the carrying capacity of tourism. They also mentioned that tourism density higher than 2,278 bed-nights/km² and tourism intensity higher than 9.58 bed-nights/resident indicate very high risk of overtourism while when the tourism density is in the range of 1,174.1-2,278 bed-nights/km² and the tourism intensity in the range 6.31-9.58 bed-nights/resident the risk of over-tourism is high. The concept of overtourism has been explored [8]. The author has analyzed various pillars of overtourism including tourism capacity, sustainability, socio-psychological and socio-political issues. He proposed a model to assist the monitoring, diagnosing and influencing the risks of overtourism in several destinations. The estimation of overtourism reviewing the existing literature has been studied [24]. The authors have combined several tools including indicators, surveys, interviews et cetera for systematizing overtourism. They have proposed several guidelines for measuring overtourism combining absolute and relative indicators. The overtourism and its impacts has been assessed [23]. The author stated that overtourism has recently caused important discussion at many destinations of great tourism importance worldwide. She also mentioned that overtourism is not a problem that it will be solved in a night while there is still no specific policy for dealing with overtourism. The impact of tourism in a city context has been examined [22]. The authors tried to clarify the concept of overtourism using qualitative data from the opinion of 80 stakeholders of 13 cities. Their results highlighted the fact that overtourism describes an issue that is multidimensional and complex while it requires additional research to clarify several myths about it. The phenomenon of overtourism in Crete, Greece has been analyzed [21]. The author has estimated several indexes related to overtourism in the

island. He mentioned that tourism density and tourism intensity in Crete exceed the average EU and global values. The negative impacts of overtourism have been explored^[20]. His research was focused on the environmental impacts and the socio-economic consequences on the local residents. He stated that overtourism increases the consumption of local resources and increases the production of wastes while it has undesired impacts on the local residents. The reasons and consequences of overtourism in cities have been examined^[19]. The author stated that there is a shift from the 3S (Sun, Sea, Sand) tourism to 3E (Education, Experience, Entertainment) tourism. He stated that changes in contemporary tourism in cities are rapid adding new problems on the old ones creating tensions between visitors and locals. The overtourism and its future perspectives have been reviewed^[18]. The authors have explored the existing literature to better understand its origins, implications and its future perspectives. They stated that overtourism comprises several phenomena which converge and overlap while it will probably become more important in the near future. The advantages and drawbacks of overtourism have been studied^[17]. The authors realized a qualitative research interviewing 54 people. They stated that there is a consensus about overtourism and its negative impacts on the environment and the society. The impacts of overtourism in several destinations and the required policies to mitigate them have been investigated^[3]. The authors stated that overtourism is a broad and complex phenomenon which is not only related with overcrowding in certain destinations. They also mentioned that the impacts of overtourism in several destinations exceed their physical, ecological, social, economic, psychological and political thresholds. The phenomenon of overtourism has been reviewed^[16]. The authors examined the emergence of overtourism in cities and suggested several mitigation measures. They stated that overtourism is a complex phenomenon while its mitigation requires political will and better management of tourists' inflow as well as acknowledgement of the problem from all the stakeholders of the local tourism industry. The phenomenon of overtourism in Crete, Greece has been analyzed^[15]. The author stated that overtourism has multiple causes and many undesired economic, environmental and social impacts. He also mentioned that the number of visitors in Crete constantly increases every year threatening the fragile ecosystems of the island and increasing the tensions between the tourists and the local residents. The adaptation of tourism industry in Crete to climate change has been examined^[14]. The author stated that the island of Crete is located in eastern Mediterranean basin and is vulnerable to climate change. He also mentioned that the adaptation to climate change is a complex process requiring a holistic approach and the smooth cooperation among all

the stakeholders of the tourism industry in the island. Several economic indicators of the hotel industry in Crete have been calculated^[30]. The authors studied 160 hotels in the region of Crete calculating their costs and the breakeven point in these businesses. They stated that their occupancy rate above which hotels generate profits is particularly high ranging at the level 41-45%.

