

TOURISM AT THE END OF THE SEA: DARK TOURISM AND THE SOVIET ENVIRONMENTAL LEGACY IN CENTRAL ASIA

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Annotatsiya: Mazkur maqolada Markaziy Osiyoda Orol dengizi ekologik inqirozi misolida qorong‘u turizm (Dark Tourism) rivojlanishining nazariy va amaliy jihatlari tadqiq etiladi. Unda sobiq Sovet Ittifoqi davrida amalga oshirilgan ekologik siyosatning uzoq muddatli oqibatlari, Orol dengizining qurishi natijasida yuzaga kelgan ekologik, ijtimoiy-iqtisodiy va demografik muammolar tahlil qilinadi. Shuningdek, Mo‘ynoq shahri, Orol dengizining qurigan hududi va kemalar qabristonining xalqaro turizm salohiyati, ekologik xotira va tarixiy merosni saqlashdagi ahamiyati yoritiladi. Tadqiqotda qorong‘u turizmni barqaror turizm tamoyillari asosida rivojlantirish imkoniyatlari hamda uning hududiy iqtisodiyotni diversifikatsiya qilishdagi o‘rni asoslab beriladi.
Kalit so‘zlar: qorong‘u turizm, Orol dengizi, ekologik inqiroz, Sovet ekologik merosi, Markaziy Osiyo, Mo‘ynoq, barqaror turizm, ekologik xotira.
Abstract: This article explores the theoretical and practical aspects of dark tourism development in Central Asia, focusing on the environmental crisis of the Aral Sea. It examines the long-term consequences of environmental policies implemented during the Soviet era, as well as the ecological, socio-economic, and demographic challenges resulting from the shrinking of the Aral Sea. Particular attention is paid to the international tourism potential of Muynak, the dried seabed, and the Ship Cemetery, highlighting their significance in preserving environmental memory and historical heritage. The study also examines opportunities for developing dark tourism based on sustainable tourism principles and evaluates its potential contribution to regional economic diversification.
Keywords: dark tourism, Aral Sea, environmental crisis, Soviet environmental legacy, Central Asia, Muynak, sustainable tourism, environmental memory.
Абстрактный: В данной статье исследуются теоретические и практические аспекты развития тёмного туризма (Dark Tourism) в Центральной Азии на примере экологического кризиса Аральского моря. Анализируются долгосрочные последствия экологической политики, проводившейся в период существования Советского Союза, а также экологические, социально-экономические и демографические проблемы, возникшие в результате высыхания Аральского моря. Особое внимание уделяется международному туристическому потенциалу города Муйнак, высохшего дна Аральского моря и кладбища кораблей, а также их значению для сохранения экологической памяти и исторического наследия. Обосновываются возможности развития тёмного туризма на основе принципов устойчивого туризма и его роль в диверсификации региональной экономики.
Ключевые слова: тёмный туризм, Аральское море, экологический кризис, советское экологическое наследие, Центральная Азия, Муйнак, устойчивый туризм, экологическая память.

Introduction (Kirish/Введение).

Tourism has evolved beyond traditional forms of recreation and cultural exploration, increasingly encompassing destinations associated with historical tragedies, environmental disasters, human suffering, and collective memory. One of the emerging areas within this field is dark tourism, which refers to travel to places connected with death, destruction, tragedy, and other painful historical events. In recent decades, dark tourism has attracted growing academic attention due to its potential to promote historical awareness, preserve collective memory, and encourage critical reflection on the social and environmental consequences of human activities.

In Central Asia, the Aral Sea represents one of the most significant examples of an environmental disaster with profound historical, ecological, and socio-economic consequences. Once recognized as one of the world's largest inland water bodies, the Aral Sea experienced a dramatic decline beginning in the 1960s, primarily due to large-scale water diversion projects implemented during the Soviet period to expand irrigated agriculture, particularly cotton production. This transformation resulted in extensive desertification, biodiversity loss, soil salinization, deterioration of public health conditions, and the disruption of traditional fishing communities. The consequences have extended beyond environmental degradation, fundamentally changing the economic structure and cultural identity of the surrounding regions.

