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- 05.01.03 – Informatikaning nazariy asoslari
- 05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
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- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellash
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- 05.08.03 – Temir yo'l transportini ishlatish
- 05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
- 10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
- 08.00.01 – Iqtisodiyot nazariyasi
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- 08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
- 08.00.06 – Ekonometrika va statistika
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- 08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
- 08.00.09 – Jahon iqtisodiyoti
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- 08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
- 08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
- 08.00.17 – Turizm va mehmonxona faoliyati

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MANAGING TOURISM IN FRAGILE ECOSYSTEMS: A CASE STUDY APPROACH

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Silk Road International University of Tourism and Cultural Heritage

Annotatsiya: Turizmni rivojlantirish, nozik ekotizimlarga katta bosim o'tkazmoqda, bu esa iqtisodiy foyda bilan ekologik barqarorlik o'rtasidagi eng maqbul muvozanatni topishni murakkablashtirmoqda. Ushbu tadqiqotda Galapagos orollari va Maldiv orollaridagi barqaror turizmni boshqarish strategiyalarining taqqoslanadigan tahlili olib boriladi, sifatli metodlar, shu jumladan, ikkilamchi ma'lumotlar va siyosat hujjatlarini tahlil qilish orqali. Tadqiqot natijalari shuni ko'rsatadiki, muvaffaqiyatli boshqaruv, tashrif buyuruvchilar soniga qo'yilgan kvotalar, mahalliy jamoalarni faol jalb qilish va moslashuvchan boshqaruvni joriy etish kabi yondashuvlarni birlashtirishni talab qiladi. Galapagos orollari samarali ilmiy asoslangan boshqaruvni namoyish etadi, Maldiv orollari esa iqlimning zaifligi bilan bog'liq qiyinchiliklarga duch kelmoqda. Tadqiqotda tashrif buyuruvchilar sig'imi, manfaatdor tomonlar o'rtasidagi hamkorlikni yaxshilash va turizmni boshqarishning iqlimga chidamli strategiyalarini ishlab chiqish zarurati ta'kidlanadi, bu esa global o'zgarishlar sharoitida ekosistemalarning barqarorligini ta'minlashga qaratilgan.

Kalit so'zlar: nozik ekotizimlar, barqaror turizm, yo'nalishlarni boshqarish, biologik xilma-xillik, ekoturizm, atrof-muhitga ta'sir, mavzuli tadqiqot.

Abstract: Tourism development is placing immense pressure on vulnerable ecosystems, making it challenging to balance economic benefits with ecological sustainability. This research compares sustainable tourism management strategies in the Galapagos Islands and the Maldives, using qualitative methods such as secondary data and policy analysis. The findings highlight that successful management requires integrating visitor quotas, local community engagement, and adaptive governance. The Galapagos exemplifies science-based management, while the Maldives faces challenges due to climate vulnerability. The study emphasizes the need for better carrying capacity assessments, stakeholder collaboration, and climate-resilient tourism strategies, offering evidence-based recommendations for fragile ecosystems worldwide.

Keywords: fragile ecosystems, sustainable tourism, destination management, biodiversity, ecotourism, environmental impact, case study.

Аннотация: Развитие туризма оказывает значительное давление на уязвимые экосистемы, что усложняет поиск оптимального баланса между экономической выгодой и экологической устойчивостью. В данном исследовании проводится сравнительный анализ стратегий устойчивого управления туризмом на Галапагосских островах и Мальдивах с использованием качественных методов, включая анализ вторичных данных и документов политики. Результаты исследования показывают, что успешное управление требует интеграции таких подходов, как квоты на количество посетителей, активное вовлечение местных сообществ и внедрение адаптивного управления. Галапагосские острова служат примером эффективного научно обоснованного управления, в то время как Мальдивы сталкиваются с трудностями, связанными с климатической уязвимостью. В исследовании подчеркивается необходимость более глубокой оценки пропускной способности, улучшения сотрудничества между заинтересованными сторонами и разработки климатически устойчивых стратегий управления туризмом, с целью обеспечения устойчивости экосистем в условиях глобальных изменений.

Ключевые слова: уязвимые экосистемы, устойчивый туризм, управление направлениями, биоразнообразие, экотуризм, воздействие на окружающую среду, тематическое исследование.

