KOZANI IN THE POST-LIGNITE ERA: PROPOSALS FOR SUSTAINABLE TOURISM DEVELOPMENT THROUGH CULTURAL AND ENERGY ROUTES

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Abstract
This study focuses on the development of a strategic tourism management plan for the Kozani region, emphasizing the promotion of sustainable practices to highlight its rich cultural heritage and natural environment. The objective is to formulate a sustainable tourism development strategy for the area, which includes the creation of cultural and energy-related routes that connect with the history and unique characteristics of the broader region. In recent decades, Kozani has experienced significant industrial growth and a diversified agricultural sector with the valuable saffron, a major export product. However, the gradual phase-out of lignite and the continuous population decline present new economic and other challenges, as more than one-third of the population was employed in this sector, creating a need for new jobs to maintain social cohesion in the area. The research is based on the analysis of bibliographic sources related to tourism development in Kozani and international examples of sustainable tourism. The study's results indicate that with appropriate support and collaboration from local authorities, businesses, and the local community, Kozani can become a model of sustainable development in the post-lignite era. The phase-out of lignite is a significant challenge that can be transformed into an opportunity for the development of alternative forms of tourism. Additionally, the adoption of sustainable tourism practices is crucial for environmental protection and for strengthening the local community.

Key Words: *Sustainable Tourism, Cultural Routes, Energy Routes, Lignite phase-out, Cultural heritage, Strategic Planning, Local Development*

Introduction

Kozani, the largest city in Western Macedonia, has historically been a hub of economic and administrative activity, playing a vital role in Greece's energy supply through its thermal power plants. However, the region has faced significant socio-economic challenges beyond its dependency on lignite. The Greek government debt crisis of 2009 had a profound impact, leading to rising unemployment, increasing poverty levels, and stagnation in infrastructure development. Compounding these difficulties, the COVID-19 pandemic created additional economic strain nationwide. While regions heavily reliant on tourism, such as Crete, the Ionian Islands, and the South Aegean, saw sharp declines due to quarantine measures, Western Macedonia experienced one of the most severe impacts. According to Eurostat data, the region's GDP dropped by 11.3% in 2020, exceeding the national average decline (Source: IMF, 2021). According to ELSAT, the 2021 census revealed a population decrease of nearly 10% in Western Macedonia, starkly surpassing the national average of 3.5%. The demographic profile is also concerning, with the birth-to-death ratio at 1:2.4, signaling an aging population and declining workforce. Together, these challenges have created a vicious cycle of economic uncertainty, outmigration, and stagnation.

The process of de-lignification has exacerbated pre-existing challenges, making Western Macedonia particularly vulnerable to structural changes. The socio-economic impacts include rising unemployment, economic hardship for local communities, and the need for worker skill upgrades to support the local economy in a shifting landscape. However, it is important to note that this transition is essential for environmental and public health protection. Studies, such as those by Rodolaki et al., (2019), Katsifara et al., (2021), and Liebig-Gonglach et al., (2023), highlight that long-term lignite mining is associated with increased cancer rates and other health risks, underscoring the importance of de-lignification. This transition requires strategies that empower the community, such as retraining programs and economic diversification strategies, to ensure a fair and sustainable shift. Youth unemployment has reached alarming levels, touching 70%, indicating limited opportunities for younger generations. Additionally, around 22,000 workers employed directly or indirectly in the lignite industry have seen their job prospects diminish (Public Employment Service, 2023). The region's GDP, which was 3.92 billion euros in 2016 (Ziouzos, 2021), has significantly declined, affecting both direct and indirect industries. The closure of thermal power stations has led to disruptions in the provision of essential services, such as district heating, exacerbating energy poverty for many households.

Kozani, a region known for its rich cultural heritage and historical connection to energy production, is currently at the center of efforts for sustainable tourism development. Strategic initiatives such as the "Kozani 2030" plan and inclusion in the CRAFT network highlight the urgent need for tourism that combines economic growth with environmental protection and active community participation. These initiatives provide a framework for capitalizing Kozani's rich cultural and natural assets, such as the saffron production and its geographical diversity. The region's historical ties to energy production, combined with the unique saffron production, can serve as powerful tools for tourism diversification and for mitigating the negative impacts of de-lignification. For instance, agrotourism programs that highlight the saffron production cycle and thematic routes focusing on historical and energy-related topics could attract visitors with specialized interests. Additionally, promoting the Kozani-Grevena Geopark, which is recognized as part of UNESCO's Global Geoparks Network, and improving access to eco-tourism paths are central elements for encouraging low environmental impact tourism. These initiatives reflect the region's potential to foster a sustainable tourism model that balances economic development with environmental conservation and cultural preservation.

The main findings of this research reveal that Kozani faces significant delays in sustainable tourism development and broader economic reconstruction. The region's long-standing reliance on energy production has monopolized its economic capabilities for over five decades, leaving little room for diversification. Furthermore, the lack of tourism infrastructure, strategic planning, and a cohesive tourism identity limits the potential to capitalize on the area's natural and cultural resources. Through the study of international examples, a tourism development plan for Kozani has been formed, focusing on four key pillars: culture and history, gastronomic tourism with an emphasis on saffron, energy heritage and infrastructure, and geophysical monuments. A crucial role is played by featuring the region's cultural heritage and history, aiming to attract visitors seeking authentic experiences. These findings align with broader research on rural development, which emphasizes the integration of local cultural identity and the sustainable management of natural resources in tourism strategies (Santoro et al., 2020; Reyes et al., 2020). Such integrated approaches can increase local economic resilience by creating diverse tourism products that appeal to a range of visitor interests, from history and gastronomy to energy and eco-tourism.