The town of Muynak, once a major fishing port on the southern shore of the Aral Sea, has become a powerful symbol of this environmental catastrophe. Today, the abandoned ships resting on the former seabed constitute a distinctive tourist attraction known as the Ship Cemetery. This location provides visitors with an opportunity to observe the physical consequences of environmental destruction and understand the historical decisions that contributed to the disappearance of a once-thriving maritime ecosystem. Consequently, the Aral Sea region has significant potential for the development of dark tourism, combining historical interpretation, environmental education, cultural heritage, and regional tourism development.

The concept of dark tourism in the Aral Sea region, however, extends beyond the commercial exploitation of sites associated with environmental tragedy. It raises important questions concerning historical responsibility, environmental justice, collective memory, and the relationship between tourism and sustainable development. In particular, presenting the Soviet environmental legacy through tourism requires a balanced approach that acknowledges the historical context, respects the experiences of affected communities, and highlights the importance of preventing similar environmental disasters in the future.

Furthermore, the development of dark tourism may create new economic opportunities for communities affected by the Aral Sea crisis. Tourism-related activities, including guided excursions, museums, local accommodation, cultural events, and community-based tourism

initiatives, could contribute to employment generation, small business development, and the diversification of local economies. Nevertheless, achieving these benefits requires appropriate tourism infrastructure, effective destination management, environmental protection measures, and the active participation of local communities.

Literature review (Mavzuga oid adabiyotlar tahlili/Обзор литературы).

The relationship between dark tourism, environmental disasters, historical memory, and sustainable regional development has become an increasingly important subject in contemporary tourism research. In particular, the Aral Sea disaster provides a distinctive case for examining how environmental destruction, historical responsibility, and the legacy of Soviet economic policies can be transformed into tourism experiences with educational, cultural, and socio-economic significance.

Allaberganov (2025) [1] examined the development of dark tourism in Muynak, focusing on local perceptions, community participation, and the challenges associated with tourism development following the Aral Sea disaster. The study demonstrates that Muynak has gradually transformed from a traditional fishing destination into a place associated with environmental tragedy and historical memory. The findings highlight the importance of local community support and the potential economic and environmental benefits of developing dark tourism. This research provides an important empirical foundation for understanding the relationship between environmental heritage and tourism development in the Aral Sea region.

In their study, Ahn, Kamalov, and Juraeva (2024) [2] revisited the Aral Sea crisis from a geographical perspective. The authors investigated the historical and environmental causes of the disaster, emphasizing the consequences of large-scale water diversion for agricultural production during the Soviet period. Their research highlights the importance of sustainable water management, regional cooperation, and community participation in addressing the long-term consequences of ecological degradation. These findings are particularly relevant to dark tourism because they establish the historical and geographical context necessary for interpreting the Aral Sea as a destination associated with environmental tragedy.

Wang and Zhang (2023) [3] proposed a hydro-eco-social perspective for understanding the restoration of the Aral Sea. Their research integrates hydrological, ecological, and social dimensions and emphasizes the importance of comprehensive environmental recovery strategies. The authors demonstrate that the Aral Sea crisis cannot be understood exclusively as a hydrological problem because it also affects biodiversity, human livelihoods, and regional socio-economic stability. This approach is relevant to the present research because it provides a broader framework for connecting environmental heritage tourism with ecological restoration and sustainable development.

Chida (2020) [4] investigated the political dimensions of the Aral Sea problem during the Soviet perestroika period and its subsequent legacy in the independent Central Asian states. The study examines how environmental, economic, and social concerns surrounding the Aral Sea became subjects of political discussion and public debate. Particular attention is given to the historical transformation of environmental awareness and the political implications of ecological degradation. This research is significant for understanding the Soviet environmental legacy as an essential component of the historical narrative presented through dark tourism.

Bespalova (2023) [5] explored the representation of the Aral Sea disaster through the documentary film Aral, Fishing in the Invisible Sea. The author examined environmental destruction, the historical consequences of Soviet irrigation projects, and the changing relationship between local communities and their natural environment. The study emphasizes the importance of cultural representations, visual narratives, and collective memory in understanding environmental disasters. From a tourism perspective, these elements can contribute to the development of interpretive experiences that communicate the historical and human dimensions of the Aral Sea tragedy.

