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SMART SUSTAINABILITY IN URBAN TOURISM: THE GRECO BEHAVIOURAL CHANGE FRAMEWORK

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Abstract — As the tourism industry continues to grow, urban destinations face multiple problems related to the social, cultural, natural, and economic environments. Use of smart tourism with digital technologies, therefore, plays a key role in mitigating multidimensional impacts that support a destination's sustainability. GreCO (Green Cultural Oases) is a collaborative project based on sustainability fundamentals (socio-cultural, environmental, economic) and technological advancements, for a smart tourist destination paradigm. This paper introduces the theoretical foundation of GreCO, which points out how smart systems change tourist behaviour to sustainable, responsible, community oriented ones. The analysis presentes that GreCO's model contributes to a shift in tourism, aligning a transition between personalisation and sustainability, and building a resilient urban tourism ecosystem.

Keywords — personalisation, smart tourism, stakeholder engagement, sustainable tourism behaviour, urban destination

I. INTRODUCTION

Over the past several decades, urban tourism has grown exponentially, exerting socio-cultural pressures, resource needs, environmental depletion, and clashes between residents and visitors on a growing scale (UNWTO, 2024). New frameworks will be required then to balance tourism growth with sustainability and urban resilience. Smart tourism destinations have arisen as a response to this challenge, combining technological advancements (IoT, AI, mobile applications, data analytics) to improve visitors' experiences and optimise destination management (Buhalis & Amaranggana, 2013; Gretzel et al., 2015). In the Municipality of Elliniko – Argyroupoli in Greece, the GreCO project (Green Cultural Oases) tries to create a sustainable smart urban destination model trying to fill that gap. Instead of treating smart technology and sustainability as toolkits, it builds an integrated approach around the 3 classical sustainability pillars: a) socio-cultural, b) environmental, c) economic for this rising destination. GreCO intends to influence both visitor behaviour and destination governance through a comprehensive sustainability framework structured around three broad areas of socio-cultural, environmental and economic pillars, through smart tourism technologies. The GreCO's theoretical framework is presented in this paper, explaining how smart tourism strategies lead to tourist behaviour change, offering a multi-dimensional model that can be replicated by urban destinations that strive to achieve sustainability.

II. LITERATURE REVIEW

A. Smart Tourism Destinations and Tourist Behaviour

Smart tourism destinations are formed through the integration of ICT infrastructures, sensor networks, cloud computing (Xiang & Fesenmaier, 2017), responsive data systems, and stakeholder engagement mechanisms leading to seamless, personalised, appropriate and contextually relevant tourism experiences (Buhalis & Amaranggana, 2013). Personalisation and data informed decision making through ICT facilitates tourism effectiveness, enhances visitor satisfaction, and helps in reaching sustainability targets (Neuhofer, Buhalis, & Ladkin, 2015). Recent research shows that smart destinations are spaces in which sustainability and technology work hand in hand, contributing to social, environmental, cultural and economic benefit when properly handled (Shafiee et al., 2023; Galvão, Brito e Abreu & Joanaz de Melo, 2024). Smart tourism systems are a major influencing factor on tourist behaviour, offering real-time contextual content, personalised recommendations, and

eco-friendly transport options, which can help create responsible routes for them (Gretzel et al., 2015). Personalization leads tourists to frequent unusual routes, connect with local people, and engage in sustainable development (Minghetti & Buhalis, 2009; Shafiee, Hasanzadeh & Darvishmotevali, 2023). What's more, smart technologies drive tourists from being passive consumers to active co-creators of their experience providing data and feedback to enhance the quality of the destinations to be visited (Neuhofer, Buhalis & Ladkin, 2015). Despite new literature on smart tourism, researchers point out that there is still a need for integrative frameworks integrating sustainability and smart systems in a comprehensive manner (Sánchez et al., 2023). The GreCO model fills this gap by connecting smart urban systems with the 3 traditional sustainability pillars and integrating them into a behavioural change framework. Through these integrations, GreCO introduces a holistic behaviour-oriented concept of smart destinations that combines technological knowledge with the canonical tenets of sustainability.

B. GreCO Theoretical Framework

The GreCO project seeks to establish a sustainable smart urban destination model based on three foundational sustainability pillars (socio-cultural, environmental, economic) supported by smart tourism toolkits, aiming at transforming tourist behaviour while enhancing community and destination resilience.