1. Historical Overview and Economic Impact of Lignite

The region of Elimiotis, also known as Elimeia, has a rich history of continuous human presence dating back to the Iron Age. Initially, it was an autonomous region governed by local aristocracy before getting incorporated into the Macedonian Kingdom. During the reign of Alexander I, Elimeia maintained a semi-autonomous status until its full integration by Philip II in 355 BCE, becoming one of Macedonia's western provinces. The people of Elimeia played a significant role during the campaigns of Alexander the Great (336–323 BCE), contributing approximately 1,500 soldiers to the Macedonian phalanx (Iordanidis, 2018). In the Roman era, Elimeia and its capital, Aiani, emerged as key mining hubs in Western Macedonia. Archaeological evidence of copper and iron extraction, particularly in the foothills of Pindos, underscores their importance, with modern-day Grevena marking one of the core mining areas of that time (Karamitrou-Mentesidi, 2011). This historical evolution highlights the strategic and economic significance of Elimeia throughout various periods, reflecting its integration into broader political and economic systems.

Archaeological excavations in the Elimeia region have uncovered significant evidence of its historical prominence, including luxurious private residences, statues, royal tombs, and public buildings. These findings highlight the area's cultural and economic peak during antiquity. The opulent structures and artifacts reflect a thriving community with considerable wealth and social complexity. During the late medieval period, in 1392, refugees from Premeti founded the settlement of Kozdiani, which later evolved into the modern city of Kozani. Initially a rural village, Kozani became integrated into the Ottoman timar system[1] and subsequently into larger administrative units known as ziamet. This progression indicates its growing economic activity, strategic importance, and emergence as an urban center (Lambrakis, 2017). By the 17th century, Kozani had firmly established itself as a significant town. The first organized school began operating in the late 1600s, demonstrating its cultural development. Moreover, in 1668, the founding of the Kozani Library marked a transformative moment for the region, positioning the city as a hub of knowledge and education (Lambrakis, 2017).

[1]The timar system was a key socio-economic and administrative framework of the Ottoman Empire from the 14th to the 16th centuries. Within this system, Zi‘amets (or zeamets) were land grants given to cavalry officers (sipahis) and other military class members in return for service. The income from these lands supported the sipahis and their retainers, who provided military service to the empire. (Sources: Mereison, 2020; Ahmeti et al., 2023)

Kozani's development suffered major setbacks beginning in 1770 due to conflicts between locals and Central European merchants, and a devastating looting by Turkish beys, marking the end of its prosperous 18th-century era. The city faced further decline during the Greek War of Independence in 1821, followed by a century of conflicts, looting, and epidemics. Kozani joined modern Greece after the Balkan Wars (1912–1913) and underwent significant demographic change due to the Asia Minor Catastrophe and population exchanges in 1922. Under German occupation during WWII, the city endured famine, violence, and executions. The 1970s brought industrial growth with the establishment of Public Power Corporation plants, turning Kozani into a key energy hub in Greece. Greece's lignite basins have been known since antiquity, with early records indicating their potential[2]. In 1840, under King Otto's initiative, geologist Fiedler documented the country's main lignite deposits[3]. The presence of lignite in Eordaia dates back to the Ottoman era, but its systematic exploitation was delayed by the turmoil of World War II and the Greek Civil War. Mining operations began later, with the establishment of mines and thermoelectric plants in Ptolemaida, Kozani, and Florina. By 2008, the region's combined capacity reached 4.78 GW (IEECP, 2023), making it central to Greece's lignite-based energy production, contributing 80% of national output and powering 60% of the interconnected electricity grid by 2021 (ELSTAT, 2021). While lignite extraction was profitable, environmental and economic pressures demand the challenging transition into a post-lignite period for Kozani. Strategic plans now aim to diversify the economy and implement sustainable practices for long-term resilience in Western Macedonia.

Before addressing Kozani's challenges, a thorough analysis of its current production model reveals critical issues. In 2013, 45% of Western Macedonia's output was derived from industry, energy provision, and mining, reflecting a significant reliance on lignite and energy production. Another 17% came from the public sector, while the primary sector contributed minimally, underlining the region's industrial orientation and the limited employment opportunities in alternative fields (Source: R.D.F. of W. Macedonia, 2023). Over the subsequent decade, the region experienced a severe economic downturn, exacerbated by the decline in lignite-based energy production. Western Macedonia's GDP dropped dramatically from €5.039 billion in 2009 to €3.795 billion in 2019, a 25% decrease over ten years (Source: IEECP, 2023). This contraction was primarily driven by the region's dependency on the lignite industry, which remains central to the local economy but is increasingly less viable due to national and international energy transitions. This dependency leaves the region vulnerable to economic shocks as the energy sector undergoes structural changes.

Greece's energy deficit is expected to worsen due to the ongoing phase-out of lignite-based energy production. The gradual closure of lignite power plants and mines has already caused substantial economic challenges, including job losses and reduced incomes, which extend beyond the lignite sector itself to the broader economy. The interconnected nature of lignite-dependent activities with other economic sectors has led to significant disruptions, a trend expected to intensify as the transition progresses. Western Macedonia, for instance, leads Greece in pending energy community applications, both in number and capacity, reflecting the region's struggle to adapt to the lignite phase-out. Studies such as those by Rovolis et al. (2016) and Ziouzios et al. (2021) emphasize the ripple effects of the lignite phase-out on regional economies. They underline the urgent need for well-structured

[2]Theophrastus (371-287 BC), made significant contributions to geology in his treatise "*ΠερίΛίθων*" (On Stones). Recent interpretations of his observations suggest that some of the materials he described may have been early references to lignite. In particular, his descriptions of combustible earths found in certain regions align with characteristics of lignite deposits.

[3]Karl Gustav Fiedler, Reise durch alle Theile des Königreichs Griechenland im Auftrag der Königl. Griechischen Regierung in den Jahren 1834 bis 1837, Leipzig 1840

transition policies, including investment in renewable energy, support for economic diversification, and measures to safeguard employment.