The conceptual foundations of dark tourism have also been developed in recent academic research. The study Conceptualising Dark Events: A New Framework (2024) [6], published in Annals of Tourism Research, integrates perspectives from thanatology, dark tourism, dark leisure, and collective memory. Its theoretical contribution is particularly important for analyzing destinations associated with environmental disasters because it demonstrates that tourism experiences connected with tragedy involve not only physical locations but also emotional responses, historical interpretation, and collective remembrance. This framework can be applied to the Aral Sea region, where abandoned settlements, shipwrecks, and degraded landscapes represent material evidence of environmental destruction.

Varnajot and Salim (2025) [7] examined the relationship between climate change, disappearing glaciers, and dark tourism through the concept of hauntology. Their research illustrates how disappearing natural environments can become spaces of historical reflection and environmental awareness. Although their research focuses on glacier retreat rather than the Aral Sea, its theoretical approach offers useful insights into how environmental loss can become a central element of tourism interpretation. The comparison is relevant because both disappearing glaciers and the Aral Sea represent landscapes transformed by environmental pressures and human activities.

Another important contribution is the research on sustainable tourism development in degraded arid landscapes. Akramova (2026) [8] examined the tourism potential of the Aral Sea region, particularly the Aralkum Desert and Karakalpakstan. The study addresses the opportunities and limitations of developing tourism in environmentally fragile territories. It emphasizes the need to balance tourism-related economic benefits with ecological protection, environmental restoration, and responsible destination management. This perspective is essential for ensuring that the development of dark tourism does not create additional environmental pressures in an already vulnerable ecosystem.

Oğuz, Özkan, and Özer (2026) [9] investigated the socio-economic and environmental dimensions of the Aral Sea disaster from a sustainable development perspective. Their research focuses on water scarcity, food security, public health, economic contraction, and the broader implications of environmental degradation for local communities. The authors emphasize the importance of regional cooperation and integrated sustainable development strategies. Their findings provide a basis for assessing how tourism can contribute to economic diversification and improved livelihoods in areas affected by the Aral Sea crisis.

Methods (Tadqiqotni amalga oshirishda foydalanilgan usullar/ Методы).

This study employs a qualitative and analytical research approach to examine the potential of dark tourism in the Aral Sea region and its relationship with the Soviet environmental legacy in Central Asia. The research focuses primarily on the environmental, historical, socio-economic, and tourism-related consequences of the Aral Sea disaster, with particular attention to Muynak and the surrounding areas of Karakalpakstan.

The methodological framework is based on the following research methods:

1. Historical analysis: This method is used to investigate the historical development of the Aral Sea crisis, particularly the impact of Soviet-era irrigation policies, large-scale water diversion, and agricultural expansion on the regional environment.

2. Literature review: Academic publications, international research papers, scientific reports, and institutional documents are examined to identify theoretical approaches to dark tourism, environmental heritage, and sustainable tourism development.

3. Comparative analysis: The Aral Sea region is considered in comparison with other international destinations associated with environmental degradation and industrial disasters. This approach helps identify common characteristics and potential models for responsible dark tourism development.

4. Descriptive and statistical analysis: Available environmental, demographic, economic, and tourism indicators are analyzed to identify changes in the region's socio-economic structure and assess the potential contribution of tourism to local development.

5. Case study method: Muynak, the Ship Cemetery, and the dried seabed of the Aral Sea are selected as principal case studies. Their historical significance, tourism attractiveness, accessibility, and potential for environmental education are examined.

6. SWOT analysis: The strengths, weaknesses, opportunities, and threats associated with dark tourism development in the Aral Sea region are identified to evaluate its development prospects.

The research also applies an interdisciplinary approach, combining tourism studies, environmental economics, regional development, historical analysis, and cultural heritage studies. Particular emphasis is placed on the relationship between environmental memory, local community participation, and sustainable tourism management.

