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Research Article

Effectiveness of Digital Technology in Enhancing Blue Tourism Sustainability in Tanzania

*[1]Mariki James Onyango

About Article

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About Author

[1] Dr. Salim Ahmed Salim Centre for Foreign Relations, Dar Es Salaam, Tanzania

Contact @ Mariki James Onyango
marikijames130@gmail.com

ABSTRACT

The study examined the effectiveness of digital technology in enhancing blue tourism sustainability in Tanzania. Specifically, the study examined the use of solar panel technology, use of artificial intelligence and use of health technologies. The study employed a desk research method which involves the collection of data from various literature sources such as documents, scripts, previous research findings, journals, and related books. Qualitative content analysis was utilized as the method for analyzing the data. The findings revealed that solar panel technology is one of the most renewable and green energy sources in reducing greenhouse gas emissions and mitigating climate change. The findings also revealed that Artificial Intelligence has released up new tourism opportunities with positive effects on the economy, society, and environment. The study concludes that integration of solar power reduces Carbon footprints and increased appeal to budget conscious travelers. Artificial Intelligent enhances visitor's management, safety, and eco-friendly experiences. Online platforms improve access to information about overseas care and empower patients to make informed decisions. The study recommends that the development and integration of renewable energy sources, like solar, wind, and hydropower, into the energy mix should be given top priority by government and tourism companies. Programs supporting sustainable agriculture and forestry conservation/reforestation should be put into place. Strategies to economic development and environmental sustainability should also be put into place such as encouraging eco-tourism, efficient manufacturing, and sustainable urban planning. The Ministry of Tourism of Tanzania should promote the use of AI technologies in the creation, use, and manufacturing of tourism products.

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1. INTRODUCTION

The United Nations has officially recognized the Blue Tourism Initiative as a term that attempts to create a thorough understanding of economic activities that occur in or through freshwater and ocean bodies of water (Picken, 2023). Coastal and maritime tourism has a lot of potential in the blue economy of Bangladesh's biggest sources of tourism-related income. The UNDP Accelerator Lab and the Bangladesh Tourism Board (BTB) collaborated in the final quarter of 2022 to research blue tourism in Bangladesh, particularly along the coast. Mapping visitor attitudes, evaluating Bangladesh's blue tourism sustainability, and identifying the countries coastal and maritime tourism resources, amenities, and activities are the primary goals of the collaborative study (Business Standard, 2020). The blue economy in Indonesia blends economic expansion with environmental sustainability. Information and communication technology, or ICT, is a key component of Indonesia's blue economy strategy (Mahadiansar, 2023).

The Blue Economy is crucial to the development of Africa's coastal countries. Africa's Integrated Maritime Strategy makes reference to the blue economy, which is emphasized as the "new frontier of African Renaissance" in the 2050 AIM Strategy. The blue economy has been called the new frontier of the African Renaissance. Its potential to boost socio-economic growth, increase incomes, and create jobs in Africa is regularly discussed in the media, economic reports, and international conferences on development and the environment. (Karani, 2022). According to Nagy and Nene (2021), 38 of Africa's 54 states are coastal and are located within the continent's maritime zones. Authorities now acknowledge destination branding as a tool for managing tourism resources and promoting the market, owing to the heightened competition for technology use in African tourism events markets (Nyagadza, 2022).

The Seychelles' blue economy strategy aligns with regional blue economy strategies and reflects global commitments to the SDG agenda and the Paris Climate Agreement. 2018 saw the creation of the Seychelles' Blue Economy Strategic Framework and Roadmap, an ocean-focused approach to sustainable development (Senaratne, 2020). The primary tourism and fishing industries employ at least 17% and 26% of the population, respectively (Hindle, 2019).The Seychelles government emphasizes the importance of oceans for regional economies and livelihoods in two ways: as livelihoods and as vital to SIDS perspectives on the Blue Economy (Schutter & Hicks, 2019).

Mauritius' tourism industry has prospered by leveraging the country's natural beauty and cultural heritage to attract foreign visitors and promote economic growth. (Dookhee, 2022). The Blue Economy could support Mauritius' development by ensuring the sustainable and equitable use of its resources while appropriately accounting for climate adaptation measures (FAO, 2023). Investments in the ICT sector have improved the country's technological capabilities, created jobs, and accelerated technological innovation (Tsakok, 2021). The governments of Mauritius participated in the United Nations Framework Convention on Climate Change and associated negotiations to lower greenhouse gas emissions and promote increased use of clean and renewable energy to lessen the nation's reliance on fossil fuels. By 2025, they hope to increase the country's use of renewable energy sources from the current 22% to 35% through waste-to-energy projects, wind farms, solar energy, and biomass (Smith & Welton, 2020).