2. Adapting International Best Practices in Sustainable Tourism for Application in Kozani

i. Exploring Irani Agritourism: Saffron Farms and Tours

Kozani, known for producing saffron of exceptional quality and ranking among the top ten producers worldwide, faces significant competition from Iran, the undisputed leader in saffron production, controlling about 88-90% of the global supply (Menia et al., 2018). Iran has developed a highly organized and structured saffron tourism industry, offering visitors fascinating experiences that combine agriculture, culture, and wellness. Many organizations, such as "Let's Visit Persia", offer travel packages catering to various budgets and durations, ranging from more affordable trips to extensive, high-quality experiences. These packages typically include activities like saffron harvesting, exploring local markets, and understanding saffron's cultural significance in Iranian cuisine. Iranian researchers have highlighted the importance of saffron tourism, with major studies underscoring its economic potential for the region. Using tools like the Electra econometric model, they evaluate and compare areas based on various criteria, aiming to boost rural development through targeted interventions, showcasing the possibilities of saffron tourism (Soota, 2014; Bhole et al., 2018).

According to the findings of Javan et al. (2020), the village of Khojan, renowned for its numerous agritourism farms connected to saffron production, stands out as the most economically developed area in the region, achieving a matrix score of 5. This high score indicates significant progress compared to other areas. In contrast, villages like Shadmianeh, Karizak, Jilo, Noruzabad, Bahroud, and Haghieh have lower economic rankings, with matrix scores of 3, 2, and 1 respectively, due to their inability to integrate tourism into their agricultural activities. These villages primarily rely on agricultural production, especially saffron cultivation, without utilizing the potential of tourism to enhance their economic capabilities, hampering their development, in contrast to other villages that have successfully combined both sectors, boosting their overall growth. These findings support previous studies that highlight agritourism as an effective development tool in underdeveloped areas, contributing to increased income and enhanced community resilience (Despotović et al., 2017; Barbieri, 2020; Bhatta, 2020).

As previous research on agricultural tourism suggests, linking agriculture with tourism can not only promote rural development but also preserve cultural heritage and local traditions (Santoro et al., 2020; Reyes et al., 2020). Laskookalayeh et al. (2020) conducted a study city using Quantitative Strategic Matrix Analysis (QSPM). Their study in Torbat Heydariyeh aligns with research from the Darbeghazi region, which explores the potential of agritourism, particularly saffron farming, to drive rural economic growth. Both studies emphasize the importance of promoting local assets and addressing regional weaknesses, through stronger collaboration. A defensive strategy, with a score of 0.228, was identified as the most effective approach, focusing on utilizing local resources while mitigating external threats to foster development. This approach aligns with strategic management principles in rural tourism, emphasizing institutional and financial support to enhance profitability (Liu et al., 2020; Deladem et al., 2021). Engaging local communities in tourism not only boosts economic benefits but also ensures sustainability through local ownership and participation (Graci, 2020; Chan et al., 2021; Rinaldi et al., 2022).

ii. Transforming Geothermal Energy into a Tourism Hub: Iceland's Power Plants as Tourist Destinations

Iceland is an island nation situated at the northern edge of the Mid-Atlantic Ridge. Often called "Europe's last wilderness", Iceland is a successful example of a nature tourism destination (Oslund, 2000; 2005). The tourism industry's marketing strategies have long relied on transmitting an image of 'pure' nature, with unspoilt and wild highland areas to attract tourist interest. Iceland's uninhabited Highlands, covering 40% of the island, feature diverse landscapes with glacial rivers and harsh climates (Sæþórsdóttir et al., 2011). Capitalizing on its distinctive geology, Iceland excels globally in renewable energy production, with nearly all electricity derived from geothermal, wind, and freshwater sources. Notably, in 2022, 70.55% of Iceland's electricity was generated from hydropower, 29.40% from geothermal energy, 0.03% from wind, and 0.02% from fuel-based sources (National Electricity Regulatory Authority, 2023). Reykjavik Energy is at the moment the leading developer of geothermal energy in Iceland. It operates the world's largest geothermal district heating system, providing thermal water to Reykjavik and surrounding communities (Gunnlaugsson et al., 2010).

Despite the undeniable benefits of renewable energy, the relationship between renewable energy infrastructure and tourism can be complicated. In a study conducted by Tverijonaite & Sæþórsdóttir (2024) to examine the tourism stakeholder attitudes towards REI, respondents considered that geothermal power plants often have significant visual impacts on an area's landscape, due to the odor, the noise, and steam they produce - but also the infrastructure itself, which does not blend in with Iceland's natural terrain. The skepticism expressed by some of the country's tourism service providers is justifiable, considering the sector's reliance on nature-based tourism. The success of the nature-based tourism sector is largely driven by the perceived naturalness of the landscape (Fredman et al., 2010). Some studies have suggested that local communities often perceive renewable energy infrastructure as a threat to the appeal of nature-based tourism destinations, primarily due to its visibility (Smardon et al., 2016).

Many tourism providers recognize the appeal of renewable energy facilities, especially geothermal power plants, which are among the most attractive REIs in Iceland. With their unique designs and visible infrastructure, such as steam, pipelines, and boreholes, geothermal plants are becoming a popular part of energy tourism, particularly for international visitors. One notable example is the Hellisheiði power plant, located within the Hengill volcanic complex. Since 2006, it has generated electricity and, since 2010, has provided hot water to Reykjavik (Gunnlaugsson et al., 2010; Ragnarsson et al., 2021). Many tourists are intrigued by the process of electricity production, and some tour operators even organize visits to these plants, where visitors often express interest in how the geothermal energy system works (Tverijonaite et al., 2024). During the planning and construction phase of the power plant, the goal was to work in harmony with nature, as well as to minimize the visual impact. The Hellisheiði power station was designed to serve as a visitor center for all the power plants in the Hengill area (Gunnlaugsson et al., 2010). Among others, it is listed by 'Visit Iceland', Iceland's official travel resource, as one of Iceland's top attractions in regards to sustainable energy, in the sections "Museums", "Exhibitions & Gallery" and "The Volcanic Way" (Visit Iceland, n.d.). "Visit South Iceland" (n.d.) and "Visit Reykjavik" also mention it (n.d.). Some tourism operators, such as 'Arctic Adventures'(n.d.) promote it as an attraction, while others, like 'Yonder Tours'(n.d.) and 'Green Energy Travel Iceland' (n.d.) also offer private specialized tours.