3. The tourism industry in Crete

Crete, the largest island in Greece, has long been a crown jewel in the Mediterranean tourism industry. With its rich history, diverse landscapes, and vibrant culture, Crete attracts millions of visitors annually, contributing significantly to Greece's economy and global cultural prominence. One of Crete's primary attractions is its profound historical heritage. The island was home to the ancient Minoan civilization, often considered Europe's earliest advanced society. Sites like the Palace of Knossos and the Archaeological Museum of Heraklion draw history enthusiasts from around the world. Additionally, Crete boasts Byzantine churches, Venetian fortresses, and Ottoman influences, making it a melting pot of cultural epochs. The island's folklore and traditions also play a vital role in its tourism appeal. Festivals, music, and traditional Cretan cuisine—such as dakos, kalitsounia, and raki—provide an authentic cultural experience that immerses visitors in the local lifestyle. Crete's natural beauty is another cornerstone of its tourism industry. The island offers a mix of stunning beaches like Elafonissi and Balos, rugged mountain ranges such as the White Mountains, and the breathtaking Samaria Gorge. These natural wonders cater to a variety of travelers, from sun-seekers to adventure enthusiasts. Eco-tourism and hiking have gained popularity, allowing visitors to explore the island's unspoiled countryside, olive groves, and remote villages. The island's biodiversity also includes unique flora and fauna, which appeals to nature lovers. Tourism significantly contributes to Crete's economy, providing employment opportunities in hospitality, transportation, and related sectors. Its share in the regional domestic product, in 2023, exceeds 50% compared to about 13% in the whole country. Many locals depend on this industry as a primary income source, especially during the peak summer months. Crete's tourism industry is a testament to its unique blend of history, culture, and natural beauty. While the island continues to thrive as a top destination, the importance of balancing economic growth with sustainability cannot be overstated. By embracing innovative and eco-friendly practices, Crete can ensure its enduring appeal for generations to come. Several characteristics of Crete and its tourism industry are presented in Table 1.

Table 1: Several characteristics of Crete and its tourism industry

Surface of Crete	8,336 Km ²
Length of coastline	1,040 km
Residents in Crete (Census 2021)	617,360 residents
Average annual air temperature (Heraklion city)	18.9°C
Annual hours with sunshine (Heraklion city)	2,780 hours
Average annual precipitation (Heraklion city)	460 mm
Average annual sea temperature (Heraklion city)	20.1°C
Tourist's beds (2021)	193,928
Arrivals in Crete in 2023	6,327,366 tourists
Number of airports for tourists' arrivals	3
Number of seaports for tourists' arrivals	6
%, arrivals in Crete to arrivals in Greece in 2023	17.7 %
Overnight staying of tourists in Crete in 2023	34,342,891 (bed-nights)
%, overnight staying in Crete to overnight staying in Greece in 2023	23.3 %
Average days of staying in Crete in 2023	5.43 days

Source: Several authors

4. Overtourism in Crete and its impacts on the local tourism industry

Recently, the island has grappled with the growing issue of overtourism, a phenomenon that threatens its environment, cultural identity, and local communities. Overtourism in certain areas can lead to environmental degradation and strain local infrastructure. Additionally, the seasonal nature of tourism creates economic fluctuations, leaving some residents vulnerable during the off-season. Efforts to promote sustainable tourism are underway, focusing on preserving Crete's cultural and natural assets while ensuring long-term economic benefits. Overtourism occurs when the number of visitors exceeds the carrying capacity of a destination, leading to adverse and harmful effects on the environment, local infrastructure, and residents' quality of life. Crete's appeal as a year-round destination has led to a significant influx of tourists, particularly during the summer months. Popular destinations such as Heraklion, Chania, and Elafonissi Beach often find themselves overwhelmed by visitors. Cruise ship arrivals further exacerbate the situation, with thousands of tourists disembarking daily in port cities. The rise of budget airlines and online booking platforms have democratized travel, making Crete more accessible than ever. While this growth has bolstered the local economy, particularly in the tourism sector, it has also introduced challenges that are becoming increasingly difficult to ignore. An important pressing concern of overtourism in Crete is its environmental toll. The island's delicate ecosystems, including protected areas like the Samaria Gorge, face degradation due to excessive foot traffic and littering. Beaches struggle with pollution, and marine life is affected by overfishing and the accumulation of plastic waste. Additionally, the increased demand for water and energy during peak tourist seasons strains local resources, leading to unsustainable practices. Crete's rich cultural heritage, which includes ancient Minoan ruins, traditional music, and cuisine, risks being diluted under the pressure of catering to mass tourism. The commodification of culture often results in superficial experiences that prioritize profit over authenticity. Moreover, local communities feel the strain of rising property prices and the transformation of residential neighborhoods into short-term rental hubs, pushing residents away from their homes. Infrastructure, too, bears the brunt of overtourism. Roads become congested, public transport is overstretched, and waste management systems struggle to cope with the influx of visitors. These issues not only inconvenience residents

