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Adoption of artificial intelligence and augmented reality for smart tourism in Kerala

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I Introduction

Kerala is the first Indian state to designate tourism as an industry, and it is widely acknowledged as one of the country's top tourist destinations worldwide. Kerala is greatly benefited by tourism as it serves as major source of employment, income and thus a major contributor to the GSDP of the state. An estimated number of 1.5 million people are employed by the sector both directly and indirectly and it contributed approximately 8 per cent of the Gross State Domestic Product (GSDP) in 2019 (Government of Kerala, 2022). With a total accrued revenue of Rs. 12285.91 crore in 2021, it has made a major contribution to the Kerala State's economy. In 2021, the number of international tourists arrivals in the State declined by -82.25 percent compared to the year 2020. However, the number of domestic tourists arriving in 2021 exhibited a positive trend of 51.09 per cent (Government of Kerala, 2023).

The tourism sector in the State has been experiencing several unprecedented financial setbacks as a result of the Covid-19 outbreak. The State tourism business incurred a substantial loss of Rs. 20000 crores in the fiscal year 2020-21 itself. The total influx of international tourists to the State experienced a significant reduction of -71.36 percent, dropping from 11.89 lakh in 2019 to 3.4 lakh in 2020. The entire revenue generated from tourism in the year 2020, amounted to only ₹11,335.96 crore, indicating a significant decrease of -74.81% compared to the previous year (Government of Kerala, 2022). The State has implemented several initiatives primarily aimed at enhancing connection through infrastructure development and marketing in order to revitalize the sector. However, it is

imperative to prioritize the marketing efforts due to the escalating rivalry from the competing states and countries. However, it is imperative to prioritize the marketing efforts due to the escalating rivalry from the adjacent states and countries.

Hence, it is imperative to modify policies in order to achieve the objectives outlined in SDG – 9, which calls for includes constructing a robust infrastructure, promoting an inclusive and sustainable industrialization, and fostering innovation. These adjustments would also aid in maintaining market stability of tourism. The issues faced by Kerala tourism include the need for ongoing innovation in structured tourism products and experiences, as well as the requirement for an adequate supply of competent and trained workers (Economic Review, 2022). For maximizing tourism's socio-economic benefit while minimizing its potential negative repercussions is crucial for the tourist sector for attaining sustainable development goals. Studies indicate that there is significant potential for utilizing Artificial Intelligence in understanding visitors' satisfaction, travel and accommodation booking and the like. Additionally, there is a wide scope for implementing augmented reality (AR) technology to improve tourists' experience in exploring knowledge, exhibitions, mobile multimedia, cultural tourism guidance, museum guidance, and other related areas (Hannam, Butler, and Paris, 2014; Mekni and Lemieux, 2014; Sanna and Manuri, 2016). This article explores the potential of harnessing Artificial Intelligence (AI) and Augmented Reality (AR) technology in sustainable tourism practices to promote smart tourism in the State and thereby to attain the Sustainable Development Goals (SDGs) in the post-pandemic period.

This study aims to seek answers to the following specific questions; 1) What are the government's policy initiatives in the adoption of cutting-edge technologies to achieve sustainable tourism development in the State? 2) To what extent AI and location-based augmented reality (AR) are used to promote smart tourism in Kerala? Although preliminary, the study questions are pertinent to both the academic field and the tourism business alike. The purpose of this study is to examine the extent of these inquiries by employing conceptual methodologies. Moreover, it tries to review the existing innovative technologies adapted in the State tourism industry so far.

II Tourism Policies of Kerala and Sustainable Development Goals (SDGs):

The state of Kerala designated the tourism sector as an industry way back in the year 1986, recognizing its significance and potential in facilitating economic growth and development. Therefore, the Kerala Government has at the outset implemented policies aimed at fostering alternative forms of tourism in the state. Accommodation and other infrastructure facilities have been regarded as critical components of the state's initial tourism policy since 1995 (Kerala State Planning Board, 2017).