The empirical foundation of the research consists of secondary data obtained from scientific publications, international organizations, environmental monitoring reports, tourism statistics, and publicly available official information. The analytical period primarily covers the environmental transformation of the Aral Sea since the 1960s, while contemporary tourism development is examined through the most recent available information.

Based on these methodological approaches, the study aims to establish how the historical and environmental consequences of the Soviet period can be interpreted through dark tourism and transformed into opportunities for environmental education, cultural preservation, employment generation, and sustainable regional economic development.

Analysis and rezults (Tahlil va natijalarlar /Анализ и результаты).

1. Historical Development and Environmental Transformation of the Aral Sea.

The Aral Sea disaster is one of the most significant examples of large-scale human-induced environmental degradation in modern history. Its transformation is closely associated with the economic and agricultural policies implemented during the Soviet period, particularly the expansion of irrigated cotton production in Central Asia.

During the 1960s, the Aral Sea was the fourth-largest inland lake in the world, with a surface area of approximately 68,478 km². However, the diversion of water from the Amu Darya and Syr Darya rivers for agricultural irrigation substantially reduced the volume of water flowing into the lake. Consequently, the sea began to shrink, resulting in severe ecological, economic, and social consequences.

The environmental transformation was accompanied by reduction of the water surface and volume, increasing salinity, deterioration of aquatic ecosystems, loss of biodiversity, formation of the Aralkum Desert, decline of traditional fishing, and deterioration of living conditions in surrounding communities.

These processes demonstrate that the Aral Sea disaster was not simply a natural environmental transformation. It was also the consequence of long-term economic decisions that prioritized agricultural production over ecological sustainability.

2. Quantitative Analysis of the Aral Sea's Shrinkage

To evaluate the scale of the environmental disaster, this study examines historical estimates of the Aral Sea's surface area between 1960 and 2018. The quantitative data are based on satellite observations and hydrological analysis reported by Yang et al. (2020).

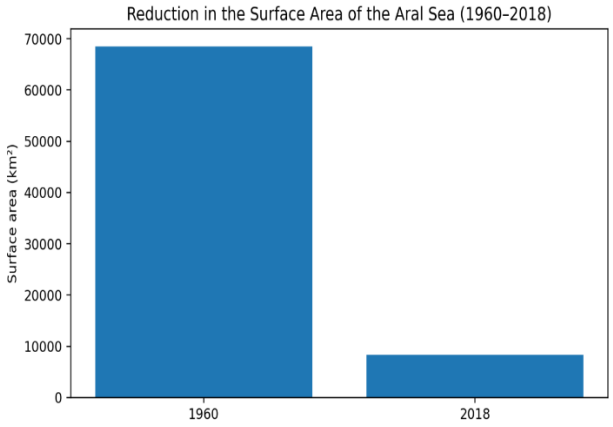
Table 1.

Changes in the surface area of the Aral Sea, 1960–2018[1]

Indicator	1960	2018
Surface area (km²)	68,478.00	8,321.50
Relative surface area (%)	100.00	12.15
Reduction in surface area (km²)	—	60,156.50
Percentage reduction (%)	—	87.85

Figure 1.

Historical reduction in the surface area of the Aral Sea (1960–2018).[2]



The calculations demonstrate that the Aral Sea lost approximately 87.85% of its original surface area between 1960 and 2018. Only around 12.15% of the initial surface area remained in 2018. The reduction of more than 60,000 km² illustrates the extraordinary scale of the environmental transformation.

The results indicate that the disappearance of a substantial part of the sea created a unique geographical landscape characterized by exposed seabed, abandoned maritime infrastructure, and desertification. These physical transformations have become important elements of the region's historical and tourism identity.

From the perspective of dark tourism, the exposed seabed is not merely an environmental phenomenon. It represents a visible historical record of human-induced ecological destruction and provides an opportunity to combine environmental interpretation, historical awareness, and cultural memory.

3. The Collapse of the Fishing Industry and Socio-Economic Consequences

The environmental crisis had a direct impact on the traditional economic structure of the Aral Sea region. Before the major environmental changes, fishing represented one of the principal economic activities of coastal communities. The industry provided employment, supported food-processing enterprises, and contributed to regional trade.