Kenya is fortunate to have many water bodies that are incredibly rich in resources that can be used to improve the economic well-being of the local population and the country's overall economy. The blue economy has the potential to be a significant area of economic growth for Kenya (Njue, 2020). In 2019, 52 percent of Uganda's tourists are from African countries, compared to 47 percent in 2012. North America and Europe accounted for 14 and 20 percent of the total, respectively. In both years, the top five countries accounted for half of all visitors (World Bank, 2019). Marine tourism is a vital part of the blue economy and contributes significantly to economic growth and environmental sustainability (Reddy, 2024). Tourism has become more interested in artificial intelligence (AI), which necessitates sustainability. By creating technological systems like blockchain and the Internet of Things (IoT) to support businesses online and improve the business-customer relationship, it plays a critical role in the tourism industry (Del Vasto & Arco Castro, 2024).

Tanzania is seeing a rise in beach-related tourism because beach visits are convenient and free. This type of travel is used by people both inside and outside of Tanzania. Because of their better air quality, restaurants and hotels close to beaches and islands are usually preferred over others, creating job opportunities (Zakayo & Mbilinyi, 2023). Tanzania's economy has shown resilience, growing at a 5.2% rate in 2023 compared to a 4.6% rate in 2022, according to the World Bank in Tanzania (2024). Tanzania's ecosystem services were valued at approximately USD 104.24 billion in 2020, with large permanent freshwater lakes accounting for 74.87% of the total (Mang'ena, 2020). Technology is the use of conceptual knowledge to accomplish real-world objectives, particularly in a repeatable manner. Customers' and businesses' travel and tourism experiences are changing as a result of technology. It can simplify procedures, save time, and give businesses and travelers a lot more opportunities. Therefore, the study was conducted to examine the effectiveness of digital technology in enhancing blue tourism sustainability in Tanzania.

1.1. Statement of the problem

Tourism is one of the most important sectors of the Tanzanian economy, yet it faces challenges that endanger its sustainability. Tanzania's natural ecosystems, which are crucial for tourism, are under increasing threat from activities such as deforestation, pollution, and climate change. This leads to habitat destruction and a reduced wildlife population, which directly effects tourism. Ndossa and Nyoni (2024) revealed that this situation has been affected by several challenges such as poor government support and lack of awareness among the community and stakeholders. Bakari (2021) added that lack of domestic tourism promotion marketing packages, absence of domestic tourism development and marketing policy and strategy, lack of attention from domestic tourism business sectors, poor service quality to domestic tourists, poor attitude of the government bodies towards domestic tourism and high

cost of services are the major challenges that hinder the growth of domestic tourism.

Ineffective management of tourism resources can lead to environmental degradation, threating the sustainability of eco system that attracts the visitors. Rutaba (2024) indicated that aquaculture activities and maritime tourism if well utilized may contribute to social and economic development. Aquaculture and maritime tourism emerges as crucial drivers for a thriving blue economy in Tanzania, contributing to economic growth, environmental conservation, poverty reduction, and social development. Mollel (2024) found that, although Tanzania is rich in natural and cultural resources to provide unique experiences to tourists; however, tourist destination hosts have not been able to benefit from tourism due to in-adequate and contradicting policies across sectors. Endorsed policies should stimulate sustainable tourism through financial incentives, development projects, and creation of entrepreneurial climate with less government intervention.

Existing studies do not sufficiently examine the effectiveness of present policies for encouraging sustainable tourism, and there are methods to strengthen support for blue tourism. The blue economy agenda strives to help coastal countries reach their full potential by increasing economies, creating jobs, enhancing food security, and reducing poverty, inequality, and gender inequities. Investing in governance, technology, markets, and finance, as well as safeguarding resources for future growth, are the four primary entrance points for bringing about comprehensive transformation. In this regard, this study concentrated on effectiveness of digital technology in enhancing blue tourism sustainability in Tanzania.

