

Modeling the metamorphosed paradigm sustainable tourism of post-COVID-19. Case study: the Danube Delta Reserve

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ABSTRACT: Within the framework of this paper, we proposed to analyze the evolution of demand for this destination during the restrictions generated by COVID 19, but also the interest of investors in this area. The Danube Delta represented the ideal destination of 2020, in a pandemic context, and continued to represent it in 2021. In this sense, the objectives of the research are represented by the analysis of the main indicators of sustainable tourism development, for which there are statistical data at the territorial level; they are recommended to be the most important for shaping the metamorphosed tourism paradigm. The purpose of the research carried out is to propose some measures/solutions to protect the ecosystem of the Danube Delta Biosphere, so that they can be implemented by the state institutions and even by the inhabitants of the local communities, in order to ensure the sustainability of the Danube Delta tourist destination in the future. The methodology for the analysis of the modeling the metamorphosed paradigm sustainable tourism post-COVID-19 in the Danube Delta was implemented through three successive stages: (1) the analysis of the main theoretical elements regarding sustainable tourism in the Danube Delta, (2) the evaluation of the main indicators proposed for shaping the metamorphosed paradigm of tourism and (3) calculating the average length of stay.

KEYWORDS: sustainable tourism, socio-economic dimension, tourist indicators, Danube Delta, pandemic, restriction, COVID-19

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1. INTRODUCTION

Tourism is analyzed in specialized literature as an activity responsible for promoting the global growth of the economy as a result of its complementarity in interdependence with other economic activities, concretely its contribution to GDP, the creation of new jobs, but also the generation of foreign exchange (Brida et al., 2016; UNWTO, 2020). However, the true significance of tourism, more than the contribution to the growth of the economy of a country, is the ability of economic growth induced by tourism to influence the economic and sociocultural process of a society, having as a positive result the development or improvement of the quality of life of the inhabitants in any state on the Earth (Akinboade & Braimoh, 2010; Cárdenas-García et al., 2015; Cárdenas-García & Alcalá-Ordoñez, 2023).

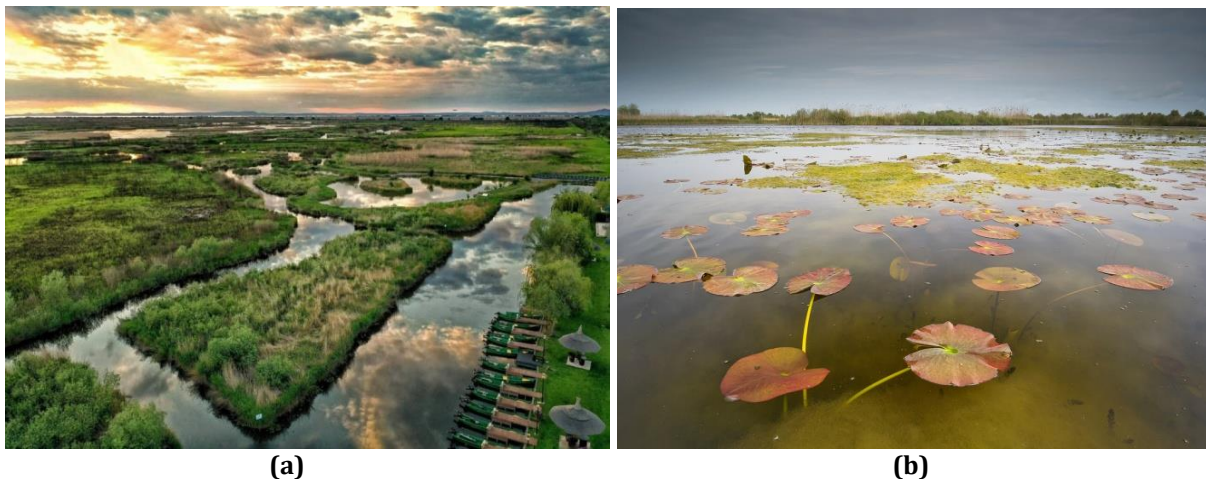
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Territorial-administrative development represents an extremely important, complex aspect that affects the entire economic, social, political and cultural life of a geographical space (Coroş et al., 2021). Among the internal factors with a fundamental role in the organization of future investments in agriculture, within a county, region or tourist area, such as the Danube Delta Biosphere Reserve, are the following: geographical location, available agricultural and human resources, agricultural capacity and structure, the image of the county, region or tourist area at the global level, the level of modernization of agriculture, the level of competitiveness of agricultural products in comparison with other counties or regions and, finally, the sustainable development of tourism, as a basic factor in including the demand for original agricultural products (Gogonea et al., 2017; Ibănescu et al., 2018).

Haven-Tang & Jones, 2012; Privitera & colab. 2018; Sidali et al., 2015 signaled the extremely strong connection between agricultural products, traditional culinary heritage and tourism, directing tourists to participate, during their stays, in local traditional food and beverage supply chains, inadvertently emphasizing their participation in the "heartland tourism experience (village)" and, at the same time, their involvement in the development of sustainable local tourism, in our case, for the Danube Delta Biosphere Reserve.

In 1991, the Danube Delta (Dobrogea Region – Romania), the largest wetland located on the European continent (approximately 6000 km²), famous for its biodiversity (Figure 1a and b), became a UNESCO Biosphere Reserve (Ivan, 2016; Galatchi, 2009; Văidianu, 2013; Găstescu & Toma, 2019); this may represent the most important wildlife area in Europe (Hall, 1993), but also the most spectacular isolated habitat on the European continent (Peptenatu et al., 2022).