From the ninth five-year plan (1997-2002), the administration began to carry out policies for the preservation of historical sites and investigated the potential for eco-tourism operations in the State. The tourist department used the Millennium Development Goals (MDGs) to raise finances throughout the eleventh five-year plan period, which ran from the year 2007–08 to 2011–12. During these times, the measures for responsible tourism as well as the conservation, preservation, and promotion of culture and history were the priorities.

In 2001, the State government created Tourism Vision 2025, with the goal of implementing short, medium, and long-term strategies to increase the sector's vibrancy and dynamism. The main focus areas included creating jobs, preserving and promoting cultural heritage, providing high-quality services, developing infrastructure with private investment, backwater tourism promotion, Ayurveda oriented medical tourism and related forms rooted in nature.

In 2003, the Government of India launched a rural tourism project in 27 States as part of the Endogenous Tourism Project - Rural Tourism Scheme (ETP - RTS), in partnership with the United Nations Population Fund (UNDP) (Ministry of Tourism, 2008). "A type of tourism activity in which the visitor's experience is related to a wide range of products generally related to nature-based activities, agriculture, rural lifestyle/culture, angling, and sightseeing," is how the United Nations World Tourism Organization (UNWTO, 2021) defines rural tourism. Rural tourism has four main components. These are experiences, community-based traits, sustainable development, and location (Rosalina, Dupre, and Wang, 2021). Kerala's Rural Tourism Initiative began at the coastal village of Kumbhalanghi in the Ernakulam district and became the State’s first tourism village. As a part of the ongoing tourism development projects, more such villages are currently marketed as rural tourism attractions or destinations.

The Kerala Responsible Tourism (RT) programme, started in 2008, is responsible for implementing community participation in tourism development. The three main focus of responsible tourism are social, environmental, and economic responsibility. Consequently, the local community experiences economic, social, and environmental benefits, with UNWTO recognizing the tangible results of these efforts. Among the several national and international honors bestowed upon the Department of Tourism, Government of Kerala, received the esteemed Ulysses Award for Responsible Tourism Project in Kumarakom, which was given in 2013 in the area of Innovations in Public Policy and Governance (Working Group Report on Tourism, 2017).

The Kerala government announced a comprehensive tourism policy in 2012, with five focal goals: 1) Creating a quality visitor experience; 2) Tourism benefits the community; 3) Creating an environment that encourages investment; 4) Establishing a stable market; and 5) Developing quality human resources. The goal of this policy being to achieve sustainable development in the tourism industry. Furthermore, the strategy underscored the importance of prioritizing the local community in the State's tourist development to maximize the advantages to the community on a social, economic, and environmental level.

During the twelfth five-year plan era, eco-tourism projects were introduced in the State as a component of sustainable tourist development. "Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education" is how the International Eco-Tourism Society (2015) defines eco-tourism. It centers on exploring natural regions to gain knowledge of the local environment, wildlife, plants, and cultural artefacts of the area. More people are travelling as a result of eco-tourism initiatives than any other kind of travel.

A strategic approach to tourism was developed in the Kerala State Planning Board's perspective plan 2030 in 2014, with the goal of promoting tourism development in the state in a way that maintains harmony with the environment, economy, and society. It is based on six main pillars: local government ownership, skill development, research, social issues, the environment, and the economy.

The 2017 Tourism Policy seeks to establish safe, secure, and tourist-friendly sites as well as to create the Kerala Tourism Entrepreneurship Fund (KTEF) and create an action plan for the growth of sustainable tourism. The Kerala government recently unveiled its "Keravan

Kerala" caravan tourism policy for 2021, which promises the travelers a personalized, safe, and environmentally friendly travel experience that caters to their interests during the tourism season. Caravan parks and tourism caravans are its two main constituents. It takes into account promoting eco-friendly practices, the market for locally produced goods, and responsible tourism activities for the benefit of the neighborhood and sustainable growth. Additionally, the tourism department announced destination wedding in three centers namely, Thiruvananthapuram, Kochi and Alappuzha in November, 2023, which is also a flag-ship program of the same.