but also diminish the quality of the tourist experience. The causes of overtourism are presented in table 2 while several indicators for assessing overtourism in tourism destinations in Table 3.

Table 2: Causes of overtourism

1	The accessibility and affordability of travel
2	The traditional policy focusing on promoting the number of tourists
3	Increase in international arrivals
4	The urbanization pressure
5	The gentrification and the increasing prices in city centers and new neighborhoods
6	The proliferation of unregulated tourist accommodation
7	The concentration of large groups of tourists
8	The decreasing cost of travelling
9	The sharing economy platforms
10	The fact that the use of public spaces is free for tourists
11	The strong seasonality
12	The reduced cost and travel time for transportation

Source: Vourdoubas, 2024

Table 3: Several indicators for assessing overtourism in tourism destinations

Category	Indicator	Value in Crete
Tourism Intensity	Tourists/resident	10.25
	Beds/resident	0.314
	Bed-nights/resident	55.63
Tourism density	Tourists arriving by aircrafts/resident	
	Tourists/km ²	759
	Bed-nights/km ²	4,120
Other indicators	Beds/km ²	23.26
	Tourism' revenue/regional GDP	>50%
	Airport and seaport closeness	
	Air and sea transportation seasonality	

Source: Own estimations

An overview of tourism densities and intensities in EU NUTS 2 regions is presented in table 4 while the impacts of overtourism in table 5.

Table 4: Overview of tourism densities and intensities in EU NUTS 2 regions

	Tourism density (bed-nights/km ²)	Tourism intensity (Bed-nights/resident)
Global average	181.8	3.31

Global min	6.4	0.00013
Global max	725,900	26.65
EU 28 average	629.3	5.77
EU28 min	26.1	0.34
EU28 max	37,300	70,73
Crete-Greece (2023)	4,120	55.63

Source: Vourdoubas, 2024

Table 5: Impacts of overtourism

Environmental	Overcrowding of infrastructure facilities and activities
	Overcrowding at attractions (natural, historical, et cetera)
	Strong contribution on pollution
	Damage to natural, historical, architectural sites
	Visual pollution
	High tourism-generated investments in tourism infrastructure
	Inflation or/and reduction in availability of goods and services
Economic	Degradation of commercial infrastructure
	Degradation of destination image
	Economic dependence on tourism
	Crowd-ness leading to a reduction of accessibility
Social	Marginalization of residents
	Problems related to uncivilized behavior and increased crime and violence
	Touristification of former residential neighborhoods
	Degradation of social infrastructure and facilities
	High possibility of misunderstandings
	Modification of several events and activities due to commercial interest
	Weakening of cultural traditions and values
	Decrease of the quality of life for the residents
	Lower quality of experience of tourists
	Increase in food prices
	Increase in house rentals
Lack of houses for rent	

Source: Several sources

Addressing overtourism in Crete requires a multi-pronged approach that prioritizes sustainable tourism practices, decentralization, and community engagement while it requires a concerted effort to promote sustainable tourism practices. Strategies could include implementing visitor caps at popular attractions, promoting lesser-known destinations to distribute tourist traffic more evenly, and investing in eco-friendly infrastructure. Encouraging off-season travel can also help alleviate the seasonal pressures on the island's resources. Education plays a pivotal role in fostering responsible tourism. Visitors should be made aware of the environmental and cultural impact of their actions, encouraging them to adopt sustainable behaviors during their stay. Local authorities and businesses must also collaborate to develop long-term policies that balance economic growth with environmental preservation and community well-being. The strategies for Combating Overtourism include:

