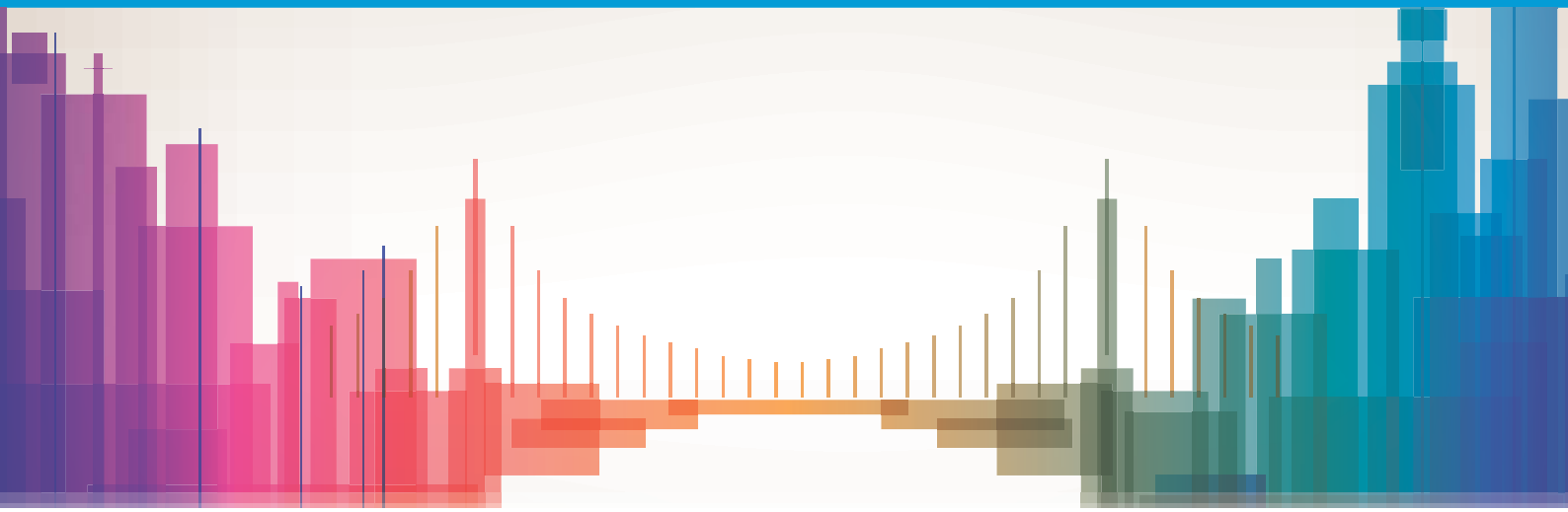
United 4 Smart Sustainable Cities

Smart tourism:

A path to more secure and resilient destinations



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Disclaimer

The opinions expressed in this publication are those of the authors and do not necessarily represent the views of their respective organizations or U4SSC members. In line with the U4SSC principles, this report does not promote the adoption and use of smart city technology. Rather, it advocates for policies encouraging responsible use of ICTs (information and communication technologies) that contribute to the economic, environmental and social sustainability of cities, as well as the advancement of the 2030 Agenda for Sustainable Development.

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Executive Summary

Digital advances are transforming how the world connects and impacts how data is shared between ecosystems, affecting behavioural patterns, and encouraging innovation and sustainable, responsible growth strategies. Societies are becoming increasingly connected and interdependent with digital technology, changing how we interact with people and places. The sheer size of global tourism and its impact on many other sectors puts it at the forefront of environmental, social and economic development agenda. Tourism is one of the sectors to digitize business processes on a global scale, by providing a number of tourist services online. Notably, flight and hotel bookings led the path for tourist services being available online. This transition to the online arena has now become an integral part of the tourist experience provided by any given destination. Digitization is expected to continue enhancing the travel experience on its trajectory toward the global goals. With the onset of the COVID pandemic, the ecosystem of digital services has expanded within the tourism sector to include into facilitated check-in into hotels, generation of QR codes for restaurants, along with enhanced virtual reality (VR) experience for specific destinations during the lockdown etc.

The tourism sector when properly managed, serves a key driver of economic growth, employment and social and cultural development. Harnessing innovation and digital technology provide tourism opportunities to improve inclusiveness, local community empowerment and efficient resource management, amongst other objectives. Smart tourism is a proven tool for measuring and managing tourism, promoting evidence-based decision making on key issues such as infrastructure, carrying capacity, housing, transport and mobility, management of natural and cultural resources and community engagement in tourism.

Technologies along with digital platforms are disrupting the way that tourism is run from end to end, impacting the way destinations facilitate tourism, develop products, gather data, access markets and attract visitors. However, with technological advancements come risks such as cyberattacks, resource scarcity stress on biodiversity, cultural heritage, and local communities that can have an increasing impact on the tourism sector in the upcoming years. Tourism industry should be planned and managed in an integrated manner for residents and visitors alike, leaving no one behind. In this regard, this Report is oriented towards demonstrating how technologies and the process of digitization are powerful tools for moving towards a tourism industry capable of ensuring its resilience, competitiveness, and sustainability in any scenario.

Furthermore, this document on Smart Tourism will provide practical recommendations for establishing a destination framework which will support cities in developing smart tourism destination platforms. It also highlights practical solutions and use cases for smart tourism.

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List of abbreviations

U4SSC	United for Smart Sustainable Cities
ITU	International Telecommunication Union
UN	United Nations
ISO	International Organization for Standardization
CTN	Technical Committee for Standardization
AENOR	Spanish Association for Standardization and Certification
UNE	Spanish Association for Standardization
CBD	Convention on Biological Diversity
ECLAC	Economic Commission for Latin America and the Caribbean
FAO	Food and Agriculture Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNEP-FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention for Climate Change
UN-Habitat	United Nations Human Settlements Programme
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
UNOP	United Nations Office for Partnerships
UNU-EGOV	United Nations University – Operating Unit on Policy-Driven Electronic Governance
UN-Women	United Nations Entity for Gender Equality and the Empowerment of Women
UNWTO	United Nation World Tourism Organization
WMO	World Meteorological Organization
WHO	World Health Organization
AI	Artificial Intelligence
VR	Virtual Reality
AR	Augmented Reality
IoT	Internet of Things
WTTC	World Travel &Tourism Council
GDP	Gross Domestic Product
QoL	quality of life
DMO	Destination Management/Marketing Organizations
ICTs	Information and communication technologies
SDO	Standards Developing Organization
SSC	Smart Sustainable Cities
SDG	Sustainable Development Goal
ITS	Intelligent Transport Systems
SEGITTUR	State Mercantile Society for the Management of Innovation and Tourism Technologies
Red DTI	Smart Tourism Destination Network
STD	Smart Tourist Destination
HDIC	Digital, smart, connected hotel
PAS	Publicly Available Specification
SMEs	Small and Medium sized Enterprises
PoI	Point of Interest

1 Digital transformation, a vital partner for safe and resilient tourism

Globalization continues to deliver important benefits to citizens, public administrations and companies; however, it is also bringing in new threats that require innovative and efficient solutions at the local, national and international levels, to provide a collective response from society for dealing with current risks and anticipating future crises.

From geopolitical and economic tensions to health and environmental threats, the risk environment is constantly evolving with new uncertainties that are continually transforming the global ecosystem. Despite this scenario, physical and digital connectivity, paired with a growing middle class and improved access to travel, have been a tremendous boost to tourism. In addition, one of the major drivers of tourism growth has also been the decreasing cost of travel particularly air travel.

This sector has provided enormous economic and social benefits to destinations throughout this period, creating millions of jobs, protecting natural and cultural treasures, increasing prosperity, reducing poverty, and improving education and health.

Tourism is a major driver of economic growth and development, providing direct and indirect livelihoods for hundreds of millions of people. Prior to the pandemic, in 2019, tourism contributed directly to 4 per cent of world GDP, representing USD 3.5 trillion (United Nations, 2022). For many developing countries, including Least Developed Countries (LDC), Small Island Developing States (SIDS) and countries in Africa, tourism is a major source of employment, foreign currency earnings and tax revenues. In SIDS, tourism represents more than 30 per cent of exports, and in some, reaches as much as 80 per cent of their exports.

Given the multifaceted nature of tourism and related consumption, the sector has strong backward linkages and corollary economic impact on many other sectors, making it a powerful engine of economic growth, poverty eradication, reducing inequalities through inclusive job creation, and community and rural development. In many countries, micro, small, medium, enterprises (MSMEs) are a significant component of the sector, where women and young people tend to concentrate.

Prior to the pandemic, 1.5 billion international tourists travelled the world and more than 8 billion travelled within their own countries. Over recent years, tourism has been affected by several crises such as 9/11, the 2009 global economic crisis or SARS. To varying degrees these crises have affected global or regional tourism. And yet, over the last few decades, no other crisis has impacted the sector as has COVID-19. In 2020, international tourist arrivals declined by 73 per cent, falling to the levels of 30 years earlier. The second-worst setback for tourism happened in 2009, when tourism flows declined by 4 per cent (United Nations, 2022).

In addition, emerging risks such as cyberattacks, resource scarcity and the destruction of biodiversity will have an increasing impact on the sector in the coming years. Key variables include the ability to overcome crises in terms of recovery time, as well as the reduction of lost visitors and the regeneration of revenue streams (UNWTO, 2019). While this certainly sounds promising, tourism as a sector needs to be better prepared in times of crisis in order to protect people and destinations.

Technology and digitization are powerful tools for moving towards a tourism industry capable of ensuring its resilience in any scenario (UNWTO, 2019).

1.1 Steps and technologies for dealing with crises

The sector's ability to cope with crises is critical to the economic development and sustainability of tourist destinations. Tourism is critical for the economy overall, with the COVID-19 global pandemic, there was a 70 per cent loss in GDP due to the tourism decline alone.[1] Ensuring this resilience in the face of threats requires collaboration between the private sector, and municipal, regional and national authorities to define and implement the necessary measures and instruments conducive to preparing for, as well as managing and recovering from, the crisis, while building visitor confidence and enhancing the reputation of tourist destinations. Of particular importance has been the coordination with national authorities between health and tourism during the COVID-19 pandemic.