In summary, the government targets niche tourism, promising visitors a safe, customized, and close-to-nature travel experience. These tourists exhibit characteristics of being more environmentally conscious, independent, flexible, and quality conscious than those who make up the majority of the mass market. This indicates that tourism is not treated as a public good. This is made clear by the three State tourism policies (1995, 2012, and 2017), the state's Vision 2025 documents, and the Caravan tourism policy of 2021. The government has made large investments in the tourism industry considering its immense potential in the state.

III Technology adaptation in the State tourism industry

Kerala is well-known for its policy initiatives aimed at harnessing the tourism industry's potential. However, the industry has been struck the most by the Covid-19 Pandemic, with low foreign remittances and severe job losses. Continuous innovation in organized tourism products and experiences is considered essential to revitalize the sector during the epidemic phase. It is suggested to incorporate the use of technology such as AI in the sector, particularly Augmented Reality (AR), which would create a welcoming and safe environment, as well as provide a very interactive medium for tourists, while also addressing a large audience (Vlahakis, Ioannidis, Karigiannis, Tsotros, Gounaris, Stricker, Gleue, Daehne, and Almeida, 2002; Attila and Edit, 2012; Kounavis, Kasimati, and Zamani, 2012). In this regard, the study attempts to bring to light the existing new tourism-related technologies.

In recent past, the State has implemented several cutting-edge marketing strategies such as digital and social media campaigns, utilizing technology to effectively draw in a larger number of visitors and successfully establish Kerala as a recognized brand in the sector of tourism activities. The "Human by Nature Campaign" was launched to highlight the culture

and daily lives of the people of Kerala. This initiative aimed to revive the tourism sector, which had been adversely affected by the 2018 flood and the intermittent breakout of the Nipah virus. According to the Economic Review of 2022, around 3.10 crore individuals viewed this campaign online and has been successful in emancipation of tourism sector in hard times.

The Kerala tourism department has a YouTube channel with over 30 million subscribers to promote tourism activities in the State. Additionally, it has created an electronic collection for its tourism videos. The department has developed a resource mapping system for certain destinations and utilized geo-tagged mobile camera photos for QR code implementation. The collective endeavors have effectively enticed 4.4 million tourists from 15,000 places throughout the globe to visit the State as part of the post-flood campaign. In addition, the Kerala tourist website offers up-to-date information about destinations, hotel options, tour operators, and more in a well-organized and visually appealing manner (Kerala tourist Department, 2022).

The Tourism department of Kerala used an additional advanced method by introducing an official tourism application named 'Kerala Tourism software'. This software offers guests staying in the area information on surrounding attractions. Additionally, it provides access to the photographs and films showcasing well-known tourism attractions inside the State. The purpose of the app is to facilitate the arrangement of trips by providing a trip planner and information on significant forthcoming events in the industry. Additionally, it disseminates information and graphics about recently discovered sites (Tourism Department, 2022). The findings from the telephonic interview with the tour guides, focus group discussion, participatory discussion, and key informant interview indicate that the application is not well-liked by visitors due to its significantly low performance rating.

In order to promote cultural tourism, a new mobile application named 'Expressions' has been released. This programme provides mini movies of Kerala art forms as an alternative to smileys. It is showcased in the diverse traditional art forms of Kerala, such as Kathakali, Thullal, Mohiniyattam, Kudiyattam, Koothu, and Nangiar Koothu. The art form's name and the artist's name are displayed at the conclusion of the video, and it can also be shared on social networking platforms.

The application 'Kerala Tourism and Tourist Places' was built by the department of tourism to provide information about the appealing destinations in the State. It provides a substantial amount of data on this subject. However, it is not exempted from criticism due to its absence of tailored advice and inadequately categorized data.