4.1 Promoting alternative destinations

A key strategy to alleviate pressure on popular spots is to promote lesser-known destinations within Crete. The island is home to numerous hidden gems, such as tranquil mountain villages, secluded gorges, and lesser-visited archaeological sites. By marketing these areas and improving accessibility, tourism can be dispersed more evenly across the island, reducing overcrowding in hotspots

while boosting economic opportunities for underdeveloped regions.

4.2 Implementing sustainable practices

Encouraging sustainable tourism practices is crucial for long-term resilience. Hotels and resorts can adopt eco-friendly policies, such as reducing energy consumption, sourcing local and organic products, and minimizing plastic use. Visitors should be educated about responsible tourism, including respecting local customs, minimizing waste, and choosing sustainable transport options. Guided tours with environmental awareness themes can help tourists appreciate the importance of conservation.

4.3 Limiting visitor numbers in sensitive areas

Introducing capacity limits in high-impact locations can help protect fragile ecosystems and heritage sites. For instance, ticketing systems with timed entry slots at popular attractions like the Samaria Gorge or Knossos Palace can manage crowds while ensuring a better visitor experience. Revenues from such systems can be reinvested into maintenance and preservation efforts.

4.4 Supporting local communities

Involving local communities in tourism planning ensures that their needs and perspectives are considered. Empowering residents to benefit from tourism, through initiatives like homestays, agrotourism, and local craft markets, fosters a sense of ownership and mitigates potential conflicts. Moreover, revenue-sharing models can ensure that economic benefits are distributed more equitably.

4.5 Promoting seasonal tourism

Extending the tourism season beyond the summer months can reduce peak-season pressures and provide year-round economic benefits. Activities such as wine tourism, olive harvesting, and winter hiking can attract visitors during the quieter seasons while showcasing Crete's diverse offerings. Fighting overtourism in Crete requires cooperation among government authorities, businesses, local residents, and visitors. Policymakers must enforce regulations that prioritize sustainability, while tourists must embrace a mindset of responsibility and respect. By striking a balance between economic growth and environmental stewardship, Crete can preserve its natural and cultural treasures for future generations while continuing to thrive as a world-class destination.

5. Climate crisis and its impacts on the tourism industry in Crete

The present escalating climate crisis is emerging as a serious threat to this island's tourism-dependent economy. Rising temperatures, shifting weather patterns, and environmental degradation are not only altering the island's natural beauty but also its ability to attract and accommodate visitors.

5.1 The Climate Crisis: A Looming Threat

The climate crisis adds another layer of complexity to Crete's challenges. The Mediterranean region is warming at a rate faster than the global average, and Crete is no exception. Rising temperatures, prolonged droughts, and unpredictable weather patterns are already impacting the island's environment and tourism industry. Heatwaves during the peak summer season make outdoor activities uncomfortable, discouraging tourists from exploring Crete's

cultural and natural attractions. Coastal erosion and rising sea levels threaten the island’s iconic beaches, while droughts strain water resources essential for tourism infrastructure, agriculture, and local communities. Furthermore, the changing climate is disrupting traditional agricultural practices, which play a key role in Crete’s culinary tourism. Olive oil, wine, and other local products face declining yields and quality, diminishing their appeal to visitors.

5.2 Rising Temperatures and Heatwaves

The Mediterranean region is particularly vulnerable to climate change, with temperatures rising faster here than the global average. Crete has already experienced an increase in the frequency and intensity of heatwaves, especially during the summer months when tourism peaks. These extreme conditions make outdoor activities, such as exploring ancient ruins like Knossos or hiking the Samaria Gorge, less appealing and sometimes even dangerous. Prolonged periods of intense heat also impact the overall comfort of tourists, discouraging repeat visits and leading many to seek cooler destinations.