1.2. Research Objectives

1.2.1. General Objective

The general objective of this study was to examine the effectiveness of digital technology in enhancing blue tourism sustainability in Tanzania.

1.2.2. Specific Objectives

1. To examine on ways the use of solar panels enhance environmental sustainability of tourism in Tanzania
2. To examine on ways the use of artificial intelligence enhances economic sustainability of tourism in Tanzania
3. To examine on the use of health technology enhances social sustainability of tourism in Tanzania?

1.3. Significance of the study

The findings will provide information on the effectiveness of digital technology in enhancing blue tourism sustainability. Governments can use the findings to design effective strategies that promote sustainable utilization of digital technology for blue tourism development. The findings can shed light on ways the use of solar panels enhance environmental sustainability of tourism. The findings will highlight the importance of artificial intelligence enhances economic sustainability of tourism in Tanzania. The findings will help policymakers about effective the use of health technology enhances social sustainability of tourism in Tanzania as well as to discover the factors affect the use of digital technology in enhancing blue tourism sustainability in Tanzania.

1.4. Theoretical framework

The study employed Ludwig Von Bertalanffy's (1901-1972) System Theory, an interdisciplinary study that seeks a thorough understanding of complex systems. It emphasizes that systems are made up of interconnected components that work together to achieve a common goal. These elements include people, processes, and technology. According to theory, transportation, hospitality, attractions, and local cultures all have an impact on tourism. This means that including different stakeholders fosters collaboration. The theory can be applied to the study of social systems, relationships, and community dynamics in addition to the analysis of organizations as systems in order to increase effectiveness and efficiency. In order to promote sustainable solutions that take into account all facets of the systems, system theory highlights the interdependence of ecological systems, human activities, economic systems, and social structures.

1.5. Conceptual framework

Figure 1.1 illustrates the relationship between digital technology (independent variable) and blue tourism sustainability (dependent variable) in respect of intervening variable including public-private partnerships, financing, investment, stakeholder engagement, state of technology. The effectiveness of digital technology in environmental sustainability, economic sustainability and social sustainability is significantly enhanced by the existence of collaborations between public and private sectors, as well as active engagement with various stakeholders.

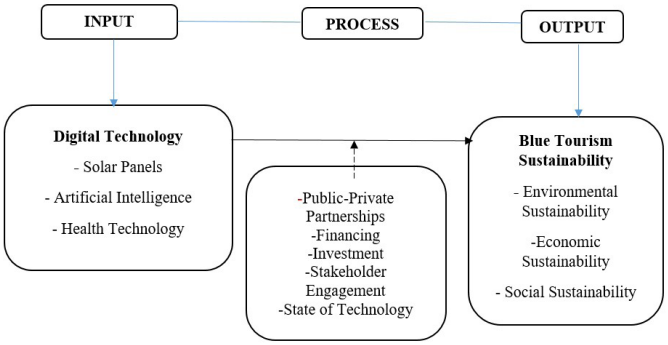

Figure 1. Effectiveness of Digital Technology in Enhancing Blue Tourism Sustainability
Source: Researcher (2024)

The diagram implies that digital technology has helped to sustain blue tourism, especially in environmental, economic, and social sustainability, by securing in with public-private partnerships, financing, investment, stakeholder engagement, and technological advancements. This indicates that digital technology helps to improve economic viability by increasing efficiency, cutting costs, and developing new business models, as well as monitoring and managing environmental impacts like wildlife and natural resource management. Additionally, it improves community and stakeholder engagement among visitors, locals, and businesses. In order to develop sustainable tourism initiatives, cooperation between government agencies and businesses is essential.

Funding prospects for sustainable tourism initiatives can be improved by having access to digital platforms.