NASA's historical account indicates that the Aral Sea fishing industry employed approximately 60,000 people in the early 1960s. By 1977, the fish harvest had declined by approximately 75%, while commercial fishing had effectively disappeared by the early 1980s.

Table 2.

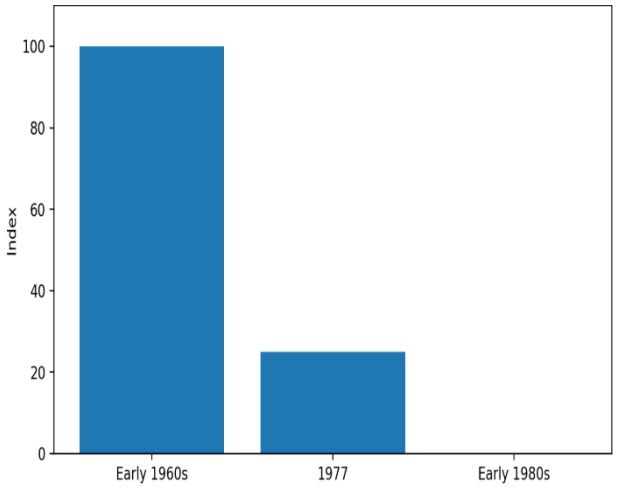
Historical transformation of the Aral Sea fishing industry[3]

Period	Condition of the fishing industry	Socio-economic implications
Early 1960s	Approximately 60,000 people employed	Active fishing communities and processing enterprises
1977	Fish harvest reduced by approximately 75%	Declining production and employment
Early 1980s	Commercial fishing industry effectively eliminated	Collapse of traditional fishing-based livelihoods
Subsequent decades	Economic restructuring	Greater dependence on alternative economic activities

Figure 2.

[1] Author's Contribution
[2] Author's Contribution
[3] Author's Contribution

Approximate historical fish harvest index (1960 = 100).[4]



The results demonstrate that environmental degradation generated economic consequences extending far beyond the loss of aquatic resources. The disappearance of fishing activities weakened the economic foundations of coastal settlements and contributed to the transformation of local employment structures.

Dark tourism may provide an alternative economic direction by creating opportunities in tourism services, cultural activities, accommodation, transportation, and environmental education. Nevertheless, tourism should complement broader regional economic development rather than be considered a complete replacement for the lost fishing industry.

4. Muynak as a Centre of Dark Tourism in Central Asia

Muynak represents one of the most distinctive locations for the development of dark tourism in Central Asia. Historically, the town was an important fishing port situated on the southern coast of the Aral Sea. Its economic prosperity was closely connected with fishing, fish processing, maritime transportation, and related industrial activities.

Following the retreat of the sea, Muynak underwent a profound economic and geographical transformation. The former coastal settlement became surrounded by an extensive desert landscape, while abandoned fishing vessels remained as physical reminders of its maritime past.

The Ship Cemetery has become the most recognizable tourism attraction in Muynak. It provides visitors with a visual understanding of the scale of the environmental disaster and the consequences of unsustainable natural resource management.

Table 3.

Main dark tourism attractions in the Aral Sea region[5]

Tourism attraction	Historical and environmental significance	Potential tourism product
Muynak Ship Cemetery	Evidence of the disappearance of the former fishing port	Dark tourism and historical excursions
Aralkum Desert	Exposed seabed and environmental transformation	Environmental and scientific tourism
Muynak Museum of Local History	Preservation of regional history and cultural memory	Museum and educational tourism
Former coastal settlements	Evidence of changes in traditional livelihoods	Heritage and community tourism
Ustyurt Plateau	Distinctive geographical and natural landscape	Ecological and adventure tourism
Former fishing infrastructure	Historical evidence of maritime economic activities	Industrial heritage tourism

The analysis suggests that Muynak's tourism potential is based on the interaction of three dimensions: the historical dimension, which preserves and interprets the former fishing economy and Soviet environmental legacy; the environmental dimension, which explains water diversion, desertification, and ecosystem degradation; and the socio-economic dimension, which creates alternative economic opportunities for affected communities.