The first step lies in identifying and understanding the threats to building a resilient tourism approach to operate and thrive in this dynamic, diverse and global environment. Crisis preparedness should be geared towards generating resilience strategies with the participation of all sectors, including tourism, where the capacity of people and infrastructure to face possible threats is analysed, and developing monitoring and prediction tools based on analytical models and digital twins that allow early anticipation of the arrival of the crisis, simulate its effects and recreate de-escalation decision scenarios.

Effective and rapid crisis response management requires solutions, services and systems that help to respond in an agile and coordinated manner to the needs of the population, including visitors, to optimize the mobilization of resources in a dynamic manner according to the circumstances of each territory and city. Technologies such as blockchain, robotics and artificial intelligence (AI) ensure secure supply chains, distribute resources and care for patients and affected people in a safe manner.

The sector also needs information tools that communicate the reality transparently and in a timely fashion to reassure citizens and tourists, using various digital channels (such as apps and bots) and ensuring the veracity of messages in the face of cybersecurity attacks. It is also essential to have teleworking tools to assist the function of professionals in the sector, in addition to educational platforms, entertainment and tourist, and cultural content that will help relieve the confinement and generate a desire to travel again, once normality is restored post COVID-19, using Virtual Reality (VR) and advanced digital portals.

[1] UNWTO, "The Economic Contribution of Tourism and the Impact of COVID-19", https://www.e-unwto.org/doi/10.18111/9789284423200

Finally, the return to normalcy will require the generation of transparency and trust such that tourists are driven to return to visit a given destination. The contribution of technology is also very important here, as it provides personalized knowledge of travelers and their demands to provide them with an experience that incorporates the safety and security of feeling cared for and safe during their trip and stay at the destination.

Technology companies share the mission of contributing with their digital solutions for *Smart Tourism* to make travelers want to return to their destinations as soon as possible. This can only be achieved by bringing the capacity of these digital solutions and with the accompanying experience to enhance tourist destinations to design resilient tourism plans and build strategic infrastructure and systems in the areas of safety, health, mobility, the environment and, of course, tourism and commerce.

2 The smart tourism destination framework

2.1 The context for smart tourist destinations

In an increasingly globalized and competitive tourism marketplace, destinations develop innovative strategies to create sustainable, creative and unforgettable experiences for tourists, improve the quality of life (QoL) of the population, and earn competitive advantages such as strong positioning over time. This is done through Destination Management/Marketing Organizations (DMO), where private and public stakeholders engage in the management and promotion of tourism products and the destination. It is important to note that in addition to public/private stakeholder engagement, DMO can also have various governance structures including fully public or fully private (UNWTO, 2019). Thereby, the coordination and commitment of all stakeholders, the strategic vision, and the implementation of innovative initiatives considering the changes in the market are essential to the development of the destinations.

Information and communication technologies (ICTs) have completely modified the dynamics of all industries – including tourism – in terms of processes, products and adaptation to clients' new demands. Destinations must ensure that their tourism models evolve to more sustainable and innovative models, adopting technologies to make tourism activity a positive contributor to the quality of life of residents and to protect nature and culture. Destinations must become more sustainable and, during and post COVID-19 times, safer and more resilient, and to do so they will need technology.

Thus, the Smart Tourist Destinations framework is key to building the "tourism of the future": a new sense of tourism that is sustainable and safe, inclusive and resilient, celebrates local cultures and identities, provides economic and social benefits, helps preserve the environment, and uses ICTs and renewable technologies at the core of tourist destination planning.

2.2 From smart cities to smart tourist destinations

The domain of smart cities has been explored in the international arena by the International Telecommunication Union (ITU), which serves as the United Nations specialized agency for information and communication technologies (ICTs) and as an international standards developing organization (SDO). Following the analysis of more than 100 definitions relating to smart city terminology, ITU, together with UNECE, developed the following definition for smart sustainable cities (SSC):

"A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects".

To further facilitate international dialogue on smart and sustainable cities, the "United for Smart Sustainable Cities" (U4SSC) initiative was launched by ITU, UNECE and UN-Habitat, and supported by CBD, ECLAC, FAO, UNDP, UNECA, UNESCO, UNEP, UNEP-FI, UNFCCC, UNIDO, UNOP, UNU-EGOV, UN-Women and WMO. This UN initiative conducts its operations in line with the Sustainable Development Goal (SDG) 11: "Make cities and human settlements inclusive, safe, resilient and sustainable". The smart city is an interconnected system with various sectors including E-health, Intelligent Transport Systems (ITS), Smart Tourism, Smart Education, and Intelligent Sustainable Buildings etc. This report will further delve into the Smart Tourism sphere within the smart and sustainable city ecosystem.

The concept of Smart Tourist Destinations evolves from the definition of smart cities. According to the Mapping Smart Cities in the EU Report by the European Parliament's Directorate-General for Internal Policies, of January 2014, the concept of *smart cities* is founded on the creation and connection of human capital, social capital, and ICTs in order to generate greater and more sustainable economic development and better quality of life. Hence, a *smart city* is enabled by excellence in the use of technologies, especially ICTs, aimed at improving competitiveness and ensuring a more sustainable future through a symbiotic union of networks of individuals, companies, technologies, infrastructures, consumption, energy and spaces.

In Spain, the National Plan for Smart Cities (March 2015), offers a *smart city* definition as proposed by the Technical Group of Normalization 178 of AENOR (AEN/CTN 178/SC2/GT1 N 003):

"Smart city is the holistic view of a city that applies ICTs to improve its inhabitants' quality of life and accessibility and ensures economic, social, and environmentally sustainable development in continuous improvement. A smart city enables citizens to interact with it in a multidisciplinary way and adapts in real time to their needs, efficiently in quality and cost, providing open data, solutions, and services oriented to citizens as individuals, to resolve the effects of the growth of cities, in public and private spheres, through the innovative integration of infrastructures with smart management systems".

With this definition, different experts from the AEN/CTN 178 started working on the pillars of Smart Tourist Destinations creating the Smart Tourism Destination subcommittee (AEN/CTN 178/SC5). A Tourist Destination is Smart when it makes intensive use of the technological infrastructure provided by the smart city in order to improve the tourism experience of the visitors, personalize it and make them aware of the tourism products and services available in the destination. It also offers data produced, directed and processed through the technological infrastructure of the destination so that DMOs, local institutions, and local tourism business can make decisions and take action based on such data (Lamsfus et al, 2015).

A Smart Tourist Destination is considered an innovative space based on the territory and a cutting-edge technological infrastructure, committed to sustainability, with an information system capable of analysing and understanding events in real-time, thus facilitating the interaction between the visitor and the environment, and improving the travel experience significantly (López-Ávila et al, 2013).

A Smart Tourist Destination can also be understood as a system linking visitors, citizens and all local organizations, which allows services to be obtained in real time (Buhalis et al, 2015). Thus, for a destination to become a Smart Tourist Destination, the integration of four essential concepts is necessary: human capital, leadership, social capital, and innovation. Advanced ICT infrastructures such as cloud and other technological innovations, provide the essential infrastructure for the development of a Smart Tourist Destination. ICT is fundamental; however, it is not enough.

Tourism affects the social and the economic activity across the territory in which it operates; consequently, it cannot be managed in an isolated or fragmented manner. Smart Tourist Destinations must be understood in their complexity, as a holistic and interdependent system, comprising distinct sectors and actors or agents (stakeholders), which are related directly or indirectly, creating a whole ecosystem in which all actors are interrelated. Key features of a Smart Destination include the following five pillars: governance, innovation, technology, sustainability and universal accessibility.

2.3 The Spanish Smart Tourist Destinations framework

The Smart Tourist Destination framework has been developed under the leadership of Spanish Secretariat of State for Tourism through the State Mercantile Society for the Management of Innovation and Tourism Technologies (SEGITTUR). The framework involves a programme with its implementation methodology, a set of public Spanish normalization (UNE) standards and the Red DTI, a network of destinations and solutions providers.

2.3.1 Smart Tourist Destination definition

The Smart Tourist Destination definition proposed by SEGITTUR and accepted by the UNE Smart cities working group reads as follows:

"A Smart Tourist Destination is an innovative tourist destination, consolidated on a cutting-edge technological infrastructure, which guarantees the sustainable development of the tourist territory, which promotes accessibility for all and facilitates the interaction and integration of the visitor with the environment, increasing the quality of their experience in the destination and improving the quality of life of the residents."

(SEGITTUR is the Spanish acronym for the State Mercantile Society for the Management of Innovation and Tourism Technologies.)[2]

[2] "SEGITTUR is an effective operator capable of contributing to the development, modernisation and maintenance of a leading tourist industry through technological innovation. It generates and manages the technology, expertise, and innovation necessary to improve competitiveness, quality and sustainability in the environmental, economic and social aspects of tourism. It disseminates, promotes and implements in tourism markets both at home and abroad the best practices, know-how and technological innovation that have made Spain a world reference in the sphere of international tourism (https://www.segittur.es/en/lines-of-action/)".

2.3.2 Methodology

As mentioned above, Smart Tourist Destinations works on five different pillars: governance, innovation, technology, sustainability and accessibility. [3]

1. Governance: The pillar of governance implies strong tourism governance (public-private partnerships and the local community), with the support of the governments, needed in order to implement and operate a Smart Tourist Destination. The governance must create a strategic vision for the future of the destination, and identify and implement all actions identified as strategic for the destination. It is important to ensure efficient management through the rational use of available resources in the territory and proper measurement, guarantee transparency and implement participation channels for citizens and for the tourism sector.
2. Innovation: The pillar of innovation involves a process of continuous improvement of services, marketing and promotion at the DMO. The continuous improvement process, carried out systematically, brings new ideas and facilitates value generation, helping to reduce risks. Training and knowledge-based solutions allow the DMO's management team and the different actors of the tourism ecosystem to be updated permanently with tools, legislative changes and trends that set the pace of technological advances in the 21st century.
3. Technology: The pillar of technology defines the digital transformation of the destination across the board, deploying cutting-edge technologies for critical processes. These may include tools to improve the tourist experience (e.g., digital tourism information offices, free Wi-Fi connection, apps, QR codes, VR), online reservation systems to streamline conversion of Big Data analysis to understand the tourist/customer behaviours, or the incorporation of Artificial Intelligence in different management processes throughout the value chain. The destination must take into consideration the rapid obsolescence of technology and develop strategies of risk assessment to avoid pitfalls or failures.
4. Sustainability: The sustainability pillar imposes a long-term perspective on tourism activity, such that DMO's management does not compromise the future of the local resources nor the quality of life. Treating the authenticity and cultural diversity of the destination with respect and expanding the opportunities and benefits of tourism to the local population are key to social and economic sustainability. This pillar involves sustainable, responsible tourism policy; a strong focus on conservation of culture and its heritage, as a differential element of the destination; and environmental preservation and improvement, as a key element for long-term survival.
5. Accessibility: Finally, the accessibility pillar aims to develop a "universal design for everybody" that allows anyone full access to the destination, without exclusions of any kind, thus guaranteeing the equal right to fully enjoy the destination. Consequently, DMO should evaluate the current normative framework on accessibility and its implementation. Accessibility must be guaranteed, especially physical and sensory accessibility, for the different tourist attractions, public spaces,

[3] The methodology has been proposed by SEGITTUR. This methodology is also supported by UN World Tourism Organization a United Nation Specialized Agency (UNWTO).

infrastructures, and tourist services. It is also important to develop accessible technology, in line with existing norms and international standards.