The Danube Delta Biosphere Reserve Authority (DDRBA, 2012), promoted tourism as an extremely important form for the sustainable development of villages in the Danube Delta Biosphere Reserve. Sfântu Gheorghe is one of the main villages of the Danube Delta, located on the Sfântu Gheorghe channel, just before the Danube River flows into the Black Sea. According to the authors Mazilu & Nedelcu (2015), the Danube is a very important accelerator of innovation, a connection and communication platform between tourists - culture and civilizations developed through relationships or social, cultural and commercial links well generated by its surroundings.



(a)
(b)
Figure 1. Unique landscapes of biodiversity. **(a)** Wetland in the Danube Delta;
(b) Water lilies in the Danube Delta

Sources: **(a)** www.discoverdobrogea.ro; **(b)** www.dandinu.net

In a study by Stronza (2001), it was noted that there is a gap between the literature addressing tourism and future studies that should address the social, economic and environmental merits of ecotourism and other alternative forms of sustainable tourism.

The tourism sector is presented in specialized studies as having an extremely important contribution to the sustainable development of an area (such as: the Danube Delta Biosphere Reserve), depending on the ways in which tourism resources are valued. For the tourist destination, the Danube Delta, we consider it to be a very important way to increase the well-being of local communities, because it has a varied range of tourist resources - natural and human (Pintilii et al., 2022).

The general objective of this paper is to analyze the relationships that may exist between sustainable development indicators, which will allow us to determine if tourism influences socio-economic development within the Danube Delta Reserve and if there are economic, social and environmental factors related to sustainability that influence these relationships.

The Danube Delta had the status of the safest destination in a pandemic context due to the fact that it withstood the first year of the pandemic better than other destinations, precisely by promoting responsible tourism and health safety conditions, as well as due to the specifics of the Danube Delta, because the delta tourism includes all forms of ecotourism.

Sustainable tourism indicators for outlining the metamorphosed paradigm of the socio-economic dimension focus on several specific elements: the economic benefits of the tourism paradigm for the Danube Delta (the number of tourists arriving and their overnight stays); analysis of the metamorphosed paradigm of tourist accommodation capacity; determining the average length of stay; the analysis of the evolutionary metamorphosis of tourism competitiveness in the Danube Delta, the assessment of the social dimension through (population dynamics).

The purpose of the research carried out is to propose some measures/solutions to protect the ecosystem of the Danube Delta Biosphere, so that they can be implemented by the state institutions and even by the inhabitants of the local communities, in order to ensure the sustainability of the Danube Delta tourist destination in the future.

The methodology for the analysis of the socio-economic and environmental dimension of sustainable tourism in the Danube Delta was implemented through three successive stages: (1) the analysis of the main theoretical elements regarding sustainable tourism in the Danube Delta, (2) the evaluation of the main indicators proposed for shaping the metamorphosed paradigm of tourism and (3) calculating the average length of stay.

This research paper is structured into five sections. Section 1 is an introduction to the analysis of sustainable tourism, detailing the rationale behind this extremely important topic for the post-COVID-19 era. Section 2 is a literature review of research related to the emergence of the contagious virus SARS-CoV-2, and it also describes how this virus (COVID-19) has affected the tourism sector. Section 3 details the sources and techniques used in the research. In section 4, the results and discussions of the research are listed in a systematized way, and also, a correlation of the research topic with the main previous research that was carried out is made. In section 5, the article ends with a conclusion that is a brief presentation of the results, offers recommendations for future research and presents the limitations of the results obtained.

2. LITERATURE REVIEW

Pneumonia of unknown cause, detected in the city of Wuhan, China and first reported to the WHO Country Office on 31 December 2019 (Zhu et al., 2020; Huang et al., 2020). COVID-19 had a devastating impact on the tourism and hospitality industry (Aluculesei et al., 2021; Hsieh et al., 2021; Jung et al., 2021; Savadori et al., 2023; Popa et al., 2023; Desculțu Grigore et al., 2024), but also on other branches of the world economy (Vitková & Štrbáková, 2021), SARS-CoV-2 creating complex socio-political situations in the period 2020-2022 (Popescu & Vâlcea, 2021).

The epidemiological virus COVID-19 was a "super-shock" (Dolnicar & Zare, 2020), which partially blocked sectors of economic activity on the entire surface of the Earth (Drăguleasa et al., 2023). At the beginning of 2020, the controversy of the SARS-CoV-2 pandemic negatively influenced tourism and related activities by stopping flights to tourist destinations, issuing quarantine orders, imposing the wearing of protective masks, alarmingly increasing unemployment and stopping the access of foreign tourists by closing the borders (Doiciar & Crețu, 2021; Kakderi et al., 2021; Tiago et al., 2021; Nemțeanu & Dabija, 2020; Nemțeanu & Dabija, 2021; Popescu & Vâlcea, 2021; Vătămănescu et al., 2021; Nemțeanu et al., 2022; Vinerean et al., 2022; Mazilu & Drăguleasa, 2022; Pripoaie et al., 2022; Băbăș et al., 2023; Drăguleasa & Mazilu, 2022; Mazilu et al., 2023a; Mazilu et al., 2023b; Nemțeanu & Dabija, 2023; Yao et al., 2023; Cehan & Iașu, 2023).

The implementation of the early measures taken by the Romanian government had as its fundamental objective the maintenance of a relatively low rate of infection and mortality throughout the Romanian space (Crețan & Light, 2020).

In the years before the SARS-CoV-2 pandemic, the average growth rate of the global tourism industry was around 4%. At the same time, this constant growth continued in the following years (Ozkaya & Demirhan, 2022). Data from the United Nations World Tourism Organization (UNWTO) show that international tourism grew by 3.8% in 2019, bringing the total number of international travelers to almost 1.5 billion and the amount of money obtained to 1.5 trillion dollars (Marinković & Stevanović, 2021; Teczke et al., 2022). Thus, the World Travel and Tourism Council (WTTC) reported that the tourism industry contributes \$8.9 trillion to the global economy as a whole. Also, according to the World Travel and Tourism Council, 10% of jobs globally are found in the tourism industry, which employs 330 million people (Iwamoto, 2022; Hambira et al., 2022).