Open daily from 9:00 - 16:00 or 17:00 depending on the season, the exhibition center allows visitors of all ages to discover how green, sustainable energy is produced at the

Hellisheiði ON Power Plant in action. They can see the turbine halls of the plant, engage with interactive exhibits, and learn about ON's collaboration with Carbfix, an innovative CO2 storage solution. Visitors can book tickets and audio guides online, and are encouraged to bring their own smartphones and headphones for a self-guided tour. The tour lasts about one hour, with additional videos and displays extending the visit. Ticket prices range from 2111-2350 ISK (14.54-16.15 EUR) for adults, with discounts for seniors, teens, and children. The exhibition is wheelchair accessible, except for the third-floor balconies (ON Power, n.d.). The visitor center offers multiple attractions to draw visitors, including scenic landscapes, a coffee corner, a souvenir shop with local eco-friendly products, and the Agndofa art installation, a multi-sensory experience connecting visitors to nature. It also serves as a venue for events and a "green stop" for travelers exploring Iceland, with facilities like water refill stations and electric car chargers. Conveniently located between Reykjavik and Southern Iceland, it is an ideal stop for those hiking the Hengill area (ON Power, n.d.).

iii. Reviving a City: The Role of Cultural Tourism in Glasgow's Renaissance

In many post-industrial cities across Europe, culture has played a key role in shaping tourism destinations and attracting visitors as part of the broader shift towards an 'experience economy' (Richards, 2002; Lorenzen, 2009). Culture serves as a fundamental resource in this context, with cultural tourism experiences emerging as a key component of this trend (Seyfi et al., 2019). Cities such as Antwerp, Bilbao, Genoa, Rotterdam, Liverpool, Manchester, and Glasgow have strategically developed their tourism offerings with a strong cultural focus (Tandzegolskienė, 2021; Noonan, 2023). Tourism focused on cultural attractions has developed into a central element in international tourism and plays an increasingly important role in the regeneration of urban and rural areas (Uysal et al., 2012; Lak et al., 2020). In many UK cities, de-industrialization prompted a search for economic renewal during the late 1970s and early 1980s.

A great case study of a post-industrial city that turned to cultural tourism is Glasgow. Glasgow was the first former industrial city to launch a cultural-led regeneration program and to be named a European Capital of Culture (ECOC) in 1990 (Mooney, 2004). In 2023, Glasgow is one of the UK's main tourist city destinations; according to the Scottish Tourism Economic Impact Model (STEAM) for 2023, Glasgow attracted 3.91 million overnight visitors, generating £2.35 billion for the city's economy. Throughout the year, the tourism sector also supported over 37,000 full-time jobs in areas such as food and drink, transport, shopping, and accommodation (Visit Scotland, 2024). Glasgow is often hailed as a model for other de-industrialized or "second cities" to emulate. By the late 20th century, Glasgow was grappling with economic decline, unemployment, and poverty. In response, the Scottish Development Agency and Glasgow District Council launched a revitalization program aimed at transforming the city into a post-industrial hub. Central to this plan was the development of cultural initiatives to attract service-sector investment and promote tourism. Creating a vibrant cultural scene was seen as key to drawing people and investments, ultimately fostering a dynamic, thriving city that would attract visitors (Mooney, 2004).

Key initiatives in Glasgow's transformation included the opening of the Burrell Collection in 1983 and the launch of Mayfest, an annual arts festival, in the same year. Other major developments include the improvement of the city's infrastructure, like the Scottish Exhibition and Conference Centre, upgrades to the airport, and retail developments including Princes Square, St. Enoch Centre, the Italian Centre, and the redevelopment of the Merchant City. Additional efforts included marketing campaigns, the establishment of the Greater Glasgow Tourist Board in 1983, the redevelopment of the Clydeside area, the hosting of the National Garden Festival in 1988, and the European City of Culture designation in 1990. The

city has continued to enhance and expand its cultural offerings, with new attractions, arts and cultural festivals, marketing strategies and improvements to infrastructure and access to support tourism growth (Hamill & Stevenson, 2012; Buchreiser, 2019).

What was considered most important was the variety and range of offerings, as this appeals to a wider audience than a singular focus would. Furthermore, the role of key individuals and the relationships between them is considered crucial in Glasgow's development. This was especially evident in the city's early growth, which was largely opportunistic in nature, rather than a strictly strategic approach. This opportunistic nature is likely because, in the UK at least, there was no precedent for such development before Glasgow. Once Glasgow had achieved success, many other cities adopted a similar approach using it as a model for their own cultural tourism initiatives (Murphy et al., 2006; Edwards, 2018). As in the cases of Porto 2001 (Balsas, 2004), Liverpool 2008 (Liu, 2019), Istanbul 2010 (Uysal & Özden, 2012), and Košice 2013, among others, this urban regeneration is often realized through the European Capital of Culture (ECoC) initiative, whose purpose is the preservation of cultural heritage, the improvement of the appearance, as well as the cultural infrastructure of cities, and the rediscovery of new creative hubs and travel destinations. The European Capital of Culture (ECoC) initiative aims to preserve cultural heritage, enhance urban aesthetics and infrastructure, and promote new creative hubs and travel destinations (Hudec & Džupka, 2014). The prestigious ECoC title also serves as a form of "hard branding," which cities can use for marketing and promotional purposes (Evans, 2003).

iv. Tortuguero National Park: A Model of Ecotourism and Biodiversity Conservation Synergy in Costa Rica

In many regions, environmental protection often centers on the establishment of national parks and reserves. However, these parks are not created in a social or economic vacuum, and their creation typically results in significant changes to local rural economies that were previously dependent on the exploitation of natural resources. Activities that sustained local communities for generations, such as farming, fishing, hunting, and the extraction of plants and their products become prohibited within national parks. In an effort to find an alternative, nature tourism has emerged as a potential solution for rural economic development. This approach advocates for the replacement of resource extraction with nature-based tourism (or ecotourism) through the active involvement of the local community in areas where national parks are established (Goodwin et al., 2001; Lepp, 2002; Bansal et al., 2011). With its internationally renowned national park system, counting more than 25 national parks, and many more protected areas and biological reserves (ICT, n.d.), Costa Rica offers a valuable case study to examine the role of national parks in sustainable tourism-based development (Place, 1991; Hill, 1990; Echeverri, 2022).