COVID-19 has forced a reset of the whole sector. Readiness is key to resilience; hence digital and sustainable transformations are not only a must, they are also a great opportunity for the entire spectrum of sectors.

For example, the Smart Tourist Destination Network (Red DTI), managed by SEGITTUR, brings together an ecosystem of more than 380 agents: destinations and DMO as titular members; institutional members; and collaborating members such as associations, businesses and academic institutions. Destinations receive knowledge, technical assistance, tools and support in their digital transformation process.

2.3.3 Expected Results

The main results of implementing the Smart Tourist Destinations methodology are:

- The Smart Tourist Destinations methodology strengthens local governance through the involvement of the different actors from various industries and the creation of a new ecosystem.
- The methodology also strengthens the internal management structures, creating new capacities in the public and private sectors.
- Destinations become more competitive due to the efficient use of its tourism budget and the identification of possible synergies with other departments.
- The smart strategy boosts the sustainable development of the destination in its environmental, economic, and socio-cultural aspects; and, therefore, it aligns strategies and visions with the United Nations 2030 Agenda.
- For businesses, smart transition facilitates the updating of tourism products and services to offer optimal experiences to hyper-connected travelers of the 21st century.
- As the *Smart Tourism* strategy overlaps with the local administration, tourism can better contribute to the economic revitalization of the territory, fostering its positive effects in the long term.
- The *Smart Tourism* methodology helps reduce the digital gap and inequality through the adoption of technology in the territory, in the public and private spheres.
- Finally, it also promotes the consolidation of public-private collaborative schemes based on innovation and the leading role of Big Data.

2.4 Standards and norms for smart destinations

Tourism is a global industry that is highly competitive and continuously developing in supply and demand sides alike. New proposals emerge constantly to attract the attention of tourists, who have more information and tools with which to select the most attractive destinations and proposals.

ICTs are transforming knowledge and the way potential tourists plan, organize and manage travel, including the interactions within the destination and sharing of experiences. Increasingly, demanding tourists seek best value for their money, more personalized services and experiences tailored to their tastes and needs; they value the most environmentally friendly options and demand to be permanently connected and to be able to make use of new technologies throughout the entire life cycle of the trip.

Turning destinations into smart destinations has an impact on management models in various areas such as those related to transparency, digital transformation, mobility, sustainability and economic development, among others. Tourist destinations integrate multiple interlocutors, public as well as private, who interact with one another and with tourists. Tourism is also a cross-cutting domain, and it is sometimes difficult to separate *tourists* and *citizens*. Consequently, actions designed to improve the tourism model will benefit the management of other sectors and areas of the destination and its various stakeholders. For instance, improvements in safety, communications, health care, transportation, telecommunications, accessibility, the food sector, hotels, restaurants, sports and cultural facilities and activities, leisure. In particular, it is important to mention the significant role that technology plays in managing tourism flows and the impact of visitors on resources (e.g., water and waste). With regards to cities, where congestion issues have emerged pre-pandemic, and will remerge post-pandemic, building smart destinations is critical to measuring flows and promoting the redistribution to less visited areas.

For example, the Spanish Secretariat of State for Tourism has developed and published several standards to improve the management and tools for Smart Tourist Destinations, to create a consistent framework for developing Smart Tourist Destinations (STDs) aligned with the process of creating smart cities. These public standards allow all interested destinations to further standardize some aspects of the STD:

- **UNE 178501 – "Smart Tourist Destination Management System. Requirements":** This standard specifies the requirements for establishing, implementing, maintaining and improving a Smart Tourist Destination management system that adequately considers governance, innovation, the use of technologies, universal accessibility, and sustainability at the destination. It covers all types of Tourist Destinations, regardless of their conception (e.g., vacation, urban, natural), size (municipal or supra-municipal) and the nature of their Management Entity.
- **UNE 178502 – "Indicators and Tools for Smart Tourist Destinations":** This standard specifies a set of indicators and tools associated with governance and the axes of a smart tourist destination (governance, innovation, technology, universal accessibility, sustainability), to be applied in the management of smart tourist destinations, so that they can be used efficiently for decision making by the destination's management body and by those responsible for the processes or activities affected and, consequently, contribute to the improvement of the destinations.
- **UNE 178503 – "Smart Tourist Destinations. Semantics applied to tourism":** This standard defines a semantic base that makes it possible to represent the relevant information that makes up the tourist destination (tourist destination, tourist resources within the destination, travel

experiences), ensuring interoperability through its use of its tourist platforms and of the city and the territory with each other and with third-party developments.

- **UNE 178504 – "Digital, smart, connected hotel (HDIC) to smart destination/Smart city platforms"**. Requirements and recommendations": This standard establishes the requirements and recommendations for converting an accommodation into a smart digital hotel connected to the tourist destination or smart city, in order to share relevant information for the tourism system, improve the planning of the accommodation and the tourist destination, adapt to the needs of tourists, reduce the negative impact on residents, and offer more efficient and more personalized services.

Additionally, the following Publicly Available Specification (PAS), which are still in the development phase (2021), should be highlighted due to their potential cross-sectoral impact and relation to tourism sustainability policies.

- **ISO/FDIS 21902 – "Tourism and related services. Accessible tourism for all. Requirements and recommendations":** This standard provides a simple approach to the requirements that a tourism service provider must comply with in order to make its offer accessible to everyone. It contains a general chapter (including aspects such as information, training, design and the built environment), and also specific chapters for each service provider type (e.g., lodging, transportation, restaurants). The document emphasizes the importance of making all links in the tourism chain accessible. The standard is an awareness-raising tool that provides expertise in tourism accessibility and leads to an opening to a wider market.
- **ISO/DIS 23405 – "Tourism and related services. Sustainable tourism. Principles, terminology and model":** This document specifies the core concepts, principles and model of sustainable tourism, which are applicable to public and private organizations and destinations, regardless of their size and location, including other stakeholders committed to sustainable tourist development.
- **ISO/DPAS 5643 – "Tourism and related services. Measures to reduce the spread of COVID-19 in the tourism industry":** The document establishes general requirements, including organizational aspects, cleaning and disinfection measures, contingency plans and air conditioning/ventilation systems. Specific requirements are then established, which vary according to the activity. Finally, several Annexes are included with World Health Organization (WHO) recommendations for handwashing, the correct use of masks and gloves, or how to act when a case of COVID-19 occurs among personnel or clients.

Cities implementing smart destination features to facilitating tourism can also benefit from smart sustainable city standards as well. In its role as an SDO, ITU through its ITU-T Study Group (SG) 20 on Internet of Things (IoT) and smart cities and communities (SC&C), develops standards to help cities address urban challenges and maximize the use of digital technologies to accelerate digital transformation. The ITU-T Recommendation Y series covers a variety of global infrastructure, Internet

protocol aspects, next-generation networks, IoT and smart cities. ITU-T SG20 has developed a series of standards which can support the overall transition to a smart city including the following:

- Recommendation ITU-T Y.4200: "Requirements for interoperability of smart city platforms"
- Recommendation ITU-T Y.4201: "High-level requirements and reference framework of smart city platform"
- Recommendation ITU-T Y.4461: "Framework of open data in smart cities"
- Supplement 33 to ITU-T Y.4000 series: "Smart sustainable cities - Master plan"
- Supplement 32 to ITU-T Y.4000 series: "Smart sustainable cities - A guide for city leaders"
- Supplement 34 to ITU-T Y.4000 series: "Smart sustainable cities - Setting the stage for stakeholders' engagement"

3 Smart tourism destination platform

A tourist destination can be defined as a physical space with or without administrative and/or analytical boundaries in which a visitor can spend the night. It is the cluster (co-location) of products and services, and of activities and experiences along the tourism value chain and a basic unit of analysis of tourism. A destination incorporates various stakeholders and can network to form larger destinations. It is also intangible with its image and identity which may influence its market competitiveness (UNWTO, 2019).[4]

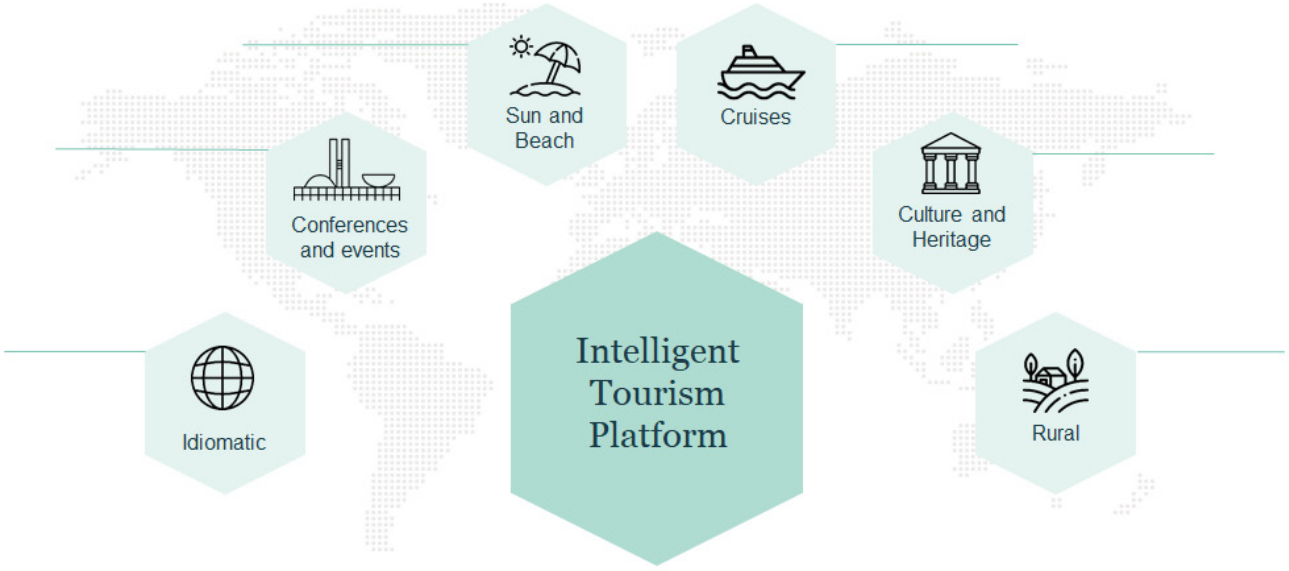
These can be of many types. When referring to tourism, it would be relevant to highlight sun and beach destinations, business destinations, language destinations, sports and leisure destinations, rural destinations, culinary destinations, and so on. These features relate to key tourism products in the destination which in many cases can be combined. For example, a city can be a cultural and business destination. Despite these distinct features of certain destinations, all of them will share the common feature that their day-to-day activities and performance are altered by a tourist influx that requires them to:

- Adapt their services (e.g., water) to the influx of tourists.
- Manage the destination with a comprehensive approach based on the governance of all services and stakeholders that are part of the destination.
- Manage the impact on social fabrics of the destination.

With a view to ensuring a fair digital transformation for the tourism sector and its destinations, accelerating and facilitating the entry of SMEs to the data economy by adding operational capabilities among all agents.

[4] - This Section explores the ideation related to the smart destination platform. It does not seek to provide an alternate methodology to the one proposed in Section 2.

Figure 1: Tourist destination managed by a Digital Platform



Therefore, it requires the design, development and implementation of a *Smart Tourism Platform* to respond to the challenges of the destinations in an integrated manner based on:

- **Unified Management:** This enables the unified management of all elements of the destination, from monitoring to operation.
- **A data-driven economy:** This involves getting the most out of the destination's data, based on standards that ensure consistency and interoperability.
- **Distributed Intelligence Models:** This includes combining and extracting value from the information as a whole: new and legacy systems, mobile and web applications, sensor technology, social media, and so on.
- **The development of an open innovation ecosystem:** Such a platform would be open to the outside world, with the aim of generating new solutions, business cases and entrepreneurship at the destination.

3.1 Value proposal

Meeting the challenges of a smart, sustainable, safe and resilient tourist destination calls for a revitalization channel that will enable it to become more competitive.

A set of solutions ensuring the sustainable development of the tourist destination, improving its accessibility and interaction with the visitor, in addition to its integration with the territory and the quality of life of its residents.

- A series of solutions geared at managing the tourist area to meet its economic and social needs using new technologies that allow us to connect the physical and digital worlds, improving relations with tourists by aiming to:

- guarantee sustainability;
- increase their activity; and
- minimize the environmental impact.

This process should be approached in three main **stages/phases:**

- before (understanding the current destination);
- during (revamp the destination); and
- after (create the destination of the future).

Firstly, the current destination must be transformed. To do so, an initial diagnosis of the degree of maturity of the destination is conducted and the focus is placed on the digitalization of operating models and visitor interaction.

Secondly, the destination must be revitalized. Once the context in which the destination operates is understood, it is necessary to enhance the destination by reinventing it and adjusting its offer and services in a dynamic way.

Finally, the destination of the future must be designed through continuous improvement. In short, the process would involve learning from the past to design a more resilient future through pre-emptive measures and preparedness to respond to any crisis.

For example, SEGITTUR (State Mercantile Society for the Management of Innovation and Tourism Technologies) from Spain has also been aiming to put in place a credible tourism system to enable the transition to a smart destination with the strategy indicated in the Figure below.

Figure 2: Smart Tourism Strategy for SEGITTUR

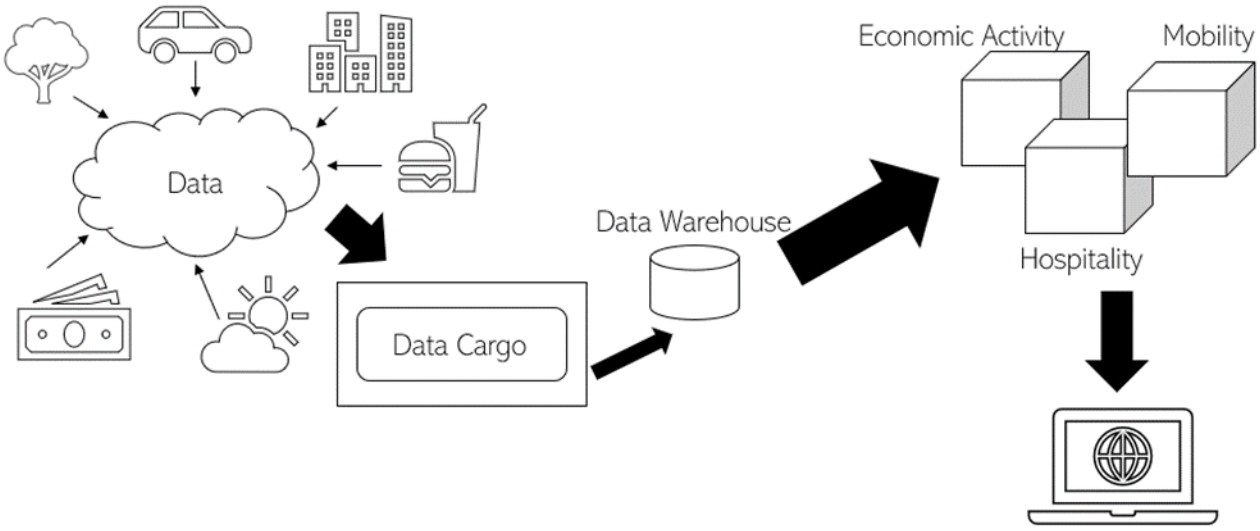


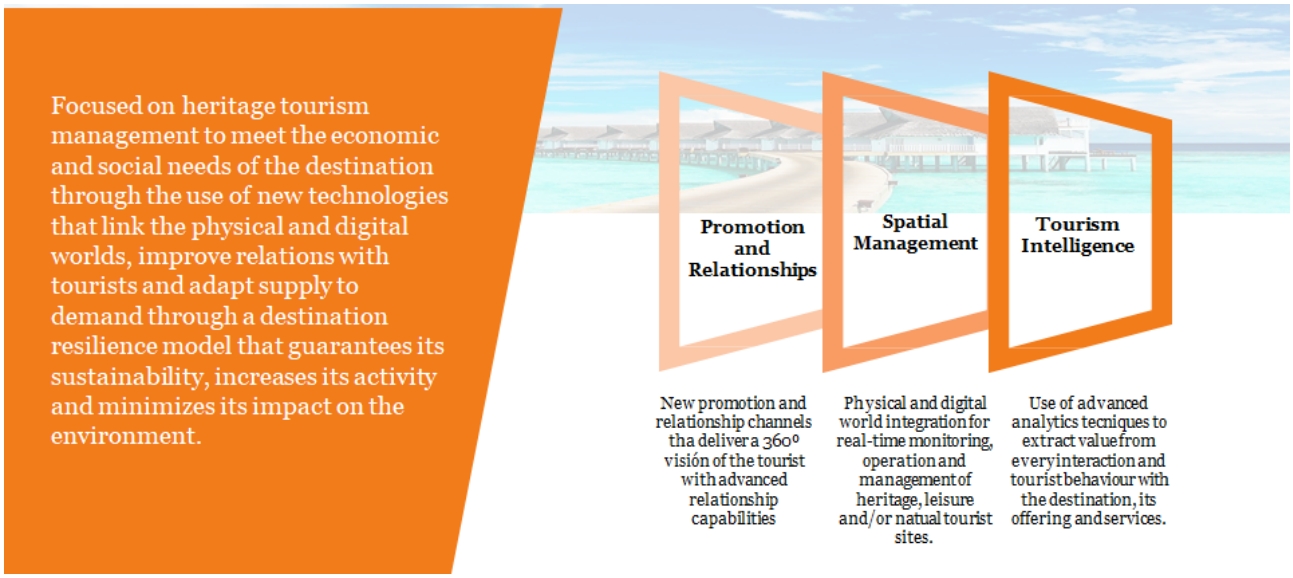
Figure 3: Smart Tourist Destination digital transformation path

Tackling the different phases of the digital transformation of the destination requires a technological model based on the following pillars:

- **Spatial management:**
    - Physical and digital world integration for real-time monitoring, operation and management of heritage, leisure and/or natural tourist sites.

- **Promotion and Advanced Relationships:**
  - New promotion and relationship channels that deliver a 360º vision of the tourist with advanced relationship capabilities.
- **Tourism intelligence:**
  - Use of advanced analytics techniques to extract value from every interaction and tourist behaviour with the destination, its offering and services.