INTRODUCTION

Fragile ecosystems are the most biodiverse and ecologically sensitive areas on earth. Examples of these include island archipelagos, rainforest ecosystems, coral reefs, and volcanic landscapes (Honey, 2008). These ecosystems attract millions of tourists every year, generating vital income streams, also the suffering from

demands created by human activity (Buckley, 2012). The tourism-biodiversity paradox recognizes that tourism relies on pristine natural environments, but tourism can fundamentally impact these environments via overcrowding, pollution, and destruction of areas for developments (Lobo et al., 2013).

The concept of carrying capacity is especially important in fragile ecosystems, where the difference between sustainable use and irreversible damage is short and not well defined (McCool & Lime, 2001). The impacts of tourism on fragile ecosystems may be habitat destruction, species disturbance, waste generation, water pollution, and destruction of the local indigenous community/culture (Drumm & Moore, 2005). The worsening of climate change creates even more challenges, as many fragile ecosystems, namely coral reefs, and rainforest ecosystems are quickly degrading faster via temperature change, sea level change, and extreme weather (Scott et al., 2012).

This research evaluates the research question: How to sustainably manage tourism in fragile ecosystems for economic benefit and environmental conservation? The aim of this article is to evaluate successful and unsuccessful management practices through comparative case studies, in order to offer evidence-based recommendations towards sustainable tourism development within vulnerable environments. The importance of this research is to contribute to theory and practice within sustainable tourism, and to draw conclusions applicable to fragile ecosystems globally.

LITERATURE REVIEW

The notion of sustainable tourism in sensitive ecosystems has transitioned from a conservation perspective to a more multilateral framework that integrates social, economic, and environmental issues (Weaver, 2001). Butler's (1980) Tourism Area Life Cycle model provides a conceptual basis for understanding stages of destination development while Fennell & Dowling (2014) highlighted the need for management approaches for sensitive environments that allow for adaptability.

The International Ecotourism Society defines ecotourism as responsible travel to natural areas that conserves the environment and sustains the well-being of local people (TIES, 2015). However, ecotourism research has shown evidence of widespread divergence between ecotourism ideals and practice, especially in fragile ecosystems, where tourism market drivers often prevail over conservation objectives and goals (Honey, 2008). Several studies by Stem et al. (2003), and Stronza and Gordillo (2008), suggested that one of the keys to achieving sustainable outcomes through ecotourism was community participation and local benefits.

Carrying capacity studies have evolved from simple numeric limits to sophisticated evaluations of social and environmental impacts (Manning, 2007); furthermore, recent investigations have advocated for adaptive management approaches to adjust the number of visitors to certain sites depending on a baseline of environmental monitoring (Lobo et al., 2013). The global climate change research agenda further emphasizes the need for sustainable tourism management. Several studies have pointed to the growing evidence of heightened ecosystem degradation at popular tourism destinations (Scott et al., 2012).

Despite the abundant literature, there are still considerable gaps in our understanding of how to actualize effective governance frameworks for tourism in fragile ecosystems, and in particular, with respect to the coordination of stakeholders and the development of adaptive management systems (Bramwell & Lane, 2011). This study will attempt to address these gaps through the comparative case-study analysis of two very different fragile ecosystem destinations.

RESEARCH METHODOLOGY

This article uses a qualitative case study methodology, which was the best approach to achieve an in-depth analysis of a complex situation in a specific case (Yin, 2018). The case study method facilitates the outcome of multi-faceted examination of tourism management strategies, tourism stakeholders, & environmental outcomes, based in fragile ecosystems.

For the research, the Galapagos Islands (Ecuador) and the Maldives were selected based on they reflected distinctions in ecosystem "fragility", tourism "importance", and the diversity of "management" approaches. These two destinations exhibit different governance structures, different ecosystems & different development of tourism along the full life-cycle of several decades, and their investigation enables developing comparative analysis of management effectiveness.

Documents were obtained systematically from peer-reviewed literature, government published reports, NGOs published reports and tourism industry published engravings from 2010 - 2024. Places where docu-



ments were gathered and visited included published research about tourism management for the Island ecosystems from the Charles Darwin Foundation, UNESCO - World Heritage individual destination reports, and Maldivian Ministry of Tourism published reports, and when possible, inspection of assessments by international organizations (e.g. UNWTO, UNEP, etc.).

The analysis of the documents examined and described management strategies, stakeholder roles, environmental damage, and economic consequences. Despite the valuableness of this research, there were limitations by researching only secondary documents, which may suffer from author's biases, and the limitation of governmental assessment reports to the official governments of the destination's history, not the actual influences of outside variables.

The analysis of destinations was limited by a temporal era (2010 - 2024) and were not seen in consideration of the islands' historical context prior to that period.