The concept of sustainable tourism emerged in the late 1980s and has become firmly established both in tourism policies and strategies (Hall, 2011; Budeanu et al., 2016) and in post-Pandemic COVID-19 tourism research. The concept of sustainable development was enunciated by U.I.C.N. (International Union for Conservation of Nature), thus: "Sustainable development is a process that takes place without producing, depleting resources, ensuring development. Tourist resources must be capitalized at the same rate as their renewal, and abandoning exploitation when the resource regenerates very slowly, in order to replace it with another one, with greater regenerative power" (Mazilu, 2011, p. 18).

The United Nations Environment Program (UNEP) has recognized tourism as an essential component of its sustainable development plan. The International Year of Sustainable Tourism for Development was established in 2017 at an important moment in the development by the global community of the Sustainable Development Goals (SDGs) and the adoption of the 2030 Development Agenda (Polukhina et al., 2024). The Sustainable Development Goals include tourism among other goals. (SDG-8) Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; (SDG 12) ensuring sustainable patterns of consumption and production; and (SDG 14) conservation and sustainable use of oceans, seas and marine resources for sustainable development (Programme for Sustainable Consumption and Production, 2012).

Sustainable tourism must necessarily be based on the following characteristics: there must be permanent cooperation between state institutions and the private sector of tourism, a rational planning of tourist traffic must be carried out, and last but not least, the local community and state institutions must participate to nature protection actions (Drăguleasa, 2021, p. 153).

Sustainable tourism in the period of the SARS-CoV-2 epidemiological virus required multiple essential ethical and professional changes for all participants in the tourism process, from the tourism industry as the carrier and creator of the tourist offer to tourists as users of innovative tourist services (Stojanović et al., 2024). Among the most important objectives of the sustainable development of post-COVID-19 tourism in the Danube Delta Biosphere Reserve is the provision of positive ecological, economic, sociocultural and institutional changes and benefits for all subjects in the evolution of sustainable tourism.

The local population and visitor arrivals stand out as the most important pillars in shaping the metamorphosed paradigm of post-COVID-19 sustainable tourism for the Danube Delta. In other words, post-COVID-19 sustainable tourism can be considered under the aspect of tourism development in a protected area (in our case the Danube Delta Reserve, Romania), the protection of the natural environment and, at the same time, of the elements of the natural environment is an indispensable activity in the planning process, assessment, development, management and control of sustainable tourism development (Stojanović et al., 2023).

Due to the possession of a diversified natural tourist potential, the development of sustainable tourism in the Danube Delta Reserve can be an integral part of the post-COVID-19 tourist offer, and this tourist potential can significantly influence, first of all, the number of tourist arrivals, the number of tourist overnight stays within tourist reception structures with accommodation function, and secondly, it significantly influences the development of ecotourism, cultural tourism, rural tourism, scientific research tourism, leisure, rest and recreation tourism.

On the other hand, it is extremely important to determine the impact on the local population and tourists, thus, it is necessary to examine the attitudes and behaviors of the population and visitors and measure their level of satisfaction with the issue addressed in this paper, namely, the development of sustainable tourism in a protected area (Cottrell & Cutumisu, 2006; Cottrell et al., 2013; Trišić et al., 2023; Gong et al., 2023). Last but not least, guidelines should be defined for the improvement and development of tourism (Stojanović et al., 2021), the promotion of tourist attractions within the Danube Delta, the exploitation of the natural tourism potential, all of which should follow sustainable tourism and the protection of the environment (the nature).

Applying the qualitative methodology, scientific knowledge has been obtained that there are certain particularities of post-COVID-19 tourism development in protected areas, which must be taken into account for a planning, development and evaluation of sustainable tourism within the Danube Delta Reserve: post-pandemic effects The long-term effects of SARS-CoV-2 on sustainable tourism are difficult to quantify; forms of tourism consist of several activities, which makes it difficult to accurately identify the number of tourists for each form; post-COVID-19 measures to revitalize the destination are still unclear; direct or indirect changes to the tourist destination must not always be harmful to terrestrial or aquatic ecosystems; travel agencies must include in tourist packages anti-Covid-19 activities that can be carried out in protected areas without degrading their development environment. The most important characteristics of the development of sustainable tourism that are determined through a thorough analysis of the scientific literature are the following: protecting natural ecosystems (terrestrial or aquatic) from the Danube Delta Reserve, minimizing waste on the impact of the natural environment, reducing air, water and soil pollution in the reserves inside the Danube Delta, preventing and informing the local community about climate change, promoting in the online environment and on-site an ecological, rational and responsible consumption behavior towards the natural environment as well as employment opportunities in deltaic tourism, by hiring qualified or specialized personnel. These factors are perceived locally and nationally in a variety of other societal, economic, and environmental contexts, including local employment and unemployment rates, business environment, availability of services and infrastructure in popular tourist reserves, accessibility, and adequate transportation infrastructure, as well as environmentally sustainable (Hall, 2019; Almuhrzi & Al-Azri, 2019; Streimikiene et al., 2021). In the current context (post-COVID-19), in tourism, it is important to create the technical-building infrastructure that guarantees tourists the practice of ecological tourism or sustainable tourism for the conservation of natural resources, the sorting of waste and the exhaustive approach to other ethical concerns (Andereck & Nyaupane, 2011; Murava & Korobeinykova, 2016; Luekveerawattana, 2018).