Figure 4: Pillars of Smart Tourist Destination

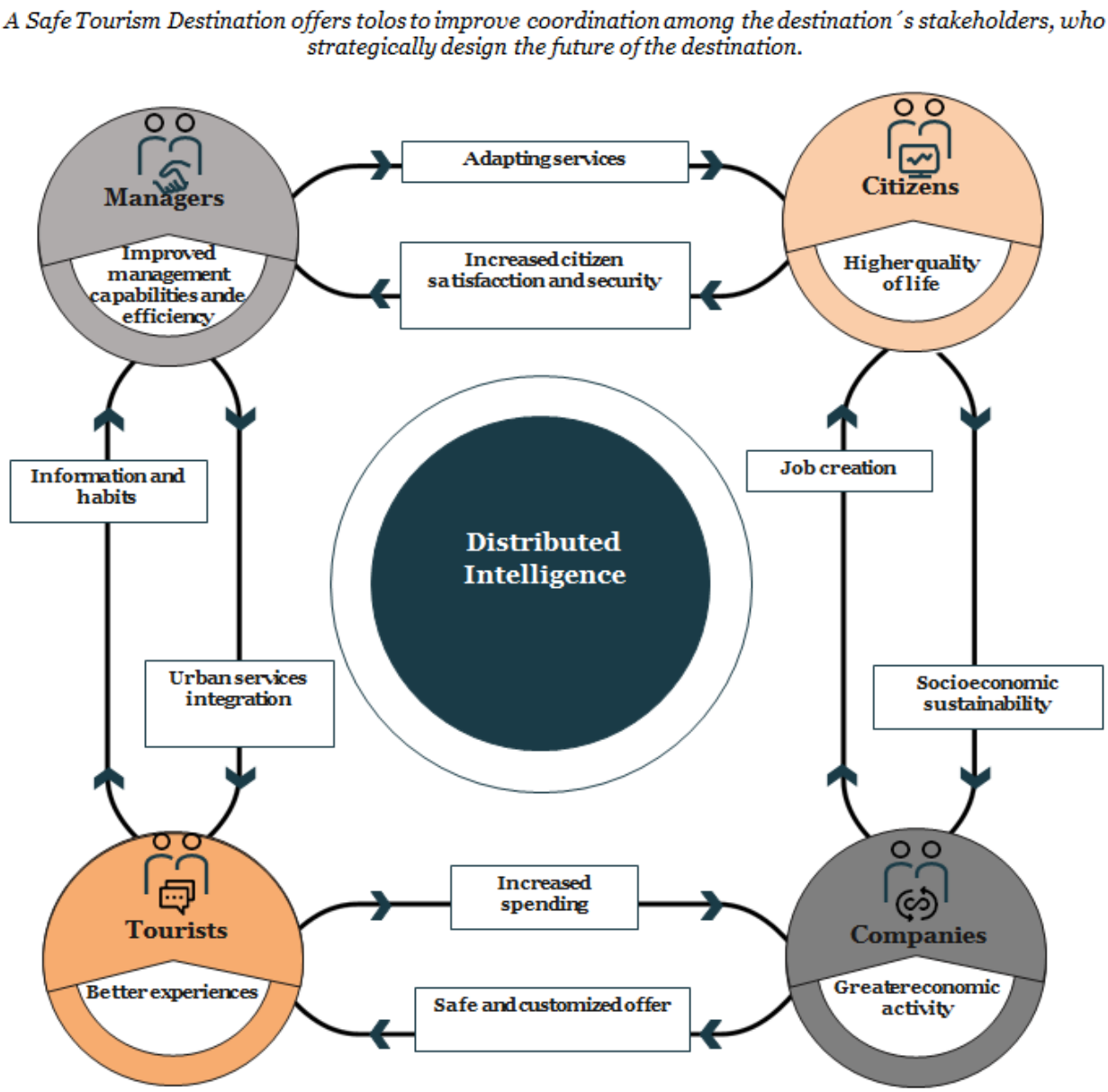


3.2 Functional overview

The *Smart Tourist Destination Platform* should be conceived as a solution that includes all the dimensions of the destination, with an approach based on intelligence and the use of data, the integration of all actors and systems through interoperable and open solutions, in a model of interterritorial and inter-administrative cohesion, and that scales through public-private partnerships.

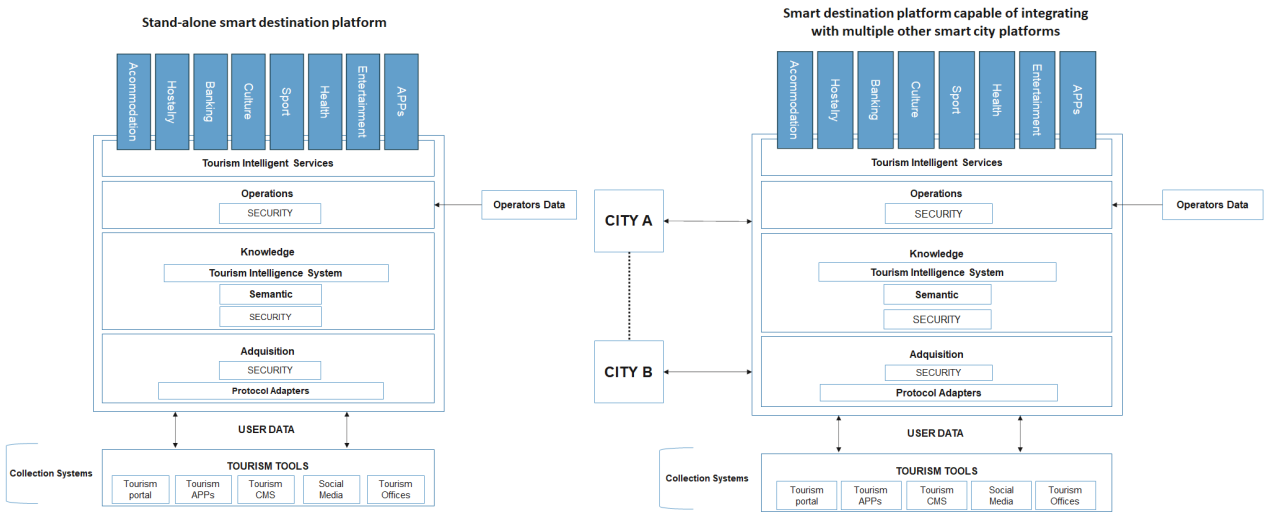
The comprehensive *Smart Tourism Technology Platform* for a destination supports the end-to-end management of the tourist destination, from a promotional and from an administrative point of view, and the relationships between the different stakeholders of the destination.

Figure 5: Stakeholder governance



Such platforms can be understood as a service, or a sectoral platform built or extended from the smart city platform or territorial platform. The *Smart Destination Platform* can be built by tapping into the capabilities of the city or territorial platform.

Figure 6: Smart Tourism Platforms for Smart Destinations

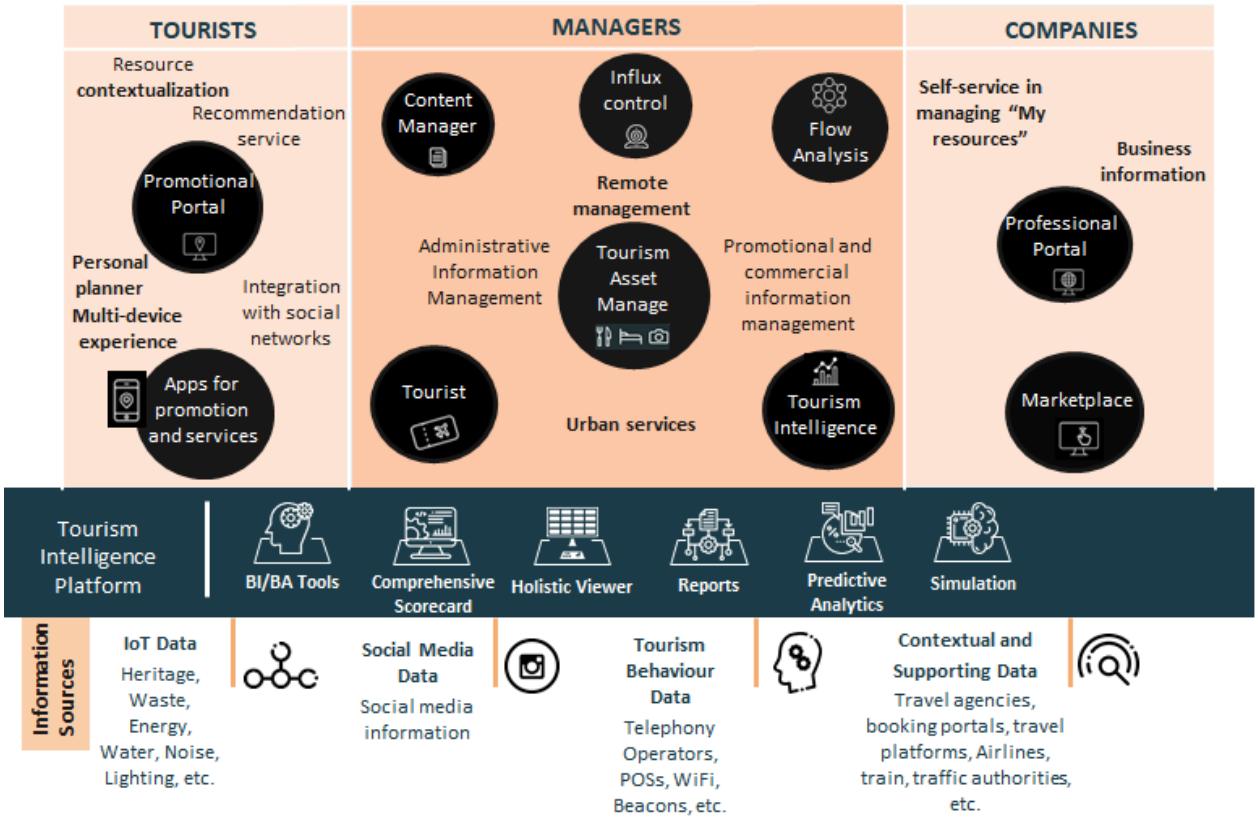


This platform must have at least the same characteristics as the city platform, and should also integrate at least the following tourism components or tools:

- Multichannel content manager for the development, creation, publication and updating of all the destination's tourism content and assets through web portals, mobile applications, totems, etc.
- Digital marketplace: offering tourists the full range of the destination's products and services.
- CRM: rendering tourist segmentation and profiling capabilities.

At a functional level, the following diagram can be used to identify the most relevant components of a smart destination platform model together with its vertical solutions grouped by stakeholders or end-users.

Figure 7: Smart Tourism Platform detailed by stakeholders and solutions



In conclusion, a Smart Tourism Technology Platform supports the end-to-end management of the tourist destination, from a promotional and an administrative point of view, and the relationships between the different stakeholders of the destination.

3.3 Comprehensive tourism management system

It is essential that along with the implementation of a technological platform for smart tourism destinations and the development of its solutions and use cases (see next section), a comprehensive tourism intelligence system based on indicators is defined in the system. This system should feature:

- **Improved strategic planning processes:** This can help to gauge and analyse the actual consumption behaviour of visitors and tourists. This tool can also serve to improve strategic planning processes by putting the knowledge generated at the service of the destination manager through a comprehensive scorecard.
- **Multidimensional analysis tool:** This must be able to load, process and analyse information that transforms it into useful, relevant, systematized and orderly knowledge that makes it possible to have updated information available at any time and to generate its own analysis easily without advanced technological or statistical knowledge.