ANALYSIS AND RESULTS

The Galapagos Islands and the Maldives have been chosen for this research on "Managing Tourism in Fragile Ecosystems" due to their unique and highly vulnerable environments. Both locations face significant ecological pressures from tourism, which threatens their biodiversity and ecosystems. The Galapagos Islands are renowned for their diverse and endemic species, while the Maldives is home to delicate coral reefs and marine life. Studying these destinations allows for a comparative analysis of sustainable tourism practices in areas with similar challenges, offering valuable insights into effective management strategies for protecting fragile ecosystems.

The Galapagos Islands: Science-Based Conservation Management

Just 1,000 kilometers off the coast of Ecuador, lies the Galapagos Islands - arguably the most effective example of science-based tourism management in a fragile ecosystem that can be found in the world. The Galapagos Islands are a UNESCO World Heritage site that is famous for its unique endemic wildlife - giant tortoises, marine iguanas, and Darwin's finches, to name a few - attracting about 275,000 visitors each year (Galapagos Conservancy, 2023).

Tourism development in the Galapagos occurs within the strict regulatory frameworks established by Ecuador's National Park Service and the Galapagos National Park Directorate. Visitor quotas limit the number of visitors allowed to enter annually, and all visitors must have a guide that takes them to designated visitor sites to control behavior and environmental impact (Honey, 2008). The "visitor management system" requires all tourists follow marked trails, stay at least 2 meters from wildlife, and visit sites in small groups of no more than 16 guests (Drumm & Moore, 2005).

Environmental impacts continue to be monitored through collaborative research efforts undertaken by the Charles Darwin Research Station and managing authorities. Studies indicate minimal species perturbation or habitat degradation at visitor sites where monitoring protocols are properly followed, however, invasive species additions and marine pollution continue to pose threats (Lobo et al., 2013). Climate change continues to unfold in the region in the form of coral bleaching and increasing incidence of sea-level rise continues to compromise the stability of the ecosystem even though tourism management has been overall effective.

Management successes include steady wildlife populations, well-established waste disposal systems, and strong community support for conservation initiatives. Overall, the governance of the Galapagos provides an illustrative example of how scientific research informs adaptive management strategies, for example, visitor quotas on a per-site basis and site rotation implemented due to longitudinal monitoring data.

The Maldives: Resort-Based Tourism in Coral Atolls

The Maldives, composed of 1,192 coral islands and islets, organized into a unit of 26 atolls, is a representative case of resort-based tourism development in marine fragile ecosystems. Tourism is directly linked over 60% to total GDP and provide employment to 38% of the workforce (Maldives Association of Tourism Industry, 2023), and highlights tourism's importance to the economy, yet is acutely vulnerable to climate impacts.

"One Island, One Resort" policy introduced during the 1970s, protected the environmental integrity of a coral island and the level of impact by confining tourism to designated islands but leaving local community islands (Scheyvens & Momsen, 2008). This safeguarding of the fragile marine eco-system has produced a luxury tourism sector with over 150 islands designated as resorts and the resorts operate as independent

eco-systems that include private white sandy beaches, coral reefs, and marine life.

The environmental impacts include the degradation of coral reefs, in which the Maldives experienced bleaching events on over 60% of its reefs during 2016-2017 (Maldives Marine Research Institute, 2018). The planet is experiencing rising sea levels increasing the threat of losing the Maldives, particularly as 99% of the area has an elevation of less than 1.5 meters above sea level. Waste management, an ongoing issue, is linked to resorts as hotels such as resorts are not self-sustaining and local industrial islands accept this waste for processing or ending up in disposal pots.

Economic benefits consist of foreign exchange revenues over \$3 billion every year and jobs for local communities, although benefits are still distributed unevenly: resorts profits go mostly to international operators, only limited direct benefits are received by local communities (Shareef & McAleer, 2005).

Management innovations consist of renewable energy, with several resorts achieving carbon neutrality using solar energy and energy-efficient technologies. Marine protected areas have also been established around resort islands, with some areas having observable positive effects on fish and coral recovery.

Looking at the two different management structures, comparative analysis shows different approaches lead to different possible outcomes regarding a combination of tourism development and environmental protection. The science-based approach in the Galapagos coordinates research with management and can provide stronger levels of environmental protection for the Galapagos using, for example, strict quotas on visitor numbers, requirements that visitors be accompanied by guides, and adaptive responses to significant impacts based on science. From a sustainability perspective, the science-based model may be able to offer protection for the ecosystem by introducing economic gains from tourism but not opportunistic growth in terms of tourism development, ensuring that surrounding ecosystem remains intact while diversifying income generation for local residents and the government.