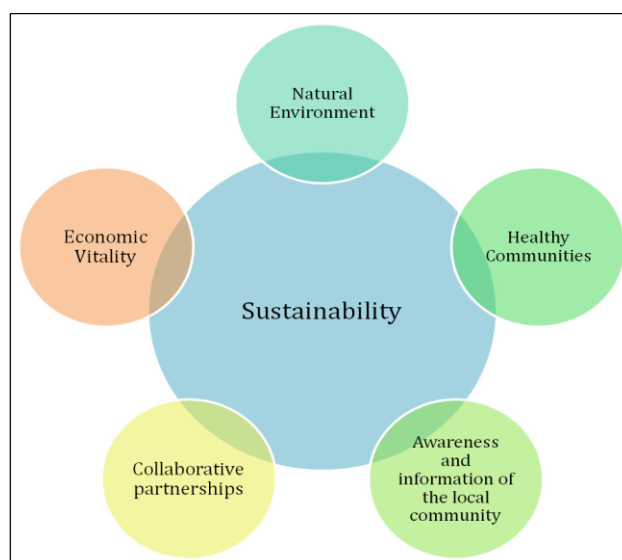


Figure 2. Basic aspects for the development of sustainable tourism in the Danube Delta.
Source: processing and adaptation by the authors after Streimikiene et al., 2021.

Based on a review of the specialized literature on sustainable tourism development post-COVID-19, the most pressing issue for the active factors involved in the tourism process is how to simultaneously

improve economic, social and environmental sustainability, or how to build a successful tourism sector through adopting a comprehensive approach to the social and environmental challenges accompanying the development of post-COVID-19 tourism (Streimikiene et al., 2021; Font et al., 2023; Rodríguez-López et al., 2019). Figure 2 shows the interconnectedness of key factors in the development of sustainable tourism post-COVID-19. This figure not only highlights the main, basic conclusions, but also suggests dimensions (Streimikiene et al., 2021) that need to be considered in future studies of opportunities and barriers for sustainable tourism in the Danube Delta Reserve.

The Danube Delta Biosphere Reserve is home to over 5,500 species of flora and fauna, being considered third in the world in terms of floristic and faunal biodiversity (Pop & Coroş, 2018). In a study by Gómez-Baggethun et al. (2019), they state that "The Danube Delta Biosphere Reserve (DBDD) is a habitat for many endangered and endemic species and a major stopover point for birds migrating between Europe, the Middle East and Africa".

The main attractions for visitors are represented by the natural landscape, spectacular fauna and flora, various protected areas, but also historical-cultural traditions preserved for decades in the deltaic space (the hearth of the rural village). Given that most of the localities in the delta area have the status of rural communities, we can say that rural tourism is practiced, with tourist activities taking place within these areas (that is, in the hearth of the village - the peasants' households). Rural Tourism (RT) "is perfect for travelers looking for authenticity, unique visits and who like to experience local lifestyles" (Niță & Drăguleasa, 2022). The Dobrogean area of Romania stood out to tourists with its remarkable tourist destination - the Danube Delta Biosphere Reserve, an extremely important tourist region for Romania, a place for which the authorities must maintain a balance between socio-economic development, including tourism, surrounding environment and rural communities (Soare, 2021).

3. RESEARCH METHODS

3.1. Study Area

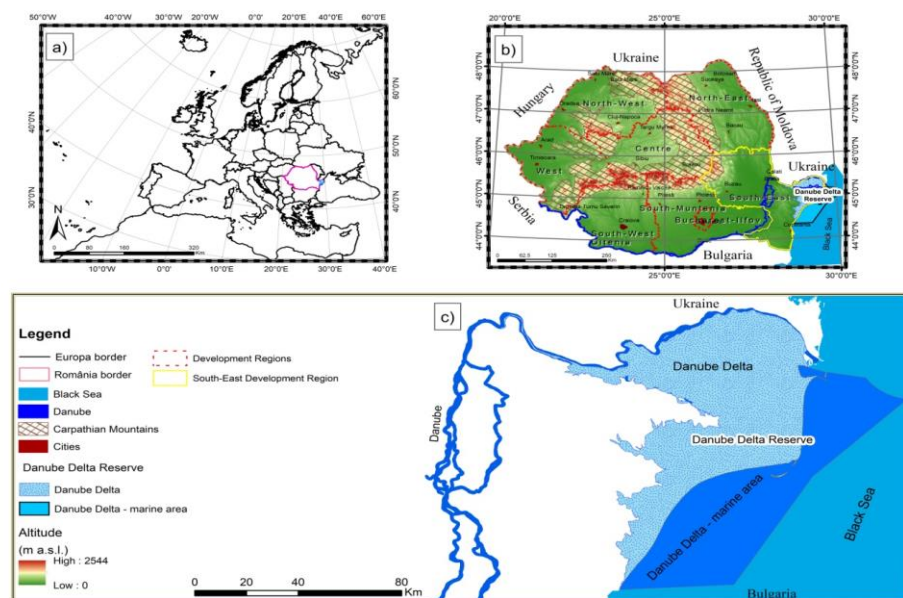


Figure 3. Geographical location of the Danube Delta. (a) the geographical position of the Danube Delta within the continent of Europe; (b) the geographical position of the Danube Delta within Romania; (c) the Danube Delta and the Danube Delta Reserve.

Source: Desculțu Grigore Mihaela Iuliana

The Danube Delta Biosphere Reserve (Figure 3) is made up of three administrative areas (counties): Tulcea (87.73%), Constanța (12.23%) and Galați (0.14%), where 11,576 inhabitants live (2020) (DDBRA, 2020). The Danube Delta Biosphere Reserve represents a special geographical space that needs multiple measures (Diaconu et al., 2022) to develop from a touristic and economic point of view and, at the same

time, to be protected from certain measures which are destructive to the environment for the development of plants and animals - pollution and excessive fishing (Văidianu et al., 2013).