The 'Muziris Virtual Tour Guide' is a mobile application that serves as a personal guide for travelers visiting Muziris. This is a dedicated Augmented Reality travel application specifically designed for the Muziris Project. It offers several features to aid tourists, including transport and hotel booking services, as well as an augmented reality street view function. This application provides users with the opportunity to explore the historical background of a location, delve into the complexities of its art or monuments, and view videos and photographs related to the site of interest. This application encompasses a total of 12 distinct geographical areas and offers an unprecedented and exceptional travel and sightseeing experience to all visitors. It offers a virtual tour guide that is easily accessible to guests.

The Tourism department of the State has implemented several significant technology-based innovations to help promotion of tourism activities. The existing literature indicates that there is significant potential for utilizing Artificial Intelligence in understanding visitors' satisfaction, travel and accommodation booking and the like. Additionally, there is a wide scope for implementing augmented reality (AR) technology to improve tourists' experience in exploring knowledge, exhibitions, mobile multimedia, cultural tourism guidance, museum guidance, and other related areas (Hannam, Butler, and Paris, 2014; Mekni and Lemieux, 2014; Sanna and Manuri, 2016). This can be achieved by utilizing augmented reality (AR) to enhance the spatial location, description, and elaboration of tourist destinations, as well as for transportation and travel booking purposes. Furthermore, it demonstrates that the integration of AR technology has led to a substantial enhancement in performance for modern smartphones and tablets, which frequently come equipped with GPS sensors and high-speed network connections.

IV Application of AI and location-based augmented reality technology to Promote Smart Tourism in Kerala

Amidst the pandemic, there has been a decline in tourism activity in the State (Economic Review, 2022). In a number of countries, the adaption of AI and AR technology in tourism

activities has bolstered the sector's resilience, enabling it to maintain a growth trajectory even during the pandemic phase. The purpose of this section is to undertake a review on the use of artificial intelligence in the tourist industry in order to emphasize the necessity of adopting AI in order to improve tourism activities in the state during the post-pandemic phase. In the field of tourism research, AI studies have been utilized for a variety of purposes, such as forecasting the occupancy of hotels and the demand for tourism; managing resources in the tourism sector; evaluating social network information and online feedback (Kirilenko et al., 2018); determining the total number of travelers and the volume of tourists; and gauging visitor satisfaction (Casteleiro-Roca et al., 2018; González-Rodrguez et al. According to Inanc-Demir and Kozak (2019), AI is widely seen as having the potential to revolutionize the operational and marketing responsibilities of tourist groups and destinations.

Augmented Reality on the other hand, is the utilization of real-time data, such as text, visuals, audio, and other virtual upgrades, combined with physical things in the actual world. This distinction from virtual reality lies in the incorporation of real-world elements. Augmented reality (AR) can be utilized as an interactive tool to integrate virtual world data into the physical world. It can offer comprehensive information about a particular location, including details about real-world elements such as rivers, trees, exotic plants, animal species, buildings, historical and archaeological sites, and other aspects associated to a tourism destination. It is observed that these AR enabled technologies can have wide spread application in the promotion of smart tourism activities in the State.

Instead of offering traditional printed materials such as pamphlets, brochures, or tourist guides, or even providing signage in the local language, individuals have the option to explore and experience a captivating tour at their own pace and without a guide (Kounavis, Kasimati, and Zamani, 2012; Hannam, Butler, and Paris, 2014; Mekni and Lemieux, 2014; Sanna and Manuri 2016). There are two distinct categories of augmented reality (AR) applications for tourism: Marker-based AR and Marker less-based AR. In marker-based Augmented Reality (AR), users are able to designate and distribute a point of interest (POI) using Augmented guides. Furthermore, multimedia items can be enhanced by handwritten annotations and comments. Marker less augmented reality encompasses four distinct types: location-based AR, projection-based AR, overlay AR, and contour AR. Marker less augmented reality (AR) technology enables the placement of virtual 3D objects in the real-world environment by analyzing the features detected in the live data. Geo-location-based

augmented reality involves incorporating features of augmented reality that are specifically tied to a real-time location. AR-compatible devices, including smartphones, enable users to access digital data that is effectively retained inside the physical environment. Pokémon Go, a smartphone game, exemplifies the widespread use of location-based augmented reality (AR). Location-based Augmented Reality is considered to be a highly effective and efficient technique for implementing sustainable tourist practices, such as eco-tourism, responsible tourism, village tourism, agricultural tourism, and others, inside the State.