2. LITERATURE REVIEW

2.1. Solar panels

Carlisle (2023) conducted a study about the digital skills divide: evidence from the European tourism industry. The study found that the most important future digital skills include online marketing and communication skills, social media skills, Ms office skills, operating systems use skills and skills to monitor online reviews. The largest gaps between the current and the future skill levels were identified for artificial intelligence and robotics skills and augmented reality and virtual reality skills, but these skills, together with computer programming skills, were considered also as the least important digital skills. Three clusters were identified on the basis of their reported gaps between the current level and the future needs of digital skills. The digital landscape is dynamic and the skills deemed essential today many evolve rapidly. The study should acknowledge the need for continuous learning and adaptability in digital skills acquisitions rather than simply focusing on a fixed set of skills.
Kuskaya (2023) investigated the association between solar energy consumption and total energy-related CO_2 emissions in the USA through Morlet wavelet analysis, which is one of the most advanced time-frequency analysis methods for the period 1990:1–2022:6. In the wavelet coherency computations, geothermal energy consumption, hydroelectric energy consumption, industrial production, and manufacturing industry production variables were also included as control variables. The findings demonstrated that solar energy consumption can have reducing effects on CO_2 emissions at lower frequencies (longer-term cycles) and sub-time periods (2014:1–2022:1) in the USA. The findings may not adequately address the issue of causality and focusing solely on the USA may limit the generalizability of the findings.
Raihan and Tuspekova (2022) examined the dynamic effects of economic growth, renewable energy use, urbanization, industrialization, tourism, agricultural productivity, and forest area in Turkey to accomplish environmental sustainability by lowering carbon dioxide emissions. The Dynamic Ordinary Least Squares method was used to analyze time series data from 1990 to 2020. The results disclosed that a 1% rise in economic growth, urbanization, industrialization, and tourism will raise carbon dioxide emissions by 0.39%, 1.22%, 0.24%, and 0.02% in Turkey, respectively. The study recommended on low-carbon economies, renewable energy use, sustainable urbanization, green industrialization, eco-friendly tourism, climate-smart agriculture, and sustainable forest management, all of which could help to accomplish environmental sustainability by lowering emissions. The study focuses on impacts of economic growth and urbanization on emissions without considering long term trends for potential for technological advancements and policy change to mitigate effects overtime.
Chisika and Yeom (2021) examined the need for regional electrification by solar power and suggest measures to integrate regional energy policies and processes for balanced development. The study found that there are many social, economic, and environmental benefits associated with using solar power. The establishment of the East African Centre for Renewable Energy and Energy Efficiency constitutes an important melting pot for diverse renewable energy policies, in addition to confirming a commitment to solar power deployment. Moreover, some East African Community (EAC) states appear to be progressing faster towards regional solar power projects, while other states are lagging due to complex contextual challenges. The statement that some EAC states are progressing faster toward solar projects lacks a specific.

2.2. Artificial Intelligence

Genç (2020) on artificial intelligence and the development of smart Tourism. The presence of artificial intelligence has created a new opportunity for tourism where economic, social and environmental benefits can be obtained, therefore local and regional governments should promote the applications regarding to artificial intelligence as well as encourage national and international stakeholders to invest in artificial intelligence induced smart tourism sector, but it is also capable of increasing the life quality of service providers and tourism investors by providing them an opportunity for a sustainable economic revenue within a healthier environment. The study should clarify how AI contributes to sustainability in tourism by optimizing resources, reducing waste or enhancing conservation efforts.
Abeba (2024) sought to analyze the role of digital transformation and innovation in enhancing the competitiveness and sustainability of hospitality and tourism businesses. The study found that digital transformation and innovation are essential drivers for enhancing the competitiveness and sustainability of hospitality and tourism businesses in South Africa. By embracing digital technologies, businesses can improve customer experiences, increase operational efficiency, make data-driven decisions, and adapt to changing market dynamics, ultimately securing their position in the evolving industry landscape. The study suggested that encourage research that explores the intersection of digital transformation, innovation, and competitiveness within the hospitality and tourism sector. The implications of digital transformation on the workforce are not addressed. It is important to consider automation and digital tools affects employment within the sector and strategies to be employed to support workers.
Ong'ele (2018) sought to establish the effect of digital adoption by tour and travel in Kenya, to enhance its competitive advantage. The study found that 30% of the Firms in Nairobi use the Facebook platform to engage their customer followed by 22% on twitter while only 9% use LinkedIn. The study also found that 90% of the Tours and Travels firms in Nairobi using digital technology have improved their performance and enhanced their competitive advantage. The results revealed that the adoption of technology was associated with increased learning as well as growth in the organization. The study concluded that adoption of digital technology improves and promotes the competitive advantage of a firm. The study recommends the need for providing effective systems and policies that would promote the adoption of digital technology within the Tours and Travel Firms in Kenya. The study does not address to potential barrier to technology adoption that firms