1. Socio-Cultural Pillar

Socio-cultural dimension in smart urban destinations refers to the preservation of cultural integrity and social harmony, and the strengthening of meaningful interactions between residents and visitors. Tourism research has repeatedly shown that socio-cultural sustainability is profoundly influenced by tourist behaviour, because patterns of communication, cultural awareness, and engagement fundamentally shape host–guest relations (Reisinger & Dimanche, 2010; Fan et al., 2022). GreCO recognises that socio-cultural challenges emerge not only from overt conflicts but also from possible mismatches in expectations, norms, and cultural practices that arise when culturally diverse tourists meet in urban destinations (Scherle & Nonnenmann, 2008). Cultural conflicts may be inevitable when cultural differences arise between tourists and local communities, especially when both tourists and communities lack cross-cultural adaptability (Reisinger & Turner, 2003). Within smart tourism environments, the socio-cultural pillar acquires a behaviourally responsive and technologically augmented character. In order to promote the socio-cultural sustainability in tourism, destination managers ought to minimise the negative socio-cultural impacts, while enhancing the satisfaction of tourists and the long-term competitiveness along with the economic destinations' development (Lu & Nepal, 2009). Smart systems can support this transition and smooth the relationships utilising personalised recommendations that reflect travellers' cultural backgrounds, linguistic needs, and social preferences (Minghetti & Buhalis, 2009). This personalisation supports intercultural competence, reducing misunderstandings and fostering respectful behaviour between tourists and residents (Ismail et al., 2020). Cultural context should be considered when designing and implementing solutions that incorporate smart technologies in order to enhance the user acceptance and satisfaction, indicating that cultural factors are crucial in shaping tourists' technology acceptance behaviours, especially in culturally diverse settings (Buhalis & Costa, 2006; Tsaur & Tu, 2019; Chen et al., 2023). By incorporating cultural analytics and AI-driven profiling, GreCO encourages visitors to engage with destinations in ways that respect local customs, minimise cultural friction, and enable deeper relational experiences.

2. Environmental Pillar

So far, environmental dimension in tourism sustainability has concentrated first on resource depletion mitigation, emissions reduction (Sun et al.,2024), as well as tourism effects on deforestation, water consumption, biodiversity displacement, etc. (Baloch et al, 2023). In contrast, in advanced urban destinations, environmental sustainability is increasingly seen as a data-driven behavioural. Energy flows, pollution, resources, etc. can be tracked, giving data to key stakeholders (Bibri, 2021) (e.g. tourists, residents, urban actors), providing real-time environmental information and sustainable choices (Nekmahmud, Ramkissoon & Fekete-Farkas, 2022). Internet Of Things (IoT) systems can collect data in near real-time to detect thresholds to help measure natural resources for environmental protection: traffic patterns, less energy consumption due to reduced gas consumption, and greenhouse gases (Zanella et al., 2014). The GreCO is, in line with this, focusing on exploring the monitoring and minimisation of tourists' environmental footprint and its impact, guiding ''tourist behaviour'' in the area. This approach is in accordance with the UNWTO (2024) that focuses on the participation of stakeholders (tourists) in driving the sustainability agenda. Leveraging technology (sensors, geospatial analytics, AI) the GreCO system provides individual recommendations and also minimises polluted routes, promoting sustainable travel while also reducing traffic congestion and carbon emissions (Suanpang et al., 2024; Mohammadian, 2024). In addition to the technological interventions, GreCO also emphasises active participation of tourists in environmental preservation which is part and parcel of awareness of their choices (Butler, 2023). This is consistent with the growing trends in smart destination management whereby digital intelligence, behavioural science and co-operation among the stakeholders are being leveraged to create adaptable, scalable and impactful sustainability strategies (Shafiee, 2023; UNWTO, 2024).

3. Economic Pillar

For a long time, the ability of tourism related activities to raise up the income and employment rates in local economies has been the driver for assessing the economic aspects of sustainability in the tourist sector (Bakalo et al., 2025). However, when it turns to smart tourism in urban destinations, the economic dimension of sustainability largely depends on digital connectivity, visitor engagement, and participatory value creation (Torres-Delgado & López Palomeque, 2018; Zhang & Li, 2022). The approach - in GreCO - operationalises this shift by promoting

mechanisms that strengthen the connection between tourists and local enterprises and SMEs. This is enabled through digital tools, experiential technologies, and gamification-based participation systems (e.g. rewarding systems), which emerge as a powerful driver for behavioural change in tourism, empowering motivational exploration, learning, and spending (Xu et al., 2017). In particular, GreCO offers gamification in destination experiences, motivating visitors to explore local businesses and engage with the community to support the local economy. This model supports the visitor experience and promotes community economy (Wells, de Salas & Hardy, 2022). GreCO also welcomes the digital transition of SMEs to becoming more resilient, echoing existing research indicating the need for technologically enhanced local entrepreneurship in sustainable destinations (Martínez-Ros, Orfila-Sintes & Nicolau, 2021). GreCO shows how coupling behavioural engagement and local economic development through smart tourism can lead to sustainable economic practices and enhance SME competitiveness, both of which can contribute to long-term economic prosperity of emerging urban destinations.