The Danube Delta is a vast area, with an average altitude of only 0.31 m. The highest altitudes can be found on the Chilia ridge (6.5 m), the Letea ridge (13 m), as well as in the Caraorman dune area. The hydrographic network of the Delta is of particular interest from a geographical, economic, as well as tourist point of view. Also, the main nature reserves and monuments in the Danube Delta are: Dealul Bujorului Natural Reserve, Valea Oilor lilac reserve, Letea Forest, Grindul Hill and Răduc Lake, Roșca – Buhaiova, Caraorman Forest, Rotunda Lake, Valea Fagilor Forest, Măcinului Mountains National Park, Niculițel Forest, Nebunul Lake, Popina Island, Sacalin Zătoane Complex, Potcoava Lake, Belciug Lake, Agighiol Geological Reserve, Chituc Hill, Histria Fortress, Lupilor Hill etc.

3.2. Data sources

This research paper uses a mixed methods approach. We use an archival methodology and descriptive statistics (Rotaru et al., 2023; Crețan et al., 2021; Crețan et al., 2023), to present modeling the metamorphosed paradigm sustainable tourism of post-COVID-19 in the Danube Delta. Moreover, a tourism indicator (length of stay) was used to determine if there are specific trends at the level of the Danube Delta.

The archival research method was used to obtain several sets of statistical data from the National Institute of Statistics of Romania. Thus, based on the statistical data, we drew graphs using the descriptive statistical method. These graphs are utilized to present the number of tourist arrivals, the number of overnight stays in tourist accommodation structures, the capacity of tourist accommodation existing and in operation, but also the structure of the population by residence on January 1, 2023. The descriptive statistics, which deal exclusively with features of the data observed by researchers, can be used to summarize population data in data analysis or investigation (Dodge, 2006). A descriptive statistic is a summary statistic that quantitatively describes or summarizes the characteristics of a collection of information (Mann, 1995). Finally, we calculated the tourist stay duration index at the level of the Danube Delta.

The process of analyzing and measuring the sustainability of the tourism sector represents a continuously metamorphosed paradigm and requires constant monitoring (Mitrică et al., 2021) of sustainable tourism indicators and events resulting from the practice of tourism.

The duration of the stay is expressed by the number of days the tourist stays in the destination; represents the ratio between the amount of overnight stays and the number of tourists (Cocean et al., 2005, p. 232) (1):

$$Dms = \frac{\hat{I}}{T} , \quad (1)$$

where: Dms = average duration of the stay; \hat{I} = the amount of overnights; T = the number of tourists.

The average duration of the tourist stay represents one of the most important variables of a tourist's decision-making; this is closely related to the tourist's experience, such as the type of accommodation structure used, the destination chosen, etc. (Salmasi et al., 2012; Alén et al., 2014).

Based on the analysis of specialized literature, we consider the following research hypothesis:

H1: "The sector of economic activity - tourism is directly connected and associated with the development and economic growth of a post-COVID-19 tourist destination, in the present case, that being the Danube Delta Reserve".

A vast literature corpus also supports this research hypothesis. Tourist arrivals also contribute positively to economic growth (Balsalobre-Lorente & Leitão, 2020). Empirical studies by Tang & Tan, 2018; Muhtaseb & Daoud, 2017; Tang & Ozturk, 2017; Roudi et al. (2019) and Mitra, 2019 found a positive effect of tourist arrivals on the economic growth within a tourist destination.

4. RESULTS AND DISCUSSION

4.1. Sustainable tourism indicators for defining the metamorphosed paradigm of the socio-economic dimension

In the specialized literature, more than 150 individual indicators of sustainable development related to the economic, social and environmental factors proposed by Choi & Sirakaya (2006) were studied, as well as 232 indicators covering the economic, social and environmental aspects proposed by the 2030 Agenda for Sustainable Development (United Nations – the 2030 Agenda). Based on frequency statistics, we have identified the most frequently used indicators in recent years in the research on sustainable tourism development (Table 1, Table 2, and Table 3). Thus, we can exclude some individual indicators because the data of these indicators are difficult to collect, or the collected data exhibit major changes in a certain period (Yuedi et al., 2023).

Table 1. Economic aspects of sustainable tourism.

Ref. no.	Aspects of tourism sustainability	Basic issues
1.	Tourist satisfaction	Overall visitor satisfaction
		Demand fidelity
		Overnights in tourist accommodations
		Duration of the tourist stay
2.	Promotion of the product	Marketing activities for sustainable tourism
		Offers and variety of experiences
3.	Control of infrastructure and superstructures	Transport
		Accommodation
		Restaurant
4.	Exploiting the economic benefits of tourism	Employment at destination
		Investments in the sector
		Real estate investments

Source: processing after Yuedi et al., 2023.

Table 2. Social aspects of sustainable tourism.

Ref. no.	Aspects of tourism sustainability	Basic issues
1.	Conservation of tourist resources	Cultural diversity
		Cultural heritage
2.	Quality of local services	Sports Center
		Institute of Education
		Health services
3.	Well-being of the inhabitants	Resident satisfaction
		Population aging
		Life expectancy
4.	Safety at the destination	Criminal activities
		Road accidents

Source: processing after Yuedi et al., 2023.

Table 3. Environmental aspects of sustainable tourism.

Ref. no.	Aspects of tourism sustainability	Basic issues
1.	Natural resource protection	Biological diversity and natural areas
		Seawater quality
2.	Limiting the impact of tourism on the environment	Waste generation and management
		Atmospheric pollution
		The volume of treated wastewater
		Electricity consumption
3.	Environmental awareness and education	The involvement of educational training related to tourism sustainability

Regarding the tourist reception structures that are located on the territory of the Delta (Figure 4), it can be observed that most of them are located in the center of the Danube Delta.