Costa Rica is the home of 6% of the Earth's biodiversity, and around 25% of its national territory is part of the National System of Conservation Areas. Sustainable tourism development is a national priority, to the extent that the Costa Rica Tourism Board (ICT) created the Certificate for Sustainable Tourism (CST) program - a program that informs travelers about accommodations and tour operators, as well as how their tourism activities impact natural, cultural, and social resources (Visit Costa Rica, n.d.). Tourism in Costa Rica plays a vital role in the national economy, contributing 8.2% to the GDP, with 6.3% coming from direct tourism activities and 1.9% from indirect sources. The sector also directly supports 8.8% of employment (Central Bank of Costa Rica, ICT). In 2023, Costa Rica attracted 2.75 million international visitors, primarily from the United States, Canada, Mexico, and Europe. Ecotourism is a major attraction in Costa Rica, with activities such as wildlife watching, hiking, volcano visits, and exploring national parks drawing significant numbers of

visitors. A survey conducted at Juan Santamaría International Airport in 2023 found that approximately 67.7% of tourists cited "ecotourism" as a key motivation for their visit. Additionally, 68.4% of tourists visited protected areas, underscoring the crucial role of nature-based tourism in the country's economy and its dependence on its rich natural heritage (ICT, n.d.).

The creation and development of the National Park of Tortuguero is a great example. The Tortuguero National Park was established in 1975, with the goal to protect the last major nesting beach in the western Caribbean for the endangered green sea turtle (Chelonia mydas), as well as nearly 20,000 hectares of lowland tropical rainforest. The national park spans 30 kilometers of the 35-kilometer turtle nesting beach, located between the Tortuguero and Parismina rivers on Costa Rica's Caribbean coast. The park's remote location, near the village of Tortuguero, is marked by constant cloud cover, rain, and rough surf, situated on a barrier island, separated from the mainland by rivers and estuaries. The establishment of the park significantly impacted the local economy, as traditional practices like turtling, forestry, and farming were no longer allowed. Since the 1980s, Tortuguero National Park has attracted growing numbers of tourists, including biologists, nature lovers, and travelers worldwide. This surge in visitation prompted the introduction of key tourism initiatives, such as a local guide program, to balance tourism with conservation (Gutiérrez-Lince et al., 2021). As Costa Rica emerged as a leading ecotourism destination, efforts to protect the park from tourism's negative effects increased. Key initiatives include the 1991 turtle watching regulations, the 1994 Tortuguero Integrated Bird Monitoring Program, and the 2005 Turtle Spotter Program. With 245,259 visitors in 2023, including 192,086 international tourists, the park is one of Costa Rica's top ecotourism destinations and a global leader in integrating tourism and biodiversity conservation (ICT, n.d.; Ralph et al., 2005; Gutiérrez-Lince et al., 2021).

3. Methodology

The methodology used in our research involves a multi-dimensional methodological approach, using a combination of bibliographic analysis with preference for primary sources from local studies, and on-site observation and route planning. The analysis was based on a comprehensive literature review, with a particular emphasis on primary sources and local studies in native languages. This approach was chosen to ensure greater accuracy, despite the challenges of translation and data verification. Primary sources, including local studies and archival materials, often provide more authentic and in-depth information that is difficult to obtain from secondary sources. The data sources included scientific articles, official publications, local monographs, and historical archives. The selection of literature was based on the relevance of the sources to the research topic, the reliability and the availability of primary data.

Additionally, significant attention was given to institutions that preserve valuable information and could offer us critical information, like the new Koventarios Library. To complement the bibliographic references, on-site observations were conducted in the Kozani area. The planning of routes within the region facilitated a deeper understanding of the energy infrastructure, geography, local architecture, and social dynamics. Routes were selected based on the importance of the locations, the mode of transportation, distances, and their historical significance, enabling a detailed recording and assessment of the observed elements. In this study, the emphasis on communication with the local community was central to understanding the socio-economic and cultural aspects of lignite production and de-lignification. These conversations explored the local perspectives on the impact of lignite's decline, focusing on issues such as job loss, economic uncertainty, and the need for social cohesion.

4. Proposals for Sustainable Routes: Cultural, Geophysical, and Energy Trails

i. Cultural Routes: Exploring Heritage and Identity Through Historical Sites and Traditions

The cultural heritage of Kozani offers a unique foundation for creating organized cultural routes that connect the rich history of the region with modern tourism. Integrating the cultural, historical, and natural characteristics of the area into a cohesive tourism product can present Kozani as a unified historical entity, attracting visitors seeking authentic experiences. Kozani stands out as the only region in Greece with two entries on the UNESCO Intangible Cultural Heritage list: the Momogeroi, a lively New Year's celebration, and the Great Dance of Vlasti on August 15. These traditions, deeply rooted in the local culture, highlight the history and values of the area. Promoting these events with a seasonal approach could support the sustainability of tourism by attracting visitors throughout the year.