The combination of an augmented reality (AR) mobile application, advanced hardware technology, a smartphone, and reliable internet access can provide a captivating visual experience and enrich a tourist's understanding of a location. By utilizing augmented reality (AR) applications, individuals or groups can independently navigate to their desired destination, select and book a hotel according to their preferences, and even locate and hire a taxi using the same technology. The augmented reality (AR) application should possess a high degree of user-friendliness and simplicity. There must to exist a rudimentary edition as well as a more sophisticated edition that offers paid amenities. The standard edition can be made available to domestic tourists, while the premium edition can be offered to both international tourists and those in need, including visitors from outside Kerala, India, and other regions. Prior to commencing the self-guided tour, it is necessary to input the information from the AR-enabled app into the AR-cloud of the Kerala Tourism website or a local server. This information should then be reviewed by specialists from various fields and consolidated in a single location.

It is however argued that incorporating technology into tourism promotion, India is not attracting tourists globally (Reejo, 2023). Currently, the Indian tourism industry is behind in adopting augmented reality technologies into its main array. The country can implement policies to use Augmented Reality technology in tourism, providing visitors with information on location, description, transportation, travel booking, and accommodation, resulting in significant earnings (Reejo, 2023).

V Future research agenda

It is viewed that AR-based technological circuits must be implemented in every tourist destination in Kerala State, which is a participant in sustainable tourism efforts. The interactive interface will be enhanced to provide travelers with a more enjoyable and

immersive experience. Multiple AR-enabled tourism venues can be combined to create an AR-Tourism Circuit. This will generate revenue for the State treasury through several channels. The integration of AR technology will amplify the tourism capabilities of the chosen places, allowing individuals from across the globe to view AR-enhanced virtual tours of key tourist spots directly on the official website of the tourism department. The service can be activated upon payment of a reasonable price, which must be paid by the tourist themselves. By employing skillful and technology methods, tourism can be enhanced without causing any harm to the natural environment and its stability. Therefore, it is imperative to implement AI and augmented reality (AR) technology efforts in the near future. The development of AI and AR technology will play a crucial role in leading the State towards the goal of establishing sustainable tourism.

VI Conclusion

The study demonstrates that the State has implemented several initiatives since the ninth five-year plan (1997-2002) to achieve sustainable development in tourism. It encompasses various forms of alternative tourism initiatives, such as rural tourism, responsible tourism, and eco-tourism. These initiatives aim to ensure economic sustainability by generating income, benefiting the local community, providing high-quality employment, promoting social equity, maintaining a safe environment for visitors, enhancing community well-being, preserving cultural heritage, and protecting the environment. Put simply, the State Tourism initiatives have the potential to meet the objectives outlined in Sustainable Development Goal (SDG) – 8 (inclusive and sustainable economic growth), SDG – 12 (sustainable consumption and production), and SDG – 14 (the sustainable use of oceans and marine resources) of the United Nations' 2030 Agenda for Sustainable Development, established in 2015. The State's sustainable tourism efforts involved the incorporation of novel technology such as Augmented Reality. This was achieved through the development of a smartphone application named 'Muziris Virtual Tour Guide'. Despite the State's implementation of technological inclusion in its tourism marketing plan, the efforts are deemed insufficient in attracting global tourists. As a result, it has been observed that the State policy initiatives should be improved by embracing innovative technologies such as Artificial Intelligence (AI) and Augmented Reality (AR) to promote smart tourism and, as a consequence, can attract tourists from all over the world in the post-pandemic era.