It is common for this system to start as a management scorecard and later be integrated into the destination's platform thus becoming a tool capable of adapting to the information needs of any tourist destination, and becoming the main source for generating tourism intelligence and knowledge at the territorial level and equipped with all the technological components of the platform at the level of processing, e.g., intelligence, data sources, software, analytics and automations.

Additionally, it should allow, and be designed to measure and quantify, indicators of the different strategic axes/dimensions of the destination (analysed in the previous topic).

In short, it must provide the destination with the following differentiating elements:

- **Unified management:** This involves the unified management of all indicators and processes of the destination; from monitoring to the operation and promotion of tourism
- **Distributed intelligence:** This includes getting the most out of the data, analysing tourist flows, making it possible to direct demand and adapt the destination's offer to the needs of each visitor.
- **Productivity of the destination:** This involves contributing to improving the use of tourism assets through the personalization of visitor services, directly impacting the destination's economy.

4 Solutions and use cases

This section distinguishes the following pillars on which the destinations build various technological solutions to respond to the challenges they face in terms of:

- Tourism spatial management
- Promotion and tourist relations channels
- Local service supply and demand management
- Tourism intelligence

The following is a description of each of these four blocks of general solutions, grounding them in technological use cases that make use of technological components to respond to the specific needs of the destinations in each of the pillars mentioned above:

Figure 8: Solutions and Use cases (1)

Figure 9: Solutions and Use cases (2)

4.1 Tourism spatial management

4.1.1 The challenge

In the current scenario, in which social distancing and tourist safety play vital roles, it is essential to transform the experience by guaranteeing safe experiences, in open spaces (beaches, parks, etc.), and in cultural and heritage sites.

4.1.2 Solution

This would include an information system comprising two modules that allow, on the one hand, the management of the flow and capacity of the spaces to be monitored, and on the other hand, the management of climatological, comfort and consumption variables for the preservation and intelligent operation of the historical, cultural and architectural heritage. Additionally, through the analysis of information, it allows maintenance tasks and the use of material and human resources of the space.

4.1.3 Benefits

- Increased competitiveness through better use of tourism resources.
- Improved quality of stay for visitors and quality of life for residents.

- Promoting the sustainable development of the destination in terms of its environmental, economic, cultural and safety aspects.

4.1.4 Use cases

Solutions adapted to the safety management of the spaces in the advent of COVID-19 are capable of directly impacting the quality and experience of the visit.

Tourism spatial management

Accordingly, the main elements of tourism spatial management would involve:

- **Safe cultural and architectural heritage**: Monitoring of heritage and/or natural elements focused on conservation and preventive safety.
- **Capacity control:** Control of the degree of occupancy of public spaces to improve their experience and provide them with safe environments.
- **Social distancing:** Analysis of the movement and flow of people to ensure compliance with the established minimum safety distance.
- **Face mask usage control:** Detection of violations related to the protection measures established for each case (e.g., use of masks, gloves).
- **Tourist pattern analysis**: Analysis of visitor behaviour to develop better marketing strategies to increase the productivity of the spaces.

4.1.4.1 Safe cultural and architectural heritage

4.1.4.1.1 Description

Monitoring system for heritage and/or natural elements focused on their conservation and preventive safety, enabling the control of environmental and structural parameters and parameters related to the management of public use of the space, and their real-time analysis.

4.1.4.1.1 Main characteristics

- Monitoring of the state of conservation showing the reading of the variables recorded by sensors and measuring equipment.
- Early warning system that allows the activation of protocols for action and maintenance of the space, minimizing its deterioration and improving the efficiency of conservation activities.

- Analytical and simulation that allows adapting maintenance resources and services, including space safety, to the detection of real needs at any given moment.

4.1.4.2 Capacity control

4.1.4.2.1 Description

Real-time monitoring of the occupancy rate of public spaces (e.g., museums, beaches, leisure centres, PoIs) to improve the visitor's experience and provide a safety environment that guarantees the distance between people and control of the capacity.

4.1.4.2.2 Main characteristics

- Generation of alerts and alarms based on the degree of occupation of the monitored space through anonymized information.
- Ability to perform automated actions based on visitor flows, and to ascertain information including average duration of visits, peak and off-peak times, for predictions.
- Contextualized information to tourists on the degree of occupancy of the areas and the safety measures to be adopted, including forecasts based on historical data and further recommendations based on their profile.

4.1.4.3 Social distancing

4.1.4.3.1 Description

System to control the movement of people in predetermined areas to control the minimum safety distance established by the health authorities through artificial vision cameras capable of detecting and warning of distance violations or group formations of people (e.g., queues in stores, access to enclosures) ensuring the safety of spaces and the movement of people.

4.1.4.3.2 Main characteristics

- Location of flow cycles throughout a site (with the volume of users by areas) and of hot/cold spots to avoid crowding.
- Alerts based on traffic data or capacity prediction criteria in each study area during specific time slots.
- Generation of alternative routes and itineraries for visitors depending on the degree of affluence such as visits to museums, cultural centres.

4.1.4.4 Face mask usage control

4.1.4.4.1 Description

Artificial vision solution integrated in the CCTV system that allows, through the training of algorithms, to detect infractions related to the protection measures established for each case (e.g., use of masks, gloves).

4.1.4.4.2 Main characteristics

- Generation of real-time alerts to identify the area or geographical area where the incident is occurring through integration with the CCTV system.
- Generation of automated action protocols such as public address announcements, launching of work orders to safety personnel.
- Ability to offer supplementary information such as capacity control, social distancing, queue management, by training additional algorithms leveraging the existing infrastructure.

4.1.4.5 Tourist pattern analysis

4.1.4.5.1 Description

Analysing visitor behaviour to secure insights for better marketing strategies that increase the productivity of the space and increase demand.

4.1.4.5.2 Main characteristics

- In this way, it is possible to understand which areas are attractive, and to identify points of greater or lesser affluence, to adapt the offer and services according to the visitor's analytics.
- Use of real, accurate and reliable data to develop tailor-made marketing studies.
- Identification of hot spots in the venue to strategically install interactive kiosks or digital screens displaying relevant information.

4.2 Promotion and interaction channels

4.2.1 The challenge

The main challenge involves providing tourists with contents and tools that contribute to improving their experience at the destination, in addition to offering updated information on the different areas and services of the territory, making them feel safer and more welcome.

4.2.1 Solution

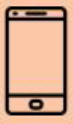
The solution for this would include a manager who, regardless of the digital channel chosen (e.g., APP, Web Portal, Totems, social media), provides tourists with content and tools that contribute to improving their experience at the destination, while offering updated information on the different areas and services in the territory that contribute to increasing the tourist's perception of safety.

4.2.3 Benefits

- Maintaining the interaction and relationship with the tourist in all phases of the trip (planning, during and after the trip) through multiple channels.
- Enabling the channels to adapt to new usage trends and their contents to the new tourist demand.
- Constant evaluation of the feedback and digital interaction of the tourist's online behaviour.

4.2.4 Use Cases

These use cases highlight solutions aimed at restoring tourist confidence in the safety of the destination by generating safe and personalized experiences.



Promotion and interaction channels

- **360° Planner:** A solution for planning the trip, managing the stay and sharing the experience, providing updates and information of interest during the stay.
- **Safe and customized offer:** Profiling and adapting the offer to the potential demand through proximity marketing and online interaction of the tourist.
- **Safe and advanced tourist services:** A bidirectional relationship channel with tourists that offers information on the services of the territory and their updates, together with answers to queries and incidents.
- **COVID-free tourist traceability:** COVID-19 test traceability module for tourists through a decentralized, reliable and safety network that allows them to access tourist services freely.
- **Virtual immersion at the destination:** Attraction of interest in the trip planning phase and offer immersive and safe experiences in the face of peak traffic scenarios.

- **Safe tourism gamification:** Enabling tourists to experience and enjoy the destination and its attractions, without compromising their safety against possible contagions.

4.2.4.1 360° Planner

4.2.4.1.1 Description

This involves enabling the organization and planning of the trip from any device by organizing the entire trip and information of interest relevant to the experiences to be consumed, offering updates and information in real time in the execution phase of the trip.

4.2.4.1.2 Main characteristics

- It gathers information on places of interest to visit and a complete travel guide, providing information and implemented hygiene and safety actions.
- Plan and book your trip before arriving at the destination for the consumption of unique experiences during your stay.

- It receives information, in real time, on modifications, capacity and the flow of people, which enables modification and creates the ability to decide between one experience and another according to certain parameters such as availability, safety and promotion.
- Providing continuous feedback on each experience consumed and sharing the journey with other users.

4.2.4.2 Safe and customized offer

4.2.4.2.1 Description

Contextualization and personalization services are used to profile tourists and adapt the offer to the potential demand, considering their preferences and interactions, physical (proximity marketing), as well as online, with the destination.

4.2.4.2.2 Main characteristics

- Through its integration with the sensors deployed for spatial management and mobile application traceability systems, tourists are provided with real-time information on the occupancy of each space.
- Based on historical data and reservation analysis, it recommends visit projections with different safety levels/scenarios depending on the area, the attraction or PoIs.
- Depending on the location of the tourist, it can offer information and content about offers and promotions, and places of interest that can have a positive impact on the tourist.

4.2.4.3 Safe and advanced tourist services

4.2.4.3.1 Description

Providing tourists with a virtual customer service office with permanently updated information on all the services of the territory, and the possibility of managing incidents and/or suggestions sent by the same, with the aim of improving the feeling of permanence, safety and comfort at the destination.

4.2.4.3.2 Main characteristics

- This allows two-way communication with tourists as if they were citizens through mobile applications, chatbots, totems and web portals.
- Enabling access to services specific to the territory/city such as transportation, safety, health information, and de-escalation protocols.
- Real-time notification of any changes that might be of interest and might impact the tourist experience such as capacity, flow of people, and changes in de-escalation scenarios.
- Continuous feedback of the interaction with the tourist, and information that allows the CRM module to better segment the tourist.

4.2.4.4 COVID-free tourist traceability

4.2.4.4.1 Description

Module of the tourism app that allows the traceability of the COVID-19 tests that tourists have taken and thus record the results, obtaining a digital certificate generated automatically through a decentralized, reliable and safety network, which ensures their good health and allows them to access tourist services freely.