This combination distinguishes Muynak from conventional tourism destinations and gives it considerable potential for international educational and environmental tourism.

5. Comparative Analysis of International Dark Tourism Destinations

The comparison of the Aral Sea region with other international destinations associated with environmental disasters, industrial decline, and historical tragedies helps identify common characteristics of dark tourism destinations and practices that could be adapted to the Central Asian context.

Table 4.

Comparative characteristics of selected international dark tourism destinations[6]

Destination	Country	Historical background	Main tourism focus
Aral Sea and Muynak	Uzbekistan	Environmental disaster associated with Soviet-era water diversion	Environmental memory and ecological education
Chernobyl	Ukraine	Nuclear accident of 1986	Nuclear disaster heritage
Bhopal	India	Industrial gas disaster of 1984	Industrial disaster and environmental justice
Pripyat	Ukraine	Abandoned city following the Chernobyl disaster	Abandoned urban heritage
Centralia	United States	Long-term underground coal mine fire	Industrial and environmental heritage

The comparison demonstrates that dark tourism destinations can develop around different forms of historical and environmental tragedy. However, the Aral Sea has a distinctive characteristic: the disaster developed over several decades rather than as a single catastrophic event.

This long-term transformation provides an opportunity to develop tourism experiences that explain the relationship between political decisions, agricultural development, water resource management, environmental degradation, and human well-being.

Successful dark tourism development requires more than the physical existence of a historical site. It requires interpretation centres, reliable historical information, professional guides, visitor infrastructure, and responsible destination management.

6. Assessment of the Socio-Economic Potential of Dark Tourism

The development of dark tourism in the Aral Sea region could contribute to the diversification of local economic activities. In particular, tourism can create additional demand for accommodation, food services, transportation, cultural products, and guided excursions.

Table 5.

Potential socio-economic effects of dark tourism development[7]

Development area	Proposed activities	Expected results
Accommodation	Guesthouses, yurts, and small hotels	Growth of local tourism enterprises
Transportation	Tourist transport and regional transfer services	Increased demand for transport services

[4] Author's Contribution
[5] Author's Contribution
[6] Author's Contribution
[7] Author's Contribution

Development area	Proposed activities	Expected results
Tour guiding	Historical and environmental excursions	New employment opportunities
Cultural heritage	Museums, exhibitions, and documentary presentations	Preservation of local history
Handicrafts	Production and sale of traditional souvenirs	Support for local entrepreneurs
Gastronomy	Promotion of Karakalpak traditional cuisine	Development of local food businesses
Educational tourism	University visits and environmental study tours	Academic cooperation and knowledge exchange
Digital tourism	Virtual exhibitions and online historical archives	Increased international visibility

The findings suggest that the economic benefits of dark tourism should be evaluated not only through the number of visitors but also through the extent to which tourism expenditure remains within local communities.

Community-based tourism represents an important development approach. Local residents should participate in the design of tourism products, provide accommodation and guiding services, and benefit directly from tourism-related income. Their oral histories, traditional knowledge, and cultural practices can also enrich the interpretation of the Aral Sea disaster.

7. SWOT Analysis of Dark Tourism Development in the Aral Sea Region

A SWOT analysis was conducted to identify the main internal and external factors influencing the development of dark tourism in the Aral Sea region.

Table 6.

SWOT analysis[8]

Strengths	Weaknesses
Internationally recognized environmental disaster; unique Ship Cemetery; strong historical and educational significance; distinctive desert landscape.	Limited tourism infrastructure in remote areas; long distances between attractions; limited specialized services; shortage of trained guides.

Table 6 (continued).

Opportunities and threats[9]

Opportunities	Threats
International dark tourism routes; cooperation with universities; growth of environmental and educational tourism; local entrepreneurship; digital promotion.	Further environmental degradation; extreme climatic conditions; commercialization of local suffering; insufficient investment; unequal distribution of benefits; damage to fragile landscapes.