4. **Conclusion**s

In conclusion, by creating personalised itineraries, promoting sustainable mobility guidance, and offering real-time data, GreCO fosters sustainable tourists' behaviour. Leading to less crowded destination spots, engagement with local culture, provision of environmentally conscious decisions, etc. (Gretzel et al., 2015) definitely support an eco-conscious behavioural pattern. Smart systems enable tourists to actively engage in co-creation, participate in sustainability efforts, and support local communities (Neuhofer, Buhalis & Ladkin, 2015). Last but not least, GreCO's personalisation, adapted to cultural backgrounds, environmental monitoring, and economic gamification, encourages responsible behavioural change. Those strategies can support the advancement of long-term sustainability in destinations and push toward continual behavioural changes of tourists and local stakeholders, enhancing destination resilience (UNWTO, 2024).

C. GreCO and Shifts in Tourist Behaviour

GreCO fosters the emergence of the smart tourist, an informed and technologically enabled traveller who modifies their behaviour consciously in order to align with sustainability goals. Using things like personalised routing, providing sustainable guidance to explore urban settings, and real-time data on environmental pollution in a particular destination area along with indigenous cultural elements (Gretzel et al., 2015; Shafiee, Hasanzadeh & Darvishmotevali, 2023; Suanpang, Chutimaskul & Viriyasitavat, 2024), smart tourists can have a positive impact on nature. By tapping into AI-driven behavioural nudges, it can guide tourists to choose low-impact routes for travel with minimal carbon footprints, adopt eco-friendly practices (Mohammadian, 2024; Masmali, 2025), and make decisions which are compatible with ecological and socio-cultural objectives of the destination (Xu et al., 2017; Wells, de Salas & Hardy, 2022). Empirical evidence has confirmed that, when delivered repeatedly as sustainability-conscious nudges, participatory participation and individualised advice, environmental/social responsible behaviour can become naturalised over time, leading to sustainable behavioural change (Majid, 2024; Shafiee, 2023). Through combining these technical tools and behavioural ones, GreCO turns the tourists' attitude from passive customers into active, sustainability-oriented individuals. Moreover, GreCO's networked strategy is consistent with destination governance models that privilege cooperation between the government, SMEs and civil society (Baggio & Cooper, 2009). This multi-stakeholder engagement is crucial because it confirms that environmentally-friendly behaviours are perpetuated through systemic incentives, participatory monitoring and feedback loops that contribute to enhanced destination resilience overall (UNWTO, 2024; Romolini, 2025). The integration of technology-enabled personalisation and gamified engagement and co-created environmental stewardship makes GreCO a prominent model in changing tourist behaviour in a way that protects urban tourism ecosystems.

III.DISCUSSION

GreCO Project is primarily focused on how it can effectively contribute to the relationship between smart technology and sustainable urban tourism. GreCO will examine relationships and perspectives among behavioural science, digital systems, and sustainability not viewing them as three separate research areas. Today, such methodology is less common. A majority of previous research for the field of smart destinations has been interested in its technological capabilities and management, and the unique characteristics of emerging technologies, such as sensors, platforms and optimisation tools (Buhalis & Amaranggana, 2013; Gretzel et al., 2015), while the sustainability research has in general tended to treat all 3 (Social, Cultural, Economic) dimensions as independently researched domains, thus missing a relevant factor: the Behavioral Process that plays an important role crucial.

GreCO, however, shifts focus to the task of creating a smart destination strategy that takes a behavioural transformational lens. Seen through this lens, personalised guidance, digital nudging and participatory feedback mechanisms are not only useful tools but are shaping how touristic visitors perceive and approach their city surroundings. Collectively, these technologies can change how visitors experience a city. Rather than participate in the steady stream that followed the normal sightseeing paths, a traveller might tiptoe into a quiet side block, find a small workshop or linger in a café where the owner knows most customers by name. GreCO is getting into a larger discussion which is being catalysed by doing so. However, despite what some of our diagrams might look like, academicians have long argued that smart systems, human behaviour and sustainability impacts are all linked to each other (Sánchez et al., 2023). The threads are interwoven and, honestly, complicated, but they are there.