5.3 Coastal Erosion and Sea Level Rise

Crete’s beaches, such as Elafonissi and Balos, are among its most prized attractions. However, rising sea levels and coastal erosion pose significant risks to these natural treasures. Higher tides are encroaching on beach areas, while storm surges and wave action exacerbate the loss of sand and coastal habitats. As beaches shrink or disappear, the island risks losing one of its primary tourists’ draws. The degradation of marine ecosystems, including coral reefs and aquatic life, further diminishes the island’s appeal for activities like snorkeling and diving.

5.4 Water Scarcity and Resource Strain

Droughts, increasingly frequent due to the climate crisis, are putting pressure on Crete’s water resources. The growing demand for water during peak tourist seasons intensifies this challenge. Hotels, resorts, and agricultural activities, which support local cuisine and hospitality, all rely heavily on water. The strain on water resources affects not only the environment but also the quality of service offered to tourists. Persistent water shortages could lead to higher costs, making Crete a less competitive destination.

5.5 Seasonal Disruption and Unpredictability

Tourism in Crete has traditionally thrived on predictable seasonal patterns, with warm summers attracting beachgoers and mild winters appealing to cultural and historical enthusiasts. However, the climate crisis has disrupted these patterns, leading to unpredictable weather conditions. Sudden storms, unseasonal rainfall, or extended heat periods can deter tourists and complicate travel plans. Such unpredictability undermines the island’s reputation as a reliable destination for leisure.

The impacts of climate crisis on Crete are presented in table 6.

Table 6: Impacts of climate change on Crete

1	The mean annual temperature is rising
2	Droughts become more frequent
3	Floodings become more frequent
4	Heat waves become more frequent

5	More hot days and nights are expected every year
6	Erosion of the sea front and the beaches is increasing
7	Several species will be extincted
8	Soil erosion and land desertification are expected to increase
9	The risk of forest fires will increase
10	The precipitation patterns will change
11	Several species from other climate zones will invade competing with indigenous species
12	Less water resources will be available

Source: Vourdoubas, 2023

6. The combined impacts of overtourism and climate crisis on the tourism industry of the island

Crete faces a dual challenge that threatens its tourism-dependent economy and delicate ecosystem: Overtourism and the climate crisis. While both phenomena pose significant threats individually, their combined impacts are compounding the pressures on Crete’s environment, infrastructure, and local communities. Addressing these challenges requires a coordinated and sustainable approach to ensure the island’s long-term prosperity.

6.1 The Intersection of Overtourism and Climate Crisis

When combined, overtourism and the climate crisis amplify each other’s effects, creating a vicious cycle. The influx of tourists increases the strain on natural resources, such as water and energy, which are already under pressure from climate-induced shortages. Overcrowding exacerbates the degradation of ecosystems that are more vulnerable due to climate change. For example, beaches that are shrinking due to rising sea levels face additional stress from the large numbers of visitors trampling their fragile dunes. Additionally, the tourism sector itself contributes to the climate crisis. Increased air travel, cruise ship emissions, and energy consumption by hotels and resorts add to Crete’s carbon footprint. The paradox of relying on tourism while grappling with its environmental consequences highlights the urgent need for sustainable practices.

6.2 Impacts on Local Communities

The combined effects of overtourism and the climate crisis are acutely felt by Crete’s local communities. Residents face disruptions to their daily lives, from traffic congestion and overcrowded public spaces to the strain on essential services like healthcare and water supply. The cost of living has risen, with higher housing prices driven by the proliferation of short-term rentals. Meanwhile, the traditional way of life that forms a core part of Crete’s cultural identity is under threat. As climate change alters agricultural conditions, many rural communities that rely on farming are struggling to sustain their livelihoods. This shift not only impacts the local economy but also the island’s cultural landscape, which is a significant draw for tourists. The loss of authenticity in favor of mass-market tourism further alienates residents and diminishes the island’s appeal.