4.2.4.4.2 Main characteristics

- Information shared in a decentralized way between companies, destination managers and tourists that allows sharing COVID-free certificates under a decentralized system in which the owner of the information is the user.
- It allows the creation of a test history for each tourist so that he or she can access the different services of the destination with all the guarantees.
- It is helpful to identify possible sources of contagion or specific quarantine episodes should a positive test be detected, acting in a faster and more coordinated manner between all the services of the destination and the tourist.

4.2.4.5 Virtual immersion at the destination

4.2.4.5.1 Description

A tool that enables virtual interaction with the destination's main assets such as points of interest and tourist attractions, with the aim of attracting interest in the trip planning phase and offering immersive and safety experiences in the most crowded scenarios.

4.2.4.5.2 Main characteristics

- It shortens visiting times, reduces crowds and offers a safer visiting environment.
- Capacity or availability of technological tools for content generation by stakeholders, e.g., destinations and museums.
- Aggregator of multiple uniform and diverse content and information: audio guides, virtual views, videos and guides.

4.2.4.6 Safe tourism gamification

4.2.4.6.1 Description

Leveraging technology to build a gamification system that lets visitors experience and enjoy the destination and its attractions without compromising their safety against possible contagions.

4.2.4.6.2 Main characteristics

- Creation of a bonus system that allows access to promotions, offers and services in different companies or activities at the destination through different channels (physical or virtual tourist cards).
- Incorporation of augmented and virtual reality technologies for the generation of gamification scenarios with greater user penetration.
- Influence on the tourist's decision process through the generation of itineraries that take into account the variables of capacity, safety and hygiene measures of the attractions.

4.3 Local service supply and demand management

4.3.1 Challenge

In a changing environment in which destinations are struggling to maintain their competitiveness, the management body has the critical role of implementing a cooperation strategy between the different businesses to increase their productivity and therefore that of the destination through synergies among the different players.

4.3.2 Solution

Collaborative platform designed to let the managing entity centralize and harmonize the entire tourism offer, thanks to the publication and creation by the entrepreneurs, in a professional portal adapted to the destination's strategy. Thus, complete experiences are generated as a sum of individualized and personalized offers for each tourist segment. It also includes a module to boost the local economy through a loyalty system.

4.3.3 Benefits

- Optimizing digital sales and promotion channels and e-commerce of the destination's businesses.
- Increased direct sales of the destination, localizing the supply chain.
- Reinforcing the branding and brand positioning of the destination through the incorporation of all its offerings and assets under a single identity.

4.3.4 Use Cases

Solutions aimed at building a collaborative tourism governance ecosystem, which allows the

Local service supply and demand management

- **Professional portal:** Content and asset manager to incorporate the safety and hygiene offer and actions carried out in response to COVID-19.
- **Marketplace:** Creation of experiences through the assets of companies adhering to the professional portal and providing tourists with the ability to reserve and purchase products and services.
- **Local economy stimulation:** Implementation of tourist loyalty strategies through a collaborative ecosystem between entrepreneurs and services.
- **Scheduling and reservation manager:** Guarantees the maximum capacity established in the regulations applicable to COVID-19 through intelligent planning.
- **Digital tourism community:** Collaborative platform for sharing "tourism expertise" and accessing grants and subsidies.

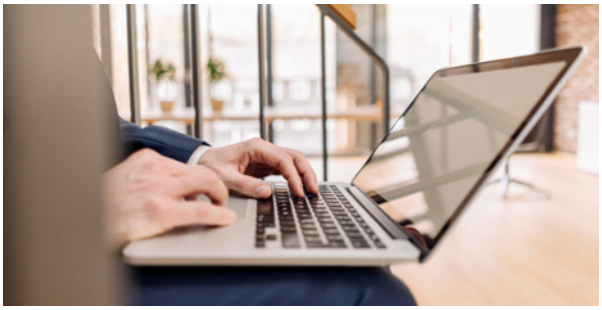
4.3.4.1 Professional Portal

4.3.4.1.1Description

Content and asset manager that allows an easy and simple way to incorporate the tourism offer and promotion of the destination's companies, providing them with tools that enable new sales and promotion channels to increase demand.

4.3.4.1.2 Main characteristics

- Coordination and governance of the sector's tourism offer in a single portal and adapting it to the quality standards established at the destination.
- Decentralized maintenance of promotional information and digital assets of the different companies adhered to the portal.



- It offers tools that allow companies to perform segmentation and analytics of user interaction.
- Incorporated timeline for publishing safety and hygiene measures against COVID-19 enabling the transparent publication of performance certificates through the Tourist App.

4.3.4.2 Marketplace

4.3.2.1 Description

The managing entity acts as an aggregator of tourist offers and assets, creating experiences through the combination of assets of the companies that are members of the professional portal, and providing the potential tourist with the ability to book and purchase products and services.

4.3.2.2 Main characteristics

- Streamlined booking and purchasing processes for local experiences and packages at the destination.
- Personalized information according to the type of user, improving the customer journey.
- Incorporating marketing tools and analysis of advertising impacts, search engine optimization, SEO, etc.
- Integrated with the destination's portal and promotional app to incorporate trip planner capabilities before, during and after.

4.3.4.3 Economic stimulation

4.3.4.3.1 Description

Capable of implementing tourist loyalty strategies through the creation of a collaborative ecosystem between entrepreneurs and services of the destination thanks to the use of different systems, e.g., tourist card (physical or virtual) or compensation system.

4.3.4.3.2 Main characteristics

- Allowing the business owner to join a collaborative loyalty programme coordinated and managed by the destination's management body.
- Enabling entrepreneurs to offer discounts and unique loyalty promotions for their services and/or collaborations within the destination's dynamization ecosystem.

- Options for integrating a customized compensation system for each destination and type of service: services of the destination (museums, cultural activities, etc.), restaurants, excursions, etc.
- Integrated with the destination's portal and promotional app to incorporate proximity marketing and gamification capabilities.

4.3.4.4 Scheduling and reservation manager

4.3.4.4.1 Description

Integration through the marketplace of the capacity to manage agendas and reservations so that the system itself is the one that guarantees the maximum capacity established in the regulations applicable to COVID-19 through intelligent planning that helps the implementation of the protocol.

4.3.4.4.2 Main characteristics

- Agile and flexible: allowing the modification of variables such as capacity, surface of the establishment and maximum stay, in order to plan the shifts and capacity of the establishment intelligently.
- It is integrated within the marketplace to offer the range of options and availability of reservation and/or visit to the tourist through the mobile application.
- Integrated with the destination's apps and promotional channels to incorporate marketing capabilities based on capacity and offer personalization based on preferences.

4.3.4.5 Digital Tourism Community

4.3.4.5.1 Description

A collaborative ecosystem linking local entrepreneurs and management entities that allows, through different channels, the sharing of expertise on the use and training of digital technologies applied to tourism, and to inform and channel grants and subsidies associated with the business activity of the local tourism sector.

4.3.4.5.2 Main characteristics

- It provides entrepreneurs, through a single channel, with access to grants and subsidies, workshops, training, and even further activities for the recovery of the sector.
- Establishing a channel to share experiences and expertise among professionals about best practices in tourism management during COVID-19.
- It links and connects professionals in the sector to establish possible synergies and cross-selling collaboration models that improve their productivity.
- It offers the possibility of posting job offers so that local resource matching is predominant.

4.4 Tourism intelligence

4.4.1 The Challenge

Broadening knowledge about visitors to the destination by aggregating and centralizing data on origin, reason for the trip, socio-demographic information, mobility, most visited areas, length of stay, etc., in order to identify patterns, relationships and trends that can be used to plan and optimize services that enhance the tourist experience and improve the quality of life of local citizens.

4.4.2 Solution

Management system (collection, storage and processing) of information about visitors captured by Wi-Fi sensors, mobile data and digital media, to obtain insights that help to know and understand tourists, and to analyse the evolution of the activity to always adapt the offer and services to the needs of the visitor.

4.4.3 Benefits

- Understanding and managing tourist flows in the destination, combating saturation and attending to the tourist carrying capacity.
- Adaptation of tourism resources to the current and future needs of visitors, improving their experience before, during and after the trip.
- Optimization of the strategy based on visitor habits and defining the tourist experience in relation to the destination.

4.4.4 Use Cases

Solutions aimed at the economic reactivation of the destination will allow its revaluation and productivity increase.

Tourism Intelligence

- **Visitor segmentation and profiling**: Qualitative analysis of tourists before, during and after their visit to the destination to create and offer new personalized experiences.
- **Visitor behaviour and mobility:** Monitoring of anonymized data to study the seasonal behaviour of segments of the population.
- **Economic impact observatory:** Analytical approach to the consumption activity carried out through credit cards at merchants operating within the destination.
- **Safe Destination Reputation Analysis:** Evaluating the perception of safety, health and hygiene that the destination is transmitting and promoting to tourists through multiple channels.
- **Mapping of tourism spatial planning strategies**: Useful in identifying and driving tourism business performance through combined analysis of tourism flow and spending information.

In addition to the solutions outlined above, tourism specific Key Performance Indicators (KPIs) for the destination management:

1. Demand
    a. Number of visitors (overall and overnight ones)
    b. Spending (overall and per arrival/trip)
    c. Distribution between national and international demand
    d. Seasonality / Dispersal of demand in time
    e. Geospatial dispersal
    f. Diversification of source markets (i.e., limit the dependence on a certain number of source markets)
2. Employment (level, quality, and gender balance)
3. Environmental KPIs (waste and water management, sewage management, climate change)
4. Local Satisfaction
5. Economic benefits / Leakages
6. Accessibility

4.4.4.1 Visitor segmentation and profiling

4.4.4.1.1 Description

Capturing and analysing visitor data to segment tourist profiles and create new personalized experiences by categorizing digital interactions, comments on social networks, tourist service chats, incident channels, blogs, mobile applications, among others, and synthesizing the data.

4.4.4.1.2 Main characteristics

- Qualitative analysis of the feedback provided by tourists before, during and after their visit to the destination, through mobile data and Wi-Fi antennas and their interaction with the destination's different marketing channels.
- Generation of configurable reports with data matrices of the visitors under study segmented by age range, nationality, gender, origin, average stay, overnight stays, and so on.

- Ability to model scenarios based on historical data to consolidate new tourist segments through better promotion and adequacy of supply.