The SWOT analysis indicates that the region has considerable potential for developing a distinctive tourism destination. Nevertheless, realization of this potential depends on overcoming infrastructure limitations, improving service quality, and establishing effective environmental protection. The ethical dimension is particularly important: the disaster should not be presented merely as an attractive spectacle, but through accurate historical information and respect for affected communities.

8. Strategic Directions for Sustainable Dark Tourism Development

Table 7.

Strategic measures for sustainable dark tourism development[10]

Strategic priority	Recommended measures	Expected outcome
Historical preservation	Establish a modern Aral Sea environmental heritage centre	Preservation of historical memory
Infrastructure development	Improve roads, accommodation, sanitation, and visitor facilities	Increased tourist accessibility
Environmental education	Develop guided environmental learning programmes	Improved environmental awareness
Community participation	Support local tourism cooperatives and entrepreneurs	Employment and household income generation
International cooperation	Partner with universities and international tourism organizations	Greater international recognition
Digital transformation	Introduce virtual tours, interactive maps, and digital archives	Wider access to historical information
Environmental protection	Establish visitor management and conservation standards	Reduced tourism-related environmental pressure
International marketing	Connect Muynak with wider Central Asian tourism itineraries	Expansion of international tourist markets

Dark tourism should be integrated into a broader regional development framework. Tourism businesses should cooperate with environmental institutions, cultural organizations, educational establishments, and local authorities. Digital technologies, including satellite image comparisons, interactive maps, digital archives, and virtual exhibitions, can improve interpretation while reducing pressure on environmentally fragile locations.

9. Integrated Interpretation of Research Results

The findings demonstrate that the Aral Sea region represents a unique case in which environmental destruction, historical memory, and tourism development intersect. The disappearance of a substantial part of the sea has transformed the geographical, economic, and cultural characteristics of the surrounding territories.

Table 8.

Summary of the main research findings[11]

Research dimension	Main finding	Implication for tourism development
Environmental transformation	Approximately 87.85% reduction in surface area (1960–2018)	Strong potential for environmental interpretation
Historical legacy	Soviet-era irrigation policies contributed to the disaster	Development of historical educational tourism

[8] Author's Contribution
[9] Author's Contribution
[10] Author's Contribution
[11] Author's Contribution

Research dimension	Main finding	Implication for tourism development
Economic transformation	Collapse of the traditional fishing industry	Need for alternative economic activities
Tourism attractions	Ship Cemetery and Aralkum Desert	Development of distinctive tourism products
Community development	Opportunities in tourism-related services	Support for local entrepreneurship
Sustainability	Fragile ecological conditions require protection	Responsible visitor management

The overall findings support the argument that dark tourism can become an important complementary instrument for sustainable regional development. Its success depends on integrating economic objectives with historical accuracy, environmental responsibility, and community participation.

10. Discussion

The research findings contribute to the broader discussion of dark tourism by demonstrating that environmental disasters can become important destinations for historical interpretation and environmental education.

Unlike conventional dark tourism destinations associated with sudden disasters, the Aral Sea represents a prolonged environmental catastrophe resulting from decades of human intervention. This characteristic creates opportunities to examine the relationship between economic planning, political decisions, natural resource management, and long-term environmental consequences.

The case of Muynak illustrates the importance of place-based tourism development. The Ship Cemetery is not simply a collection of abandoned vessels; it represents the transformation of an entire economic and social system. Its historical significance becomes more meaningful when visitors are provided with information about former fishing communities, the Soviet irrigation system, and the environmental consequences of water diversion.

From an economic perspective, dark tourism can contribute to regional diversification. However, the development model should avoid excessive commercialization of environmental suffering. Tourism revenues should support local businesses, cultural preservation, environmental education, and community development.

Therefore, the Aral Sea region should be promoted as a destination for responsible environmental dark tourism, in which historical remembrance, educational value, ecological awareness, and sustainable economic benefits are treated as interconnected priorities.

11. Principal Scientific Findings

1. The Aral Sea disaster demonstrates the long-term environmental consequences of economic development strategies that fail to incorporate ecological sustainability into resource management.