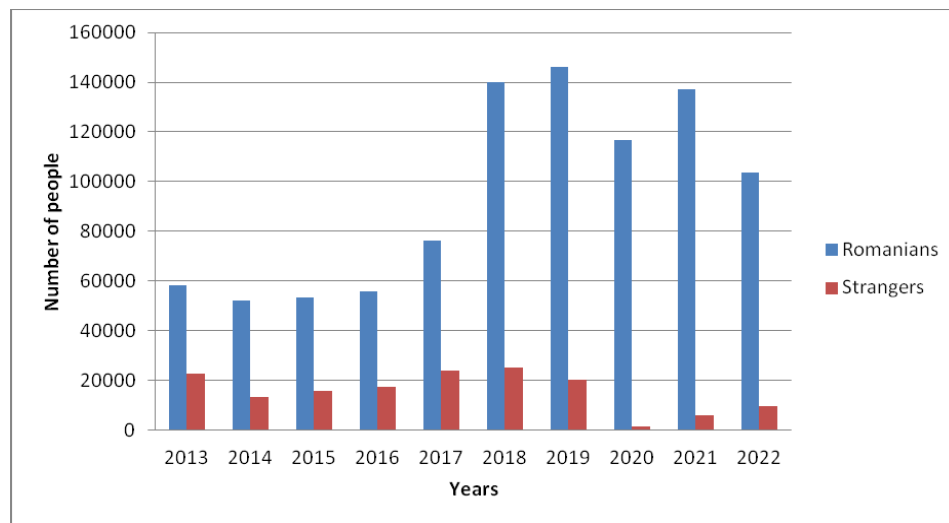


Figure 5. The number of tourist arrivals in the Danube Delta area, including the city of Tulcea.
Source: processing by the authors of INS data, 2023.

For the analyzed period 2013-2022, it is found that in the Danube Delta destination, including the city of Tulcea, arrivals of Romanian tourists predominated (Figure 5).

Regarding the number of overnight stays in tourist accommodation structures in the Danube Delta, including the city of Tulcea, an increase of Romanians was recorded from 2014 to 2019 (Figure 6), followed by a decrease in the period 2020-2022, due to the start of the SARS-CoV-2 epidemic.

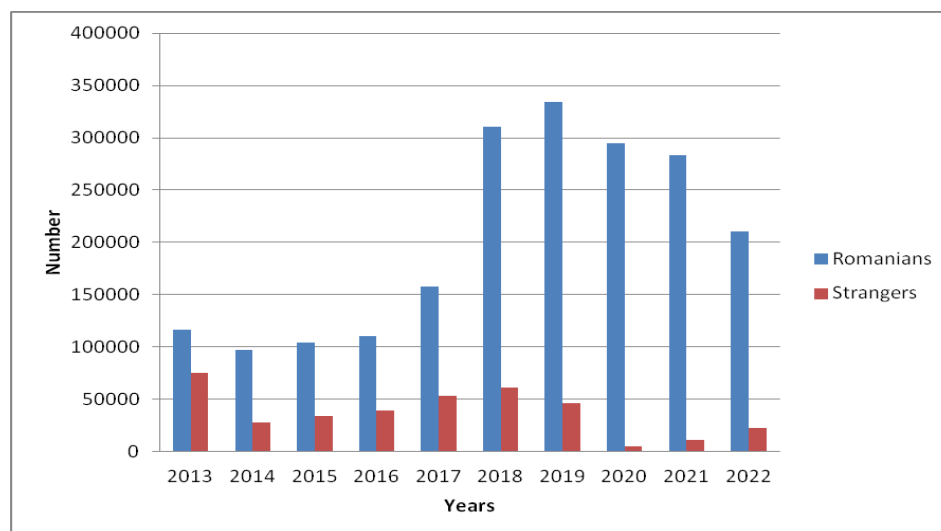


Figure 6. The number of overnight stays in tourist accommodation structures in the Danube Delta area, including the city of Tulcea.
Source: processing by the authors of INS data, 2023.

The existing tourist accommodation capacity (Figure 7), in 2022 the largest increase in accommodation places was observed in the Danube Delta, including the city of Tulcea. This means that the beginning of Covid was not a negative factor in terms of the modernization and increase of accommodation places within the Danube Delta Biosphere Reserve.

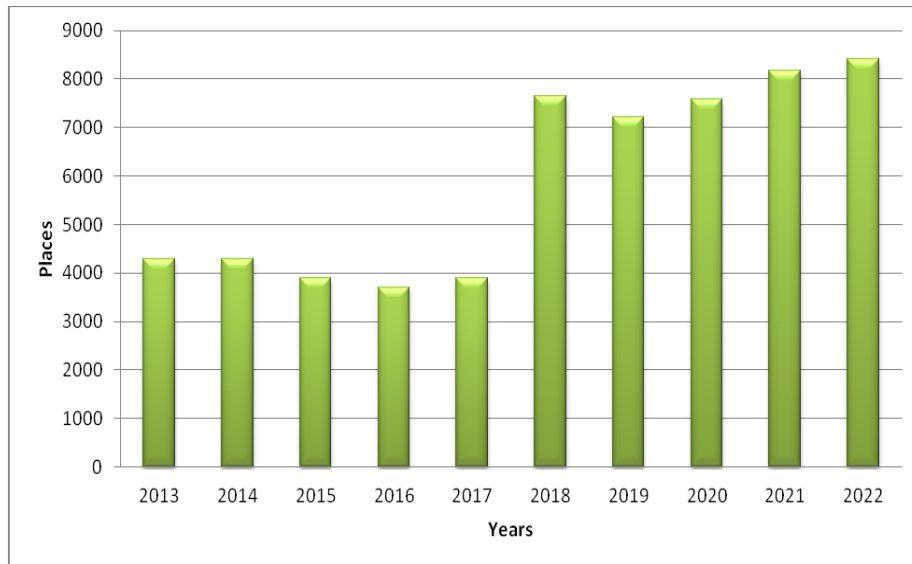


Figure 7. The existing tourist accommodation capacity in the destination called the Danube Delta area, including the city of Tulcea.
Source: authors processing of INS data, 2023.