in Nairobi face to develop effective support system and policies. Kumbo (2024) studied about elevating Tanzania's Tourism: Integrating GIS, AR and AI for Immersive Exploration and Promotion. The study concluded that by integrating GIS, AR, and AI technologies, Tanzania's tourism promotion system offers tourists a dynamic and immersive way to explore the country's rich cultural and natural heritage. Through interactive experiences, virtual tours, personalized recommendations, and seamless access to information, tourists can enhance their understanding, engagement, and enjoyment of Tanzania's diverse attractions. This enriches individual travel experiences and contributes to the sustainable growth and promotion of tourism in Tanzania. The implications for local communities and business are not discussed in depth. The study should elaborate on ways the integration of these technologies contribute to environmental conservation and responsible tourism practices.

2.3. Health technology

Hannes (2021) studied about shaping digitalization among German tourism service providers: Processes and implications. The study concludes that the expansion of time, financial, and human resources for the development of an internal digital environment is particularly important. Workflows and work processes must be reorganized; digital marketing and sales concepts, as well as operational measures, must be developed and expanded; and data analysis must be improved. The study recommended that policymakers can take action to provide greater support and to overcome the backlog, especially which revealed during the pandemic. There is little discussion in the involvement of various stakeholders in the process of digital transformation.

Szromek (2022) assessed the level of adjustment of the activities of health tourism and hospitality enterprises to the sustainable. The results indicated that only every other surveyed health resort entity implemented a sustainable development system or program. Most health resort entities undertook initiatives to support the local community in the field of education, health, sanitary safety and mitigating the negative effects of climate change. The study recommended including environmental issues in the business models of health tourism entities, e.g. by including them in the strategy, including mission, communicating pro-environmental goals and actions to stakeholders, and applying environmental management systems and concepts. The study doesn't address how to gauge how successful sustainability initiatives are.

Jiang and Phoong (2023) analyzed the impact of digitalization on the social and economic sustainability of the tourism industry via systematic literature network analysis. The findings indicated that digitalization impacts economic sustainability, encompassing economic benefits in tourism product development, tourism consumption, and industrial development. Moreover, digitalization fosters social development, cultural awareness, and tourism participation in digital technology and cultural heritage. The study doesn't address how to measure how digitization affects social and economic sustainability.

Moses (2024) explored links among Economic (ECD), Environmental (ED), Social (SD), Technological (TD) dimensions, and Sustainable Road Transport Infrastructure (SRTI). Results reveal technology positively mediates relationships between economic, environmental, social dimensions, and sustainable road transport infrastructure. Findings emphasize technology's crucial role and the potential of technological advancements to enhance sustainability. The study recommends that road transport infrastructure development agencies prioritize the integration of sustainability factors, particularly technology in projects. It is rarely discussed how to measure how technology affects the sustainability of transportation infrastructure.

3. METHODOLOGY

This study used a desk methodology. A desk study research design is also known as secondary data collecting. This is essentially the collection of data from existing resources, preferably at a lower cost than field research. The primary sources of research were gathered from these literature materials. A qualitative approach was utilized in this research, focusing on analyzing and interpreting the gathered information. The researcher relied on secondary sources, including relevant and reliable documents that were deemed suitable for the research objectives. The data collection technique employed was documentation, wherein the researcher gathered information from various written sources. Content analysis was utilized as the method for analyzing the data obtained from the library research. Content analysis involves several procedures aimed at deriving accurate conclusions from statements within the collected documents.

4. RESULTS AND DISCUSSION

4.1. Solar panels

The relationship between solar energy and travel is becoming more and more significant as global tourism grows. Carbon emissions from the tourism industry can be significantly reduced. Solar energy helps lessen the effects of climate change because it generates clean electricity without releasing greenhouse gases. Between 2011 and 2019, China's tourism sector grew rapidly in consecutive years. Resolutely, tourism revenue soared to a record-breaking 5.725 billion RMB in 2019. In 2021, there were 3.246 billion domestic visitors from China, and domestic tourism revenue (total tourism consumption) reached 2.92 trillion RMB20, despite the devastating effects of COVID-19.