The route could begin at Ancient Aiane, the former capital of ancient Elimeia, one of the four kingdoms of Upper Macedonia. Aiane has an archaeological museum with artifacts from the classical and Hellenistic periods, shedding light on the long historical significance of the area. This route could be further enriched with stops at the picturesque villages of the area, such as Velvento and Eratyra, which maintain their Macedonian architecture and traditional charm. Velvento, with its cobblestone streets and painted houses, showcases the region's agricultural heritage, while Eratyra offers an authentic experience of the Greek countryside, focusing on local arts and traditions. The route could conclude in Siatista, a town renowned for its impressive Ottoman-period mansions, which stand as enduring symbols of the region's prosperity during the 17th and 18th centuries. Notable examples include the Poulkidi (also known as Poulko's) and Nerantzopoulos mansions. The historic mansions of Siatista, blending Ottoman and Byzantine architectural influences, embody the cultural and economic vibrancy of an era when Kozani thrived as a major commercial hub through the silk and fur trade. Distinguished by elaborate decorations, intricate wooden ceilings, colorful frescoes, and luxurious interiors, they exemplify the aesthetic sophistication and social prestige of their owners. This architectural heritage offers a window into the resilience and adaptability of the local community, preserving and showcasing its cultural identity despite periods of foreign domination. Far more than mere buildings, the mansions stand as enduring testaments to Kozani's prosperity, outward-looking spirit, and cultural significance during this flourishing historical period.

ii. Crocus

Gastronomy, a cultural touchstone beyond basic sustenance, reflects heritage, traditions, and identity. In Kozani, the cultivation of crocus (saffron) represents a tradition dating back to the 17th century, nurtured by unique soil and climate conditions—well-drained, moderately fertile soil and a warm temperate climate—that, combined with specialized knowledge of cultivation and harvest, yield a high-quality product (Source: European Commission, Geographic Indications and Quality Systems). To amplify the recognition of saffron and promote agritourism, targeted tourism interventions are necessary. Given that only two villages in the area produce saffron regularly, focused tourism efforts are feasible, as the concentrated location minimizes travel distances and resources needed.

To effectively exhibit Kozani's unique saffron heritage while promoting tourism, an integrated program is proposed. The saffron harvest period in Kozani presents an excellent opportunity to promote an innovative and sustainable tourism model, blending local agricultural traditions with the region's cultural heritage. Through targeted public and private

sector partnerships, a comprehensive tourism experience can be developed, integrating the traditions of saffron cultivation, culinary arts, and the historical identity of the area. The creation of such tourism packages will not only encourage longer stays for visitors but also enhance cultural exchange by offering a multifaceted experience that integrates local traditions and history. Collaborations with local hotels, restaurants, travel agencies, and cultural institutions like the Kovenatarios Library will strengthen these initiatives, ensuring both economic sustainability and cultural preservation.

A central element of this program could be the establishment of an annual festival, modeled after successful events like the Truffle Festival in Kalabaka. The Annual Saffron Harvest Festival, taking place from late October to early November, could strategically align with the saffron harvest season, extending the tourist season in the Kozani region. This festival would bridge the gap between traditional tourist periods, such as Christmas, winter tourism, and Carnival, encouraging visitation during a relatively quieter time of the year. During the festival, visitors will have the opportunity to engage in interactive experiences, such as meeting local farmers and participating in the saffron harvesting process. This approach not only emphasizes the region's cultural richness but also promotes the long-term growth of local tourism through the celebration of authentic, locally-produced culinary treasures.

iii. Geophysical Routes: Navigating Natural Landscapes and Ecological Corridors

At this stage, proposals for sustainable tourism development in the region of Kozani focus on two major pillars: the Kozani-Grevena Geopark and the mountainous area of Voio. These regions blend rich natural heritage with distinct historical and cultural identities, offering unique opportunities for ecological and cultural tourism. The Kozani-Grevena Geopark, recognized by UNESCO as part of the Global Geoparks Network, spans approximately 2,500 square kilometers, encompassing five municipalities: Grevena, Deskati, Voio, Kozani, and Servia. This designation enhances the region’s international profile and underscores the importance of geological and cultural preservation. The geopark's geological formations, fossil evidence from the prehistoric-era, caves, and gorges provides excellent opportunities for outdoor activities such as hiking, climbing, and educational tours, attracting eco-conscious travelers. Voio area, geographically situated between Western Macedonia and Epirus, is distinguished by its diverse landscapes, traditional architecture, and historical significance. Its stone bridges and traditional settlements, influenced by Macedonian and Epirotic styles, offer visitors a journey through time, while the mountain’s natural beauty calls for the exploration of trails, dense forests, and picturesque villages. Furthermore, local festivals and customs, along with traditional gastronomy, enrich the overall tourist experience.

The "Pindos" project, launched in 2010, established a network of trails connecting traditional villages like Mastorochoria and Kastanochoria, renowned for their stone architecture and located at 750–1,450 meters above sea level. The region's rich biodiversity, including streams, and unique geological formations, makes it ideal for alternative tourism. Expanding on this network, a comprehensive ecological trail system could connect key attractions within the Kozani-Grevena Geopark, promoting hiking and outdoor activities while incorporating informative signage about local biodiversity, geology, and conservation efforts. Such initiatives would not only offer recreational and educational opportunities for visitors but also support the region's sustainable tourism development.