References

Attila, K., & Edit, B. (2012, September). Beyond reality: The possibilities of augmented reality in cultural and heritage tourism. *In 2nd International Tourism and Sport Management Conference, Debrecen* (Vol. 5, No. 6).

Government of India (2021). *India's climate vision – Success Story,* New Delhi.

Hannam, K., Butler, G., & Paris, C. M. (2014). Developments and key issues in tourism mobilities. *Annals of tourism research, 44*, 171-185.

http://dspace.iimk.ac.in/xmlui/bitstream/handle/2259/168/13-17.pdf?sequence=1&isAllowed=y (accessed on 21 September 2022).

Digital 2022: Global Overview Report

https://datareportal.com/reports/digital-2022-global-overview-report

(accessed on 23 September 2022).

https://economictimes.indiatimes.com/news/india/kerala-attracts-3-8-mn-domestic-tourists-in-q-1-2022-registers-72-48-per-cent-growth/articleshow/91793005.cms (accessed on 21 September 2022).

https://www.keralatourism.org/touriststatistics/ (accessed on 19 September 2022).

Kerala State Government (2001). *Tourism Vision* 2025. Thiruvananthapuram.

Kerala State Planning Board (2011). *Annual Plan Proposal.* Thiruvananthapuram

Kerala State Planning Board (2022). *Economic Review 2021*. Thiruvananthapuram.

Kerala State Planning Board (2023). *Economic Review 2022*. Thiruvananthapuram.

Kerala State Planning Board (2017). *Working Group Report on Tourism.* Thiruvananthapuram.

Kounavis, C. D., Kasimati, A. E., & Zamani, E. D. (2012). Enhancing the tourism experience through mobile augmented reality: Challenges and prospects. *International Journal of Engineering Business Management, 4*, 10.

Manuri, F., & Sanna, A. (2016). A survey on applications of augmented reality. *ACSIJ Advances in Computer Science: an International Journal,* 5(1), 18-27.

Mekni, M., & Lemieux, A. (2014). Augmented reality: Applications, challenges and future trends. *Applied computational science,* 20, 205-214.

Nair, L. R., & Dhanuraj, D. (2018). Kerala tourism–The role of the government and economic impacts. *Centre for Public Policy Research (Centre for Public Policy Research, Issue. C. f. PP Research.*

UNWTO. Rural Tourism. Available online: https://www.unwto.org/rural-tourism (accessed on 23 September 2022).

National Strategy Roadmap for Sustainable Tourism, (2021), Ministry of Tourism, Government of India, June 2.

Reejo, R. J. (2023). A Review on Marketing Tourism in the Era of AI: Future Scope for Sustainable Tourism in India. In B. Bhardwaj, D. Sharma, & M. Dhiman (Eds.), *AI and Emotional Intelligence for Modern Business Management* (pp. 321-347). IGI Global. https://doi.org/10.4018/979-8-3693-0418-1.ch021

Rosalina, P. D., Dupre, K., & Wang, Y. (2021). Rural tourism: A systematic literature review on definitions and challenges. *Journal of Hospitality and Tourism Management, 47*, 134-149.

Rural tourism scheme for infrastructure development scheme guidelines http://164.100.158.43/sites/default/files/Guideline_12.pdf.

Smith, V. L., & Eadington, W. R. (Eds.). (1992). *Tourism alternatives: Potentials and problems in the development of tourism.* University of Pennsylvania press.

Vlahakis, V., Ioannidis, M., Karigiannis, J., Tsotros, M., Gounaris, M., Stricker, D., ... & Almeida, L. (2002). Archeoguide: an augmented reality guide for archaeological sites. *IEEE Computer Graphics and Applications*, 22(5), 52-60.

www.forest.kerala.gov.in (accessed on 23 September 2022).

www.ibef.org. (accessed on 23 September 2022).

www.ijisrt.com, volume 6, Issue 7 VR Kerala: An Integrated tourism application, July 2021. (accessed on 23 September 2022).