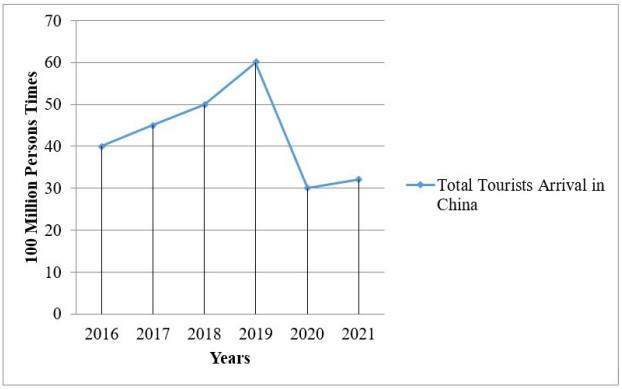

Figure 2. Tourism in China
Source: Yu and Gao (2023)

Solar power installations are becoming more and more common in Malaysian homes and businesses. The sun emits an enormous amount of energy every day. In 2023, Malaysia's solar energy capacity was roughly 1,933 megawatts, which was the same as the year before. Over the past ten years, the nation's solar energy capacity has grown, rising from 205 megawatts in 2014 (Siddharta, 2024). The percentage of domestic travels made in 2021 for the purpose of visiting friends and family was much lower (24.2%) than it was in 2019 before the pandemic (42.3%). This resulted from then-existing travel restrictions between states and districts. However, there was an increase in domestic visitor travel for entertainment/attending special events/sports (5.4%) and medical treatment (10.3%) when compared to 2020.

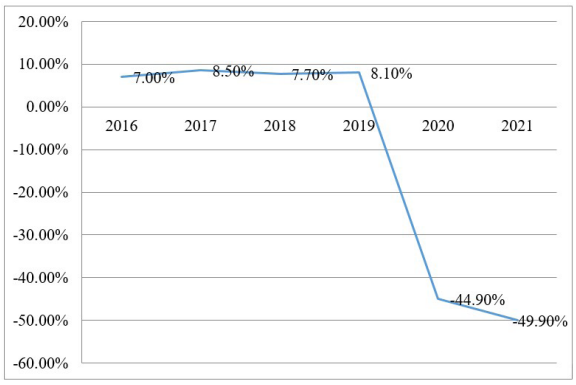

Figure 3. Malaysia's Domestic Visitor Arrivals (2012-2021)
Source: Tourism Malaysia (2021)

Domestic travelers with household incomes between RM5, 001 and RM10, 000 contributed the most to domestic travel in 2021, accounting for 30.4% of all visitors, compared to 23.3% prior to the pandemic in 2019. The reason was the country's border closure, which prevented Malaysians from traveling abroad. Domestic travel by households with incomes between RM1, 001 and RM3, 000, however, fell 6.4% to 29.3% from 2019. Mauritius' tourism sector has significantly outperformed global statistics by a factor of two, with a 97% recovery in 2023 compared to 2019 and a 100% recovery in the first quarter of 2024 compared to the corresponding period before the pandemic. The tourism industry is promoting the use of solar energy, as many Mauritius hotels and resorts have installed solar panels on their rooftops to generate electricity for their own use.

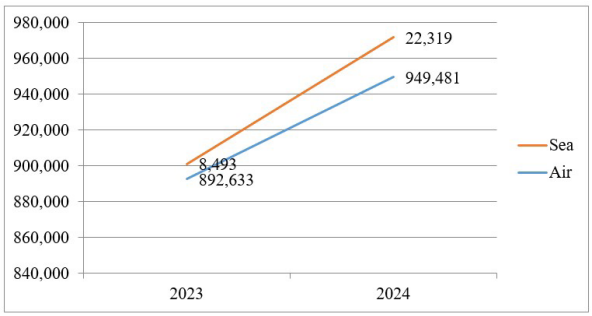

Figure 4. Total Tourist Arrivals: YTD 2024 September
Source: Ministry of Finance and Economic Development: Statistics Mauritius (2024)

There were 110 hotels with 13,248 rooms in Mauritius as of September 2019. The average room occupancy rate for the big resort hotels was 72% in the first nine months of 2019 as opposed to 75% in the same time frame in 2018. During the same nine months in 2019, visitors stayed an average of 10.8 nights. The solar energy sector is growing in Tanzania. Clean energy resources abound in the country, including hydropower, wind, and solar, the latter of which has expanded at the fastest rate in recent years. National parks are adopting solar energy and installing solar panels to power park facilities in an attempt to reduce their reliance on diesel generators. Tanzania's dedication to clean energy and environmental preservation is demonstrated by the government's support of solar energy projects like the Kilwa Solar Plant and Serengeti Solar Park. A record 1,808,205 tourists visited Tanzania in 2023, up 24.3% from 1,454,920 in 2022, 922,692 in 2021, and 616,491 in 2020.