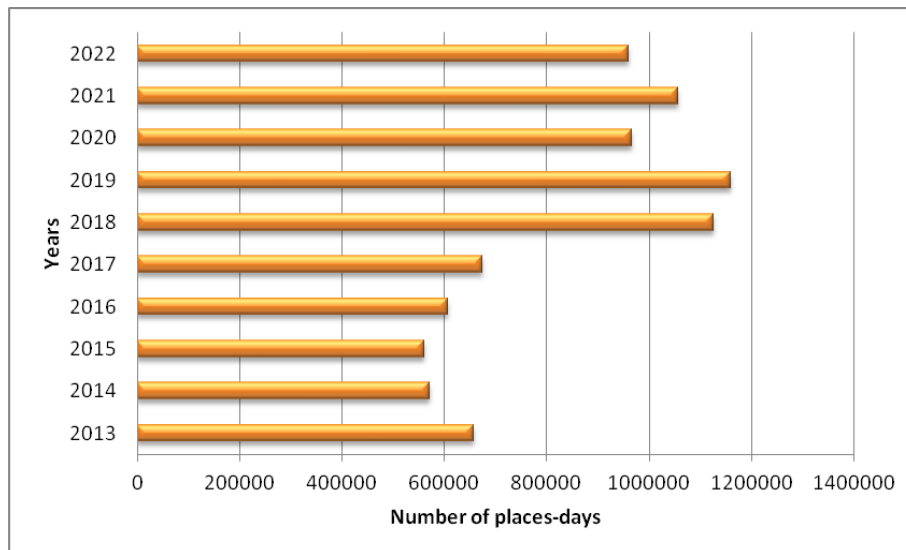


Figure 8. Tourist accommodation capacity in operation in the destination Danube Delta area, including the city of Tulcea.
Source: authors processing of INS data, 2023.

By comparing the tourist accommodation capacity in operation (Figure 8), to the entire existing one, it can be observed that the maximum recorded for the period 2013-2022 was recorded in 2019. At the same time, the beginning of the SARS-CoV-2 virus in 2020 represented a minus in terms of the increase in the number of places-days of tourist accommodation capacity, for the year 2021 and 2022.

For the year 2022, the average length of a stay was 2.05, the number of days the tourist spent in the Danube Delta, including the city of Tulcea.

The low number of tourists who remained within the Delta can be correlated with the Covid period, as from 2022 tourism gradually began to evolve, as compared to 2020, when almost all activities were closed.

4.2. Socio-economic aspects

The SARS-CoV-2 pandemic has proven to be one of the biggest challenges and, at the same time, catastrophe in the history of the traveling and tourism sector in the global economy (Sumanapala & Wolf, 2022). Therefore, the profound impact of the epidemiological virus COVID-19 on the tourism and hospitality sector of the world economy indicates the need to properly address the social, economic and

environmental aspects of the sustainability of a tourist destination (García-Madurga et al., 2021; Seabra & Bhatt, 2022).

According to the opinions of some specialists in the field, it is anticipated that global tourism will regain its position in the post-COVID-19 era, while environmental problems, i.e. climate change, will continue to constrain the development of sustainable tourism (Marome & Shaw, 2021; Bethel et al., 2021). In addition to this problem, the anticipated increase in tourism as a result of the COVID-19 pandemic may lead to higher levels of air and water pollution (Marome & Shaw, 2021) in areas where tourism is practiced, i.e. tourist destinations such as in our case the Danube Delta Reserve. Therefore, the accelerated recovery of tourism in the post-COVID-19 era, if not properly checked, may deliberately lead the tourism industry away from ethical, responsible and sustainable tourism development (Higgins-Desbiolles, 2020).

Tourism industry stakeholders can encompass environmental and social protection by forming alliance strategies, to recover and survive in the post-COVID-19 era in a more resilient and sustainable way (Nguyen et al., 2021). Moreover, a mix of scientific discovery, digital infrastructure and urban planning can enable cities in the Danube Delta to effectively deal with all economic, health and local and regional climate crises. The environmental dimension of the sustainability of a geographical space plays a decisive role in the living conditions of the population and is therefore the key aspect in the connection and collaboration between tourism and socio-economic development (Pulido-Fernández et al., 2013).

The population of the Danube Delta increased from 12,000 inhabitants in 1900 to almost 20,000 in 1966, before decreasing to 12,638 inhabitants by 2011 (INS, 2017). The demographic decline in the area and the aging of the local community is due to the migration of young people to the developed cities, but also to high mortality. Young people migrate because living conditions are difficult, they are isolated, suffer from a lack of employment opportunities and the general infrastructure conditions are bad. Thus, a poorly developed infrastructure for education and medical care results (Boja & Popescu, 2000).

The population density is approximately 5 people/km². Therefore, a third of the population lives in the city of Sulina, and the rest is distributed in 24 rural settlements and more than 14 nationalities coexist peacefully in the Danube Delta (Gâstescu & Ştiucă, 2008).

There are 28 localities in the Danube Delta. The population of these localities experienced fluctuations throughout the period in terms of the evolution of the area's economic importance. Between 1912 and 2011, the number of inhabitants of the Danube Delta decreased by more than 5,000 inhabitants. This phenomenon is given by the decrease of the annual average of 2.5‰ (Damian & Dumitrescu, 2009). The numerical evolution of the population decreased between 1912 and 2011, even during the periods when the population experienced an increase in development (Figure 9).