2. The transformation of Muynak into a post-maritime settlement has created a distinctive tourism landscape in which abandoned infrastructure represents an important element of historical and environmental heritage.

3. The combination of dark tourism, environmental education, and cultural heritage tourism provides opportunities for developing a differentiated tourism product in Central Asia.

4. Community-based tourism can strengthen the socio-economic contribution of tourism by creating employment opportunities and supporting local entrepreneurship.

5. The integration of historical archives, satellite imagery, digital storytelling, and environmental interpretation can improve the educational value and international visibility of the Aral Sea destination.

6. Sustainable dark tourism requires an integrated management approach that combines tourism infrastructure, environmental protection, historical accuracy, and local community participation.

In conclusion, the Aral Sea region has the potential to become an internationally recognized destination for dark tourism and environmental heritage tourism. Its development represents an opportunity to transform the memory of environmental destruction into a platform for education, cultural preservation, and sustainable regional development.

Conclusion and Recommendations (Xulosa va takliflar/Выводы и предложения).

The study examined the potential of dark tourism as a tool for interpreting the Soviet environmental legacy in Central Asia, focusing particularly on the Aral Sea disaster and its consequences for the socio-economic development of the surrounding regions. The findings demonstrate that the Aral Sea crisis represents not only one of the most significant environmental disasters of the twentieth century but also an important historical phenomenon that provides valuable opportunities for tourism development, environmental education, and cultural heritage preservation.

The analysis revealed that the extensive diversion of water from the Amu Darya and Syr Darya rivers during the Soviet period fundamentally transformed the ecological and economic conditions of the Aral Sea region. The reduction of the sea's surface area, the disappearance of traditional fishing activities, the formation of the Aralkum Desert, and the deterioration of local livelihoods illustrate the long-term consequences of unsustainable natural resource management. These transformations have created a unique landscape in which environmental destruction and historical memory are closely interconnected.

The research identified Muynak as a particularly important destination for dark tourism development. The Ship Cemetery, the dried seabed, former fishing infrastructure, and local historical heritage provide distinctive opportunities for developing educational, historical, and environmental tourism products. Unlike conventional tourism destinations, Muynak offers visitors the opportunity to understand the relationship between human activities, political and economic decisions, environmental degradation, and regional socio-economic transformation.

The comparative analysis of international dark tourism destinations demonstrated that the Aral Sea region possesses distinctive characteristics that could strengthen its position within the international tourism market. In particular, its historical connection with Soviet-era environmental policies and the long-term nature of the ecological catastrophe provide a unique foundation for developing responsible dark tourism experiences.

Furthermore, the study established that dark tourism could contribute to regional economic diversification through the development of accommodation services, transportation, local gastronomy, handicrafts, museum activities, and guided excursions. The involvement of local communities is particularly important because tourism development should generate direct economic benefits for residents while preserving their cultural identity and historical experiences.

Based on the research findings, several practical recommendations are proposed:

1. Establish a modern Aral Sea Environmental Heritage Centre in Muynak to present the historical development, ecological consequences, and socio-economic dimensions of the disaster.

2. Improve tourism infrastructure, including transportation, accommodation facilities, visitor information centres, and public services.

3. Develop international educational tourism programmes in cooperation with universities, research institutions, and environmental organizations.

4. Support community-based tourism initiatives by encouraging local entrepreneurship, traditional handicrafts, and the participation of local residents in tourism services.

5. Introduce digital tourism solutions, including virtual exhibitions, interactive maps, satellite image comparisons, and digital historical archives.

6. Establish responsible tourism management principles to protect environmentally vulnerable landscapes and prevent the commercialization of local suffering.

7. Integrate the Aral Sea region into international tourism routes connecting Uzbekistan with other Central Asian destinations.

In conclusion, the Aral Sea region has considerable potential to become an internationally recognized destination for responsible dark tourism and environmental heritage tourism. Its development should be based on the integration of historical remembrance, environmental

education, cultural preservation, and sustainable economic development. The transformation of the Aral Sea disaster into an educational tourism resource can help preserve the historical memory of the region, increase international awareness of environmental responsibility, and create new economic opportunities for local communities.

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