4.2. Artificial intelligence

Travel is one of the many industries that AI is transforming. U.S. tourist destinations are using artificial intelligence (AI) to collect and analyze real-time data on visitor flows, weather, transportation availability, and other relevant factors to manage visitor flows, prevent traffic, and enhance the quality of the visitor experience.

By using artificial intelligence in sustainable tourism, more potent systems that can store and process amounts of data, analyze amounts of data, and learn from their own and others' experiences in fulfilling customer orders can be developed. These systems will be able to generate a customized product far more quickly than traditional search technologies. Artificial intelligence technology has transformed many facets of our lives, including travel, healthcare, education, manufacturing, lifestyle, and more (Zhang & Zhongli, 2019). The travel and hospitality industry is among the first to adopt new technologies like robotics and artificial intelligence (AI). The development of smart destinations has fundamentally altered the travel and tourism sector by improving operational effectiveness and customizing travel experiences.

The use of Artificial Intelligence (AI) technology in the creation of smart destinations has given the tourism sector the opportunity to rethink and redevelop travel in a way that is both technologically advanced and environmentally conscious. The way people travel and engage with their surroundings is being altered by technology and digital connectivity. It was estimated that 56% of foreign visitors to the UK use location technology to find attractions while on vacation, and 85% of them plan their trips online (OECD, 2020).

4.3. Health technology

Technology changed the medical tourism landscape in emerging markets by expanding access and creating new care options. The development of medical technology is a major driver of health tourism. The emergence of online platforms made it easier to locate healthcare options abroad. Patients can easily read reviews, make appointments, and compare clinics, hospitals, and costs. For example, a U.S. patient may use an online market place to arrange knee replacement surgery in Thailand. Idoko (2024) revealed that advances in health information technology

(HIT) have transformed nursing practice in the United States and fueled improvements in clinical decision-making, patient care, and overall healthcare efficiency. HTA has been formally integrated into coverage decisions in Thailand through the National List of Essential Medicines and the Universal Health Coverage Scheme benefits package (Leelahavarong, 2019).

The Italian Medicine Agency (AIFA) published the first Guidelines for the economic evaluation of new health technologies in Italy in May 2020. Block chain technology is revolutionizing the exchange and storage of medical records while also enhancing patient data security, privacy, and international sharing. An Italian patient can safely share their medical history with an Indian specialist via a block chain-based health information exchange, resulting in a smooth course of treatment. When fiscal impact and indirect costs are taken into account, the gradual adoption of QIVc as a seasonal influenza prevention strategy among Italian healthcare workers may have favorable economic effects (Calabrò, 2024).

German businesses are leading the way in creating innovative digital health solutions by combining cutting-edge technology with conventional wisdom from the healthcare sector. Establishing an environment that encourages the conduct of rigorous research, makes knowledge translation easier, and incentivizes innovative medical technologies according to their added value is necessary for the dissemination of valuable health care (Dreger, 2021). The precision of medical care is being improved by AI-driven diagnostic tools and treatment recommendations. Even for patients seeking care overseas, machine learning algorithms can evaluate enormous volumes of medical data to help with treatment planning.An AI system that assists a German clinic in creating a customized cancer treatment plan could be advantageous to an Australian oncology patient. Age and gender differences in the use of these technologies persisted, with one exception: there were no gender-specific differences in VC usage (Hannemann & Babitsch, 2023).

4.4. Discussion of the results

4.4.1. Solar panels

Sustainability can result from using solar energy in tourism operations. This is confirmed by the study done by Chisika and Yeom (2021) found that there are many social, economic, and environmental benefits associated with using solar power. By using solar energy, hotels, resorts, and attractions can lower their carbon footprint and attract eco-aware travelers. The pandemic has led to an increase in the use of technology in the travel industry, including virtual experiences and online reservation systems. Future travel in China is probably going to be influenced by ongoing innovation.