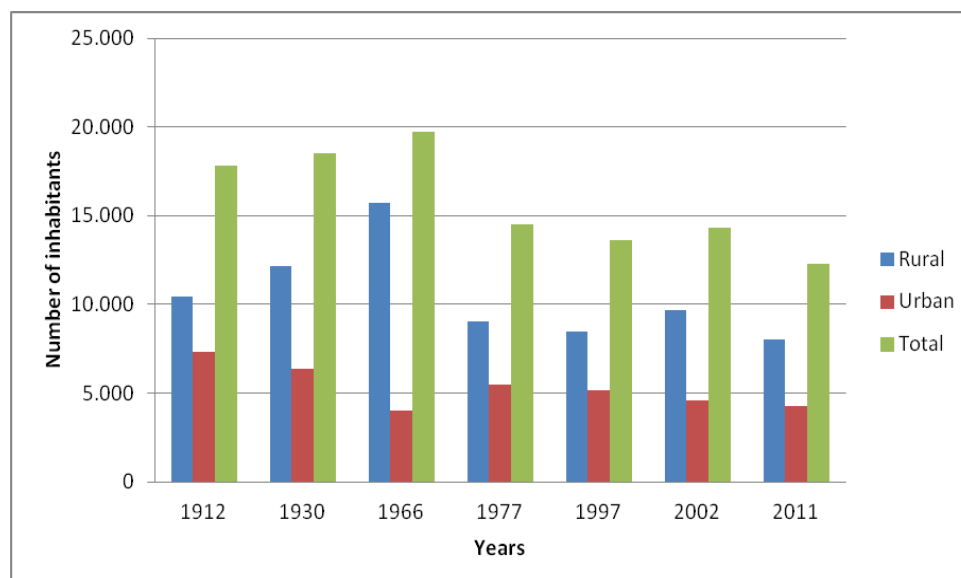


Figure 9. Evolution of the population in the Danube Delta.

Source: data processing based on the Management Plan of the Danube Delta Biosphere Reserve, PMRBDD, (2014).

The Danube Delta exhibits a multitude of plant and animal species that contribute to the formation of a specific biodiversity (Figure 10a, b).



(a)



(b)

Figures 10. Variety of the biodiversity in the Danube Delta. (a) wild horses in the Dranov Lake area; (b) colony of pelicans in the Danube Delta.

Source: (a) Desculțu Grigore Mihaela Iuliana; (b) Szabó József Iosif.

The environmental problems facing the Danube Delta are multiple, such as: reducing the number of fish of valuable species, accelerating the eutrophication of lakes, multiplying algae, destroying or blocking of important areas for the reproduction of species, etc., all these problems modify the entire deltaic

ecosystem. Added to these are the unsustainable exploitation of resources: excessive fishing and grazing, water pollution and unauthorized tourist accommodation and food-related constructions.

5. CONCLUSIONS

The development of sustainable tourism must take into account aspects related to the economic development of local communities, socio-cultural aspects, but also aspects related to the protection of the Delta's natural environment. The successful development of this type of tourism leads to: the protection of the natural, socio-cultural and historical resources of the local communities in the rural area - the hearth of the deltaic and Dobrogean village, the appropriate use of resources for the preservation of the natural environment and the development of businesses that allow the creation of new jobs. Tourist demand for stays in the Danube Delta Biosphere Reserve is most succinctly captured by the dynamics of the number of tourist arrivals for the period 2013-2022.

The competitiveness of the Danube Delta is quite low compared to other tourist areas in Romania, as it is located at a great distance from the spa resorts and seaside resorts. Thus, for the period 2013-2022, the number of tourist reception structures with tourist accommodation functions was increasing from 2019 to 2021, followed by a sharp decrease in 2022, due to Covid-19.

For environmental issues, we bring to the attention of the authorities the following aspects that have a negative impact on the terrestrial and aquatic ecosystems within the Danube Delta Biosphere Reserve: pollution, poor waste management, unauthorized construction, a decrease in the number of fish species, but also increasing amounts of algae.

This research is a starting point for further studies and perspectives. The Danube Delta Reserve must embark on strategic development policies to ensure the sustainable efficiency of the local economy and, at the same time, respect the local environment, culture and traditions. In this context, new (digital) information technologies, as well as European strategies, could support the management of the Danube Delta tourist destination in order to take measures in specific issues, for example: appropriate planning of urban and rural space, of the environment, spatial mobility of the population, smart cities, proper management of biodegradable waste and water as well as energy consumption and most importantly – promotion of the destination, local culture and management of tourist traffic. Moreover, the advances being made in the field of Information Technology effectively and appropriately help to improve the management and promotion of tourist destinations globally, and at the same time, it increases the awareness of tourists towards sustainable tourism that respects the existing local population and resources (Ruggieri & Caló, 2018).

To conclude, like any study, this study is not completely without its limitations. Firstly, the list of indicators could be expanded to include several new ones. Secondly, the research included the most common and general terms of the subject, which may exclude studies that used more specific terms for a nature reserve. The third limitation is that only papers in English were included, but other studies, such as those written in French or German, were not considered.

Speaking about the perspectives of further research on this current and relevant topic, I can think of the possibility of conducting a comparative study with the aim of evaluating tourism agencies and sustainable development within two nature reserves in Romania. The second direction of the research will focus on an interview related to the main motivational directions of the respondents as related to the idea of the benefits of sustainable tourism in the Danube Delta Biosphere Reserve, highlighting their personality, experience, and personal development in connection with the tourist destination. The third future direction of research could involve the application of several GIS techniques in studies of sustainable tourism at the level of a nature reserve.

USE OF AI TOOLS DECLARATION

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this work. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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