4.4.4.2 Visitor behaviour and mobility

4.4.4.2.1 Description

Tourism mobility flow analysis to study the seasonal behaviour of segments of the population, making it possible to analyse the estimated activity in different geographical areas and points of interest, and to extract behavioural patterns to establish preventive measures to ensure the safety of the areas and visitors.

4.4.4.2.1 Main characteristics

- Monitoring of anonymized data from mobile devices and Wi-Fi sensors that allow obtaining information about places with more traffic, time spent at points of interest, peak/valley hours, and so on.
- Travel prediction and simulation of inflow scenarios based on historical storage.
- Generation of reports to compare results and evaluate seasonality and tourism behaviour at different intervals (e.g., month, year).

4.4.4.3 Economic impact observatory

4.4.4.3.1 Description

Analysis and monitoring of the consumption activity of tourists visiting the destination with anonymized data from the transactions made by visitors through their debit/credit cards at the different merchants operating within the destination.

4.4.4.3.2 Main characteristics

- Cross-analysis of information with data from other systems and services of the destination, allowing for a much richer and high value-added global vision.
- Estimation of activity by geographic area, origin of visitor, spending, merchant category codes or average spending, segmenting tourist spending.

- Predictive models to detect trends and anticipate the needs of tourists, offering them services focused on their profiles and needs.

4.4.4.4 Safe Destination Reputation Analysis

4.4.4.4.1 Description

Enabling an analysis of the perception of safety, health and hygiene that the destination is transmitting and promoting to tourists so that campaigns and actions can be established to increase the image and brand of the Safe and Resilient Tourism Destination.

4.4.4.4.2 Main characteristics

- Analysis of tourist sentiment through multiple channels, with special emphasis on social networks and mobile apps.
- It allows us to evaluate the tourist's perception in different phases of the trip: at origin, during the stay and post-trip.
- At origin: enabling targeted marketing campaigns to be implemented and improving web positioning.

- At the destination: able to analyse the tourist experience to act and react in real time to possible negative aspects.
- Post-trip: analysing the feedback received and the behaviour of the tourist in order to learn from the experience and improve the next campaign.

4.4.4.5 Mapping of tourism spatial planning strategies

4.4.4.5.1 Description

Useful in identifying and boosting the performance of the space (e.g., store, museum, restaurant, tourist attraction) through geospatial analysis combined with information on tourist flows and economic impact.

4.4.4.5.2 Main characteristics

- Analysis of expenditure variables through anonymized information on POS transactions (average expenditure, frequency) with the minimum level of aggregation (e.g., type of store, district, neighbourhood).

- It studies demographic variables of visitors to each tourist area by analysing mobile data to identify potential customers.
- It combines both sources of information and performs geospatial analysis to understand tourist spending behaviour and improve spatial productivity.
- Increasing the RoIe of existing and/or future businesses through the generation of ad hoc reports that help decision-making and the implementation of strategies to increase revenues and reduce costs.

5 Success cases

5.1 Cáceres smart heritage

5.1.1 Summary

City managers in tourist areas may not have information regarding how many tourists visit the city, how long their stay lasts or what their profile is. These data are essential to be able to create tourism strategies, identify the city's potential and make the necessary improvements to increase the number of tourists and recommend a visit to the city.

To this end, the city of Cáceres proposes itself as a pioneer in Smart Tourist Destination projects to improve tourist knowledge and shape smart tourism strategies.

5.1.2 Entity

Cáceres City Council.

5.1.3 Region and location

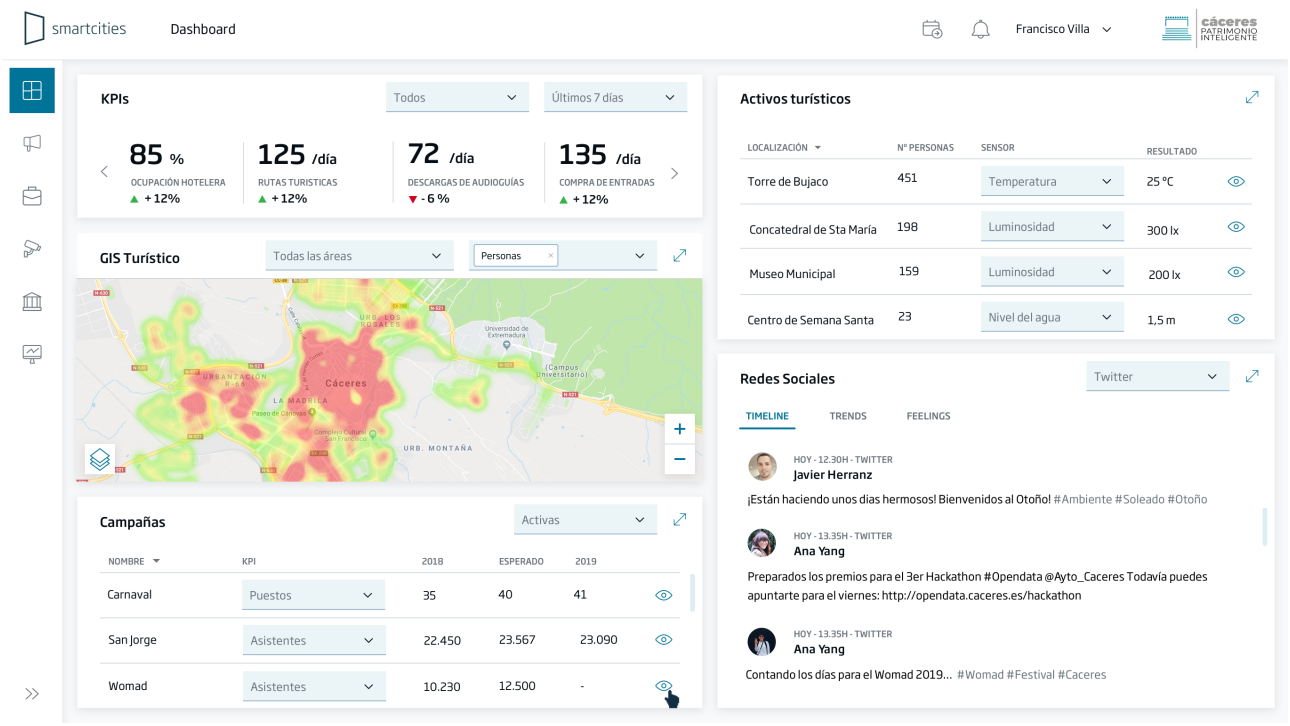
Cáceres is a World Heritage City located in Spain near the border with Portugal. Receiving more than 900 000 visitors, it is the third most visited monument in Europe. It has more than 2 400 hotel rooms and attractive natural, monumental and cinematographic tourism.

The community of Extremadura is in the centre-west of the Iberian Peninsula and is made up of two of the largest autonomous communities in Spain. Bordering Portugal, it boasts a wide range of natural and tourist attractions.

5.1.4 Definition/explanation of the case

The Cáceres City Council intended to implement a project that would enhance and publicize the city's heritage, and preserve its monuments. To this end, together with Minsait, it developed a project to acquire a greater knowledge of their visitors in order to activate strategies to attract, retain and increase these visitors' length of stay. The city's business sector has been incorporated within this strategy, and has been involved in the process of diversifying the consumption of the supply of services to structure a management system and model that promotes the city's business fabric.

Figure 10: Smart Destination Manager



The integrative model is led by the horizontal city platform Onesait Platform, which collects all the data from the project and displays them strategically within the holistic tourism scorecard Smart Destination Manager. This allows the state of the city to be visualized, as well as the making of forecasts or the creation of unified strategies with the different tourism stakeholders in the city such as businesses, hotels and event managers, to increase tourist satisfaction and length of stay.

In addition, a series of sensors and devices have been deployed within the project to create an intelligent ecosystem by monitoring different points:

- Counting sensors to delimit the capacity of the city's main monuments, so creating a safe environment for visitors.
- Cameras for monitoring the condition of the city squares.
- Monitoring of heritage elements with sensors for humidity, temperature, presence, luminosity, water level and quality, energy efficiency and weather stations, all of which will carry out a study of the building's state of conservation.
- Tourism portal and app to improve the visitor's experience and provide content, routes and promotions to extend the length of stay.
- Beacons that will send notifications to the app based on the profile about events in the city, videos and audio guide and information about the monuments to simplify the tourists' journey.
- Totems where city events, information of interest, access to routes, stores and restaurants will be published.

5.1.5 Impact / added value contributed

Currently, the City Council has the Onesait city platform and the comprehensive manager of the tourist destination where the state of the city can be visualized, creating unified and integrated strategies with the different actors of the city, knowing the profile of the tourist and sizing services and infrastructure to improve the perception of the tourist.

The City Council will be able to prevent deterioration and carry out preventive maintenance of monumental buildings, limit the capacity of monuments according to needs, design tourism and gamification strategies thanks to beacons, portals and apps.

5.2 Las Palmas de Gran Canaria – "Blue Intelligence"

5.2.1 Summary

Minsait has launched a pioneering initiative in Spain. An application that consolidates the new era of urban services management in a tourist destination par excellence such as Las Palmas de Gran Canaria.

The "LPA Blue Intelligence" project aims to turn Las Palmas into a Smart Destination par excellence through the implementation of a Smart city platform that provides an integrated and transversal vision of the city, bringing together a large amount of data generated from different sources to make Las Palmas a benchmark in tourism and the environment, and improve the quality of life

of citizens and visitors daily. The benefits achieved include savings in water risk, optimization of waste collection routes, management of parking spaces, smart payment for public transport or management of the fleet of vehicles of all municipal services, and a substantial improvement in the management of Las Canteras beach and all its associated services and activities.

5.2.2 Entity

Las Palmas de Gran Canaria Municipality.

5.2.3 Region and location

Las Palmas de Gran Canaria is a Spanish city and the capital of Gran Canaria Island, which is located off the north-western coast of Africa. It has an extension of 100.55 km² and a population of 379 925. The city is a major cruise port and known for its good weather and beaches. The main – and most touristic – beach is Las Canteras, with three kilometres of sand and as many kilometres of promenade, where the offer of services such as hotels, restaurants, bars and terraces, is very broad.

5.2.4 Definition / explanation of the case

"Las Palmas Blue Intelligence" uses Onesait Platform (formerly Minsait IoT Sofia2), Minsait's open Internet of