GreCO, rather than trying to eliminate that complexity, attempts to operate in and through that complexity. For example, its usage of up-to-date data presents an example of yet another kind of governance as it is responding to the needs of real-time events, and not simply being built with some agenda on board. A destination that has such tools would be able to respond more promptly to a sudden surge in a stretch of waterfront, to an increase in heat stress in a popular square, to a suddenly jolting visitor flow after a festival.

In this sense GreCO presents an alternative path to tourism management. Not a purely governed system; one that hears, adjusts and stays involved with the rhythms of the region. But there are several tensions that warp this picture. Personalised recommendations, ongoing monitoring and other issues naturally generate problems around data ethics, algorithmic transparency and level of trust that visitors place in such systems. The ability of tourists to easily adopt these technologies is in no way a given. And there are also uneven access and technology readiness disparities, which could exacerbate pre-existing disparities in who benefits from smart destination projects in terms of access, and technology literacy. Behavioural approaches like nudges or gamification do not lead straight to real lasting change of any kind if they aren't supported by institutional mechanisms or community standards. And that should all suggest that any consideration of the socio-technical limitations of convergence of smart and sustainable strategies in any attempt to do so, should be included in the discussion. GreCO's emphasis on mutual assistance in terms of local governmental bodies, SMEs, individuals and tourists is followed up by governance. This kind of citizen-generated data and participatory monitoring can be seen as an example of more participatory decision making within destinations, leading to changes in policy that are in keeping with cultural requirements and environmental cues, changing visitor behaviours. This places GreCO within the broader intellectual debates on smart city governance and participatory and equitable modes of data capture. In summary, the GreCO model demonstrates how smart systems can provide practical support for the integration of sustainability practice (as opposed to its being a discrete component). This allows for co-creation and promotes adaptive governance and provides a models that other destinations could readily adopt; however, they come with shortcomings in implementing these in-custom experiences with a unique focus on sustainability triggers. The broader takeaway is that sustainable smart destinations are about so much more than a technical breakthrough. It necessitates a thorough understanding of the entanglement of institutional contexts, human behaviour and digital technologies. GreCO has a value for how all but the best, most perfectly integrated pieces could come together, to push urban tourism towards tending to the long-term health and well-being in cities.

IV.IMPLICATIONS

A number of important implications for the theory, destination management, and policy development of sustainable smart urban tourism are implied by this study. Theoretically, GreCO constructs a logical framework that links the traditional pillars of sustainability and the science of behavioural analysis and digital infrastructures. As other studies have tended to treat smart technologies and sustainability as separate categories, GreCO reveals that behavioural levers – personalisation, digital nudges, and participatory engagement – emerge as an interconnected dot that allows smart solutions to realign with socio-cultural, environmental, or economic goals. This further drives the development of the smart tourism theory by providing behaviour-based planning as the main vehicle for sustainable destination planning, rather than being an afterthought.

GreCO offers destination managers and tourism experts practical examples of how contemporary technologies could enhance sustainability metrics and enhance their visitors' experience, emphasising cross-cultural conflicts minimisation using personalisation and smart technology to achieve better communication and customised experiences. Managers may adjust for real-time data analytics, personalise itineraries, and IoT-enabled infrastructures and adjust the itinerary dynamically to redirect tourist flows more effectively, routing toward less recognisable cultural points, and easing crowded destinations as a result.

At the same time, SMEs are given new ways of attracting clients, promoting local products, and supporting community-based entrepreneurship through digital engagement models such as incentive schemes, gamified challenges, and personalised offers. This may help destinations address demand patterns, achieve better overall visitor satisfaction, and boost local economic drivers by formally including sustainability cues into visitor decision-making patterns. GreCO focuses on the central importance of data-driven, participatory urban management in policy development and its governance.

Adopting citizen-generated data and cross-sector cooperation may have the potential to enhance transparency and optimise allocation of resources and ultimately inform long-term planning for the sustainable growth of tourism and tourists. These lessons can be used by regulators to establish guidelines for ethical data use through regulation to support, drive, and foster digital inclusion and good smart tourism, benefiting local people. Additionally, GreCO emphasises the relevance of ethical standards, privacy protection, and equitable access to smart tourist infrastructures for governance as well as for the different urban populations to smart tourism infrastructures.

In sum, the findings of this study indicate that sustainable smart destinations do not depend on advanced technologies alone; rather, they entail the amalgamation of the socio-economic, environmental, cultural data and technical systems, linking digital innovation, behaviour guidance, and collective governance to create an efficient and sustainable environment as a whole. GreCO offers a model for other city venues, which have ambitious sustainable growth aspirations while protecting a high-quality, culturally diverse visitor experience.

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