6.3 Strategies for climate change mitigation

Addressing the combined impacts of overtourism and the climate crisis requires a holistic approach that balances economic growth with environmental and social sustainability. Several strategies can help Crete navigate these challenges including the following:

- a) Promoting sustainable tourism

While the challenges are significant, Crete also has opportunities to adapt and thrive. Sustainable tourism initiatives, such as eco-friendly accommodations, renewable

energy, and water conservation practices, can help mitigate the impact of climate change. Promoting year-round tourism that highlights off-season attractions, such as wellness retreats or cultural events, can reduce pressure on resources during the summer months. Additionally, raising awareness among tourists and local stakeholders about the importance of environmental preservation can foster a culture of sustainability.

b) Investing in infrastructure

Enhancing public transport systems to reduce traffic congestion and carbon emissions. Improving waste management and recycling facilities to cope with increased tourist numbers. Upgrading water and energy systems to ensure sustainability in the face of climate challenges.

c) Diversifying tourism offerings

Promoting off-season tourism to alleviate pressure during peak months. Highlighting lesser-known destinations and experiences, such as agrotourism and cultural festivals, to distribute visitors more evenly.

d) Encouraging responsible tourism

Educating tourists about the environmental and cultural impact of their actions. Partnering with businesses to adopt sustainable practices, such as reducing single-use plastics and conserving energy.

e) Addressing climate change locally

Investing in renewable energy sources, such as solar and wind power, to reduce reliance on fossil fuels. Supporting climate-resilient agriculture to sustain local food production and culinary tourism. Restoring and protecting natural ecosystems, such as wetlands and forests, to enhance resilience against climate impacts.

7. Discussion

While tourism remains a vital component of Crete's economy, overtourism and climate crisis present significant challenges that must be addressed to ensure the island's future prosperity. By embracing sustainable practices and prioritizing the well-being of its environment and communities, Crete can continue to thrive as a world-class destination. The balance between welcoming visitors and preserving the island's essence is delicate but achievable with thoughtful planning and commitment. Overtourism and climate crisis adversely affect the natural ecosystems and the natural resources, the historical and cultural monuments of Crete while they have undesired impacts in the quality of life of the local residents. Their combined effect is amplified being higher than the sum of their individual effects. However, tourism industry is the main industry in the island significantly contributing in the prosperity of the locals. Although overtourism and climate crisis have adverse impacts on the local tourism there is lack of policy measures which could mitigate their adverse impacts. The multiple stakeholders of the local tourism industry have not developed so far appropriate policies and measures mitigating the impacts of climate crisis and overtourism on the island. However, the collaboration of the local stakeholders in these issues presupposes the acceptance and their consensus regarding climate crisis and overtourism in Crete. It should be also mentioned that there is lack of specific quantitative studies analyzing the short-, medium- and long-term impacts of overtourism and climate crisis on tourism industry in the island. Our study offers only a qualitative assessment without quantifying the impacts of both overtourism and climate crisis on the tourism industry

in Crete.

Future research should be focused on: a) Making a quantitative assessment of the impacts of overtourism on the tourism industry of Crete, and b) Making a quantitative assessment of the impacts of climate crisis on the tourism industry of the island taking into account their undesired and harmful combined effect.

8. Conclusions

The impacts of overtourism and climate crisis on the tourism industry in Crete have been studied. The combined challenges of overtourism and the climate crisis present a formidable threat to Crete's tourism industry, environment, and communities. Both of them have adverse and harmful economic, environmental and social impacts. However, they also offer an opportunity to reimagine the island's approach to tourism and development. By embracing sustainable practices, investing in resilient infrastructure, and fostering a culture of environmental stewardship, Crete can mitigate these challenges and ensure a prosperous future. Ultimately, the success of these efforts will depend on the collaboration of all stakeholders—local authorities, businesses, residents, and tourists. The path forward requires balancing economic interests with the need to preserve Crete's unique identity and natural beauty. If done right, Crete can serve as a model for other islandic destinations facing similar challenges, proving that sustainability and prosperity can go hand in hand. Both overtourism and climate crisis pose a profound challenge to Crete's tourism industry, threatening its natural landscapes and resources, its cultural and historical heritage, and its economic stability. However, with proactive measures and a commitment to sustainability of natural and anthropogenic ecosystems, Crete can mitigate these effects and continue to thrive as a global tourism destination.

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