Promoting the Kozani-Grevena Geopark and Voio as sustainable tourism destinations can be based on a low-cost strategy focused on using digital media, collaborating with local stakeholders, and enriching the on-site visitor experience. A digital strategy serves as a key pillar of this approach. To elevate the Geopark and Voio as premier ecotourism destinations,

targeted digital campaigns, partnerships, and enhanced visitor services are key. A strong online presence through social media, travel bloggers, and an interactive app or website featuring maps, trail guides, and accommodation details can boost visibility and accessibility. Collaborating with local businesses and NGOs enables curated packages, blending stays in traditional guesthouses, local cuisine, cultural tours, and craft workshops, appealing to visitors seeking authentic experiences. Visitor centers with educational displays, maps, and local products can enrich the on-site experience.

iv. Energy Transition Routes: The Historical Impact of Lignite and the Shift to Renewable Energy

Kozani presents a remarkable opportunity for sustainable tourism, embracing and transforming its legacy from lignite-powered energy into a unique narrative of industrial history and the transition to renewable energy sources. The proposed "Energy Heritage Route", spanning 10 kilometers, would guide visitors through a carefully designed journey illustrating Kozani's key role in Greece's energy past while showcasing its current commitment to sustainability. This route is envisioned not merely as a path connecting historical monuments but as a dynamic educational experience that bridges the past with the future, allowing visitors to deeply engage with the history of energy both in Greece and globally. The route begins at the Kardia Power Plant, a symbol of Greece's industrial expansion, which produced over 293 million MWh of energy from 1974 to 2021 (ELSTAT, 2019). This narrative frames Kozani's critical role in fueling the country's development, offering tourists the chance to reflect on the social, environmental, and economic implications of dependence on coal. Adjacent to the power plant, the Kardia lignite mine highlights the vast scale of the resources extracted, with 543 million tons of lignite mined to fuel industry and heat households.

This mine serves as a dramatic reminder of the intensity and environmental cost of past energy practices. Interpretive stations here could illuminate the complex social history of mining, from the skilled workers who labored in the mines to the communities that depended on them, enriching the historical narrative with local voices and experiences. The route then transitions to the present with a visit to Kozani's photovoltaic park, the largest solar park in Southeastern Europe, which produces enough electricity to power 75,000 homes. The use of bifacial solar panels at the park, which capture light from both sides for higher efficiency, showcases the latest advancements in solar technology. Informational displays and guided tours could explain the principles behind solar energy, making renewable energy tangible for visitors of all ages and backgrounds (NECP, 2023). Additionally, the establishment of a Lignite Museum within the old Kardia plant could serve as a reminder of Kozani's role in Greece's energy sector. The route could also be complemented by a Sustainable Energy Innovation Hub, which would act as a progressive educational center dedicated to clean energy and environmental practices. This space would inspire future generations by demonstrating real-world applications of energy efficiency technologies, waste reduction practices, and even offering workshops or innovation labs for students and entrepreneurs.

5. Discussion

At this stage, Kozani faces significant challenges in crucial areas of sustainable tourism development, despite its potential. Its prolonged reliance on energy production as the primary driver of economic growth has hindered the evolution and innovation of other sectors. This economic dependency not only obstructed tourism development but also limited broader economic diversification. The absence of strategic investments in sectors such as tourism and

agriculture has tightly bound the local economy to lignite-based energy production, a sector now under serious threat due to the ongoing decarbonization process. Furthermore, Kozani lacks a coordinated strategic plan for diversification and branding—an essential element for competing with international benchmarks. Countries such as Costa Rica, Iceland and Iran, or even cities like Glasgow have successfully implemented strategies with minimal interventions but impactful initiatives to promote their unique advantages, offering models that Kozani could adopt.

In Iran, the integration of tourism with saffron cultivation has contributed to both economic diversification and the enhancement of local identity. Villages that combine saffron production with tourism activities demonstrate increased economic prosperity compared to those focused solely on agriculture. Studies by Shirzadi Laskookalayeh et al. (2020), Mahmoodi et al. (2020), and Javan et al. (2022) highlight significant improvements in income streams and tourism growth in communities adopting agritourism. Additionally, Iran's strategic promotion of saffron as a premium product, emphasizing its health benefits, has boosted its commercial value on international markets (Ghazanfari et al., 2024). Kozani, with its long-standing tradition in saffron production, has the opportunity to implement a similar strategy, integrating agritourism centered on saffron into its economy, attracting high-value tourists and markets. Comparative analysis reveals that in the early stages of tourism development, infrastructure expansion, while important, may not be as critical as adopting appropriate management strategies (Nguyen, 2021; Day, 2023).

This approach has proven successful in various cultural and agricultural contexts, emphasizing local heritage and environmental sustainability while aligning with available resources and capabilities. Many countries have implemented similar policies that have successfully promoted sustainable tourism growth (Jeong et al., 2023). Kozani could adopt comparable measures, integrating its saffron production into a broader framework of sustainable development that aligns with its cultural and environmental assets. Studies from diverse international contexts underscore the effectiveness of this approach, highlighting that preserving local cultural heritage can serve as a foundation for gradual tourism development without compromising authenticity or ecological balance (Ritonga et al., 2018; Lak et al., 2020; Yan et al., 2021; Molavi et al., 2023; Fan et al., 2024). For Kozani, this translates into taking advantage its unique strengths, such as its rich cultural history and distinctive natural landscapes, while supporting small-scale initiatives like festivals, environmental conservation activities, and the branding of local products. Integrating sustainability into the region’s identity as a tourist destination can provide deeper emotional connections with visitors, thereby distinguishing Kozani from competing locations (Grubor et al., 2017).

Similarly, Tortuguero National Park in Costa Rica offers a compelling parallel. As one of the country’s primary ecotourism destinations, it exemplifies a successful integration of the tourism industry with biodiversity conservation. The park not only protects critical habitats for species such as sea turtles but also contributes significantly to the local economy. This success is rooted in collaborative efforts involving government, non-governmental organizations, and local communities. These stakeholders work together to balance the preservation of natural resources with providing educational and immersive experiences for visitors. It is important to emphasize that, although sustainable tourism is increasingly recognized globally as a vital strategy, its establishment as a social norm requires a comprehensive and multi-layered approach. This entails systematic education for all stakeholders, including local communities, tourists, and policymakers (Streimikiene, 2021). Education plays a critical role not only in raising awareness of sustainability's importance but also in providing the tools and knowledge necessary for implementing sustainable practices.