The Maldives provides a good economic model in terms of luxury tourism development but it is fraught with unique issues which present risks to the sustainability agenda, such as climate change impacts and limited benefits for local people. The “one island, one resort” policy could severely limit tourism impacts but does not allow for the use of islands for resources that have complex spatial patterns at the ecosystem level.

Governance, stakeholder coordination, and adaptive capacity will influence management effectiveness based on the integrated system examined here. The Galapagos has institutions to aid tourism development and environmental sustainability which are founded on government, science, and community engagement, while the Maldives will be required to rely on the private sector for innovative solutions as the issue is marketed based, with mixed results in terms of sustainable environmental protection and the relationship between protected and non-protected areas.

In both instances, continuous monitoring and adaptive management are essential to respond to changing environmental conditions. Climate change presents a significant challenge as it requires dedicated approaches that look to emission reductions, climate adaptation of infrastructure, and promoting resilience in the ecosystems.

Awareness and education are also important at both destinations, but the way they are applied is widely different. The Galapagos use trained guides to ensure consistent educational environmental programming as all visitors must have a guide, while the Maldives provide environmental programs using resorts, which can be provided at a wide range of standards and program delivery.

Several recommendations arise for sustainable tourism management in fragile ecosystems from the findings of the case studies. Our suggested policy approaches include dynamic carrying capacity assessments that allow flexible visitor limits derived from real-time environmental monitoring and implications. Governments should create integrated governance arrangements with tourism authorities, environmental authorities, and research organizations as a form of comprehensive management to create guidelines and policies.

Strategies for stakeholder collaboration must prioritize active citizen participation and clarified benefit and sharing arrangements. Communities must receive short-term direct economic incentives from tourism activities in conjunction with meaningful direct participation in tourism decision-making processes. There should be a private sector element in co-management arrangements in managing local visitation, which incorporates environmental performance standards or certification arrangements through access to natural tourism products.

Education, training, and awareness-raising activities must reach tourists and tourism operators and local communities. Government mandated orientation programs for the visitor, with an emphasis on the destination's environmental sustainability arranged in similar construction to the Galapagos example, should be included in tour packages for all destinations characterized as fragile ecosystems. Some use of digital technologies can



assist, including through virtual reality suites and real-time impact monitoring.

For monitoring and impact assessments, some form of standardisation in approaches to measuring the impact of tourism on fragile ecosystems is required. Environmental audits, community surveys and economic measurement should be repeated at regular intervals each year or season, and decision-makers should adaptively manage in response for any seriously adverse focused decisions. International value-added services would be in regionally or nationally bound organisations that engage with other organisations at global forums, in the interstate and educational examples, in potentially supporting improved national or subnational tourist practices framed around equivalently naive goals to reach precipitating destinations.

CONCLUSION AND SUGGESTIONS

The comparative case study assessment indicates that sustainable tourism management in fragile ecosystems can be achieved by developing integrated approaches that balance strict protections for the environment and economic development objectives. Both the science-based model for the Galapagos Islands, and the resort-based model for the Maldives offer avenues for sustainable tourism development, though neither provides a sufficient solution to the complex challenges fragile ecosystems face.

Key observations extended the asset of adaptive governance arrangements, stakeholder collaboration, and ongoing environmental monitoring as the only way to achieve sustainable outcomes. Furthermore, climate change is understood to be a fundamental issue which requires destinations with all fragile ecosystems to apply proactive adaptation strategies.

Implications for tourism managers include the necessity for longer-term planning perspectives, the investment in environmental monitoring systems, and developing crisis management capacity. For tourism managers, implications are that they must demonstrate a longer-term orientation to planning, invest in environmental monitoring systems, and develop crisis response capacity. In the area of governance, there are implications for policymakers, in encouraging a governance approach which integrates the efforts of many agencies and the multiple stakeholders while remaining adaptable to changing environmental conditions.

Future research directions should prioritize standardized impact assessment methodologies, climate adaptation strategies, and emerging technologies in sustainable tourism management practices. Evaluating longitudinal studies which will monitor environmental and social outcomes is very important when evidence is available, in order to make informed management decisions.

The time to address the impacts of tourism in sensitive environments has never been more urgent, as these unique environments face overwhelming pressure from a myriad of factors, including tourism development and climate change. We are in a position to implement sustainable management practices that will protect these irreplaceable ecosystems for future generations while simultaneously supporting the communities that rely on tourism to sustain their livelihoods.

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