Technological advancements in solar energy storage and efficiency may result from the expansion of the solar industry, making solar energy more feasible and appealing. The increase in domestic travel for entertainment and events suggests that event tourism may grow. Investment in healthcare facilities and services may rise as a result, which would benefit the medical tourism sector. These are accepted by the study done by Kuskaya (2023) demonstrated that solar energy consumption can have reducing effects on CO2 emissions at lower frequencies (longer-term cycles) and sub-time periods in the USA.

Higher income groups may continue to place a higher priority on domestic travel even as international travel options reopen, which could result in long-lasting shifts in consumer behavior. The rise in domestic travel has the potential to improve domestic travel standards by attracting tourism and local government investment. A commitment to environmentally friendly travel is shown by the use of solar energy to power pick facilities. This strategy can improve the experiences of tourists while reducing the negative environmental effects of tourism. These are supported by the study conducted by Raihan and Tuspekova (2022) indicated that on low-carbon economies, renewable energy use, sustainable urbanization, green industrialization, eco-friendly tourism, climate-smart agriculture, and sustainable forest management, all of which could help to accomplish environmental sustainability by lowering emissions

4.4.2. Artificial intelligence

AI integration in the travel sector frequently yields advantages like better visitor management, increased safety, personalized experiences, and environmentally friendly procedures. This linked with the study done by Kumbo (2024) indicated that by integrating GIS, AR, and AI technologies, Tanzania's tourism promotion system offers tourists a dynamic and immersive way to explore the country's rich cultural and natural heritage. As this technology becomes more widely used, travel can become more efficient and pleasurable. Businesses can stand out in a crowded market by utilizing AI technologies in sustainable tourism. Providing creative, personalized solutions can draw in tech-savvy customers seeking out cutting-edge travel experiences.

AI improves the efficiency of resource management at tourist destinations. Technology and the integration of digital technology are changing how people travel, which highlights the need for travel agencies to improve their digital strategies, interact with tourists in an effective manner, and adjust to the changing travel planning and experience landscape. These are related with the study carried out by Genç (2020) revealed that The presence of artificial intelligence has created a new opportunity for tourism where economic, social and environmental benefits can be obtained, therefore local and regional governments should promote the applications regarding to artificial intelligence as well as encouraging national and international stakeholders to invest in artificial intelligence induced smart tourism sector.

4.4.3. Health technology

Patients can easily obtain information about overseas care thanks to online platforms. Innovation in data management, patient care, and service delivery can be promoted by incorporating block chain technology into the healthcare industry. Szromek (2022) indicated that only every other surveyed health resort entity implemented a sustainable development system or program. Most health resort entities undertook initiatives to support the local community in the field of education, health, sanitary safety and mitigating the negative effects of climate change.

Modern digital health solutions frequently give patients the self-assurance to take an active role in their care. Patients can make better health decisions if they have access to information and self-monitoring tools. These are in agreement with the study done by Jiang and Phoong (2023) indicated that digitalization impacts economic sustainability, encompassing economic benefits in tourism product development, tourism consumption, and industrial development. The use of AI in treatment planning fosters global collaboration among healthcare providers. Clinics can share treatment plans and knowledge, enhancing the standard of care and promoting global best practices. Moses (2024) emphasize technology's crucial role and the potential of technological advancements to enhance sustainability.

5. CONCLUSION

There are numerous social, economic, and environmental advantages to using solar power, such as reducing carbon footprints and drawing in low-budget tourists. Artificial intelligence (AI) is revolutionizing travel by improving visitor management, boosting safety, and producing personalized, eco-friendly experiences. Incorporating online platforms into healthcare improves patients' access to information about care abroad and helps them make well-informed decisions. Through easily accessible information and self-monitoring tools, contemporary digital health solutions enable patients to actively participate in their care, promoting increased confidence and facilitating well-informed health decisions. AI improves health outcomes by helping to standardize care and adopt international best practices.

RECOMMENDATIONS

The study recommends that the development and integration of renewable energy sources, like solar, wind, and hydropower, into the energy mix should be given top priority by government and tourism companies. Programs supporting sustainable agriculture and forestry conservation/reforestation should be put into place. Strategies to balance economic development and environmental sustainability should also be put into place such as encouraging eco-tourism, efficient manufacturing, and sustainable urban planning. The Ministry of Tourism of Tanzania should promote the use of AI technologies in the creation, use, and manufacturing of tourism products.

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