Several examples demonstrate how regions can successfully pivot from industrial decline to cultural and sustainable revitalization. For instance, Glasgow has transformed from a

heavily industrialized city into a thriving cultural hub, taking advantage its history, architecture, and the arts to redefine itself. In another example, Iceland has successfully used its geothermal energy resources to create tourist attractions centered around geothermal areas and renewable energy infrastructure, reinforcing its identity as a country of sustainability. Kozani, with its rich heritage & energy history, could adopt similar initiatives.

Promoting destinations based on their natural features and environmental value is not a novel strategy. The concept of branding a product extends beyond its tangible aspects, incorporating intangible values such as sustainability, quality, and the ethical principles it represents. For Kozani, adopting a green branding strategy could significantly boost its competitiveness. This approach can align market needs with the promotion of sustainable practices, building trust and appeal among consumers and tourists alike. An excellent example of this philosophy is the inclusion of the Grevena-Kozani Geopark in UNESCO's Global Geoparks Network. This distinction underscores the region's unique geological and cultural heritage—Such initiatives demonstrate that Kozani can achieve substantial benefits through targeted, small-scale interventions and effective branding strategies rather than relying on resource-intensive, large-scale infrastructure projects with prolonged timelines.

For Kozani, well-designed, small-scale interventions can maximize their impact when implemented with the active involvement of the local population. Empowering local communities through training programs, involving them in co-creating tourism experiences, or creating a sense of ownership over the region's identity offers numerous benefits. This approach aims to develop a tourism model that is not only sustainable but also deeply connected to the local community and the region's history, transforming it into a destination of cultural and emotional significance for both visitors and residents.

Kozani's cultural traditions, such as the Momogeroi, hold significant heritage but lack broader visibility. To boost tourism, these events could be promoted more widely, drawing comparisons to successful cultural tourism networks like UNESCO World Heritage Sites. The absence of a cohesive promotional strategy hampers Kozani's ability to attract year-round visitors. Collaboration among local stakeholders—cultural associations, product producers, and tourism operators—could create a unified tourism product that highlights the region's cultural heritage, agriculture, and natural beauty. A multi-stakeholder approach, similar to partnerships seen in other regions, can foster economic growth and strengthen local identity through diversified tourism experiences, such as culinary tours (Dimitrovski et al., 2021; Nasution et al., 2023; Spadaro et al., 2023). Kozani faces significant challenges as it transitions from a lignite-based economy to a more sustainable economic model. Tourism, while valuable, cannot be the sole solution for absorbing displaced workers or ensuring the region's sustainable development. Complementary measures, such as workforce retraining and education, the promotion of new industries, and the sustainable application of existing expertise, are critical to strengthening economic resilience (Dimitrovski et al., 2021; Spadaro et al., 2023).

The region's history of lignite dependence offers a compelling narrative of resilience, similar to other areas undergoing similar transitions. This narrative can support green tourism, but only with strategic investments in education, infrastructure, and economic diversification, as tourism alone cannot replace the jobs lost from decommissioning lignite mines and power plants. Instead, it should be part of a broader strategy that focuses on upskilling the workforce, attracting new industries, and repurposing lignite-era expertise for sustainable purposes. Framing the phase-out of lignite as a story of resilience—how the community turned a challenging transition into an opportunity for sustainable growth—could serve as a powerful model for other regions.

6. Conclusions

The current research highlights Kozani's transition from a lignite-based economy, illustrating both critical challenges and promising opportunities for sustainable tourism development. The findings underscore that, while the region faces delays in promoting sustainable tourism and achieving economic diversification, it holds significant potential for transformation. Supporting the local economy through sustainable tourism initiatives can create employment opportunities, encourage population retention, and enhance overall quality of life. This study employed a comprehensive methodology, integrating literature reviews, primary local sources, and direct observations to analyze Kozani's socioeconomic transformation. Its primary goal was to capture the region's economic, cultural, and geographical characteristics during this transitional phase.

However, the research also identified certain methodological limitations. For instance, designing tourism routes from the ground up may inadvertently overlook potential risks, especially when hypothetical routes are proposed without established infrastructure or clear stakeholder buy-in. Observations from early-stage development phases, though valuable, may also reflect subjective interpretations influenced by contemporary regional dynamics, potentially limiting the accuracy of long-term sustainability predictions. Despite these limitations, the research provides a robust foundation for future tourism initiatives, presenting adaptable frameworks that can evolve in tandem with infrastructure improvements and shifting tourism dynamics. Drawing on international experiences and best practices, the study formulated a strategic proposal centered on carefully designed thematic tourism routes that capitalize Kozani's unique strengths while aligning with sustainable tourism objectives.

The "Heritage" and "Crocus" Routes highlight the region's famous saffron industry and agricultural heritage, offering visitors engaging cultural experiences that connect them to traditional practices, heritage, local cuisine, and the rural landscape. The "Geophysical Exploration Routes" emphasize Kozani's natural beauty and geological characteristics, appealing to environmentally conscious travelers with activities such as hiking and ecotourism. Meanwhile, the "Energy Transition Routes" blend industrial heritage tourism with narratives of innovation, providing educational insights into the history of lignite production in Kozani and its ongoing shift towards renewable energy sources. Collectively, these routes aim to balance cultural preservation, environmental sustainability, and economic revitalization, positioning Kozani as a forward-looking tourism destination.

Future research could prioritize developing sustainability indicators to guide Kozani's transition toward sustainable tourism. Environmental indicators like biodiversity health, carbon emissions, waste management, and land use changes can provide actionable insights into minimizing tourism's ecological footprint. Additionally, integrating renewable energy sources and sustainable infrastructure could further reduce environmental impacts. Economic and socio-cultural indicators could also be explored, including local residents' satisfaction, community involvement, and the effectiveness of heritage conservation efforts. These measures will help ensure tourism supports Kozani's identity while providing economic growth through increased revenue, job creation, and demand for local products such as saffron. Establishing a strong, data-driven framework will enable a resilient and sustainable tourism model for the region while supporting economic growth through increased revenue, job creation, and demand for local products such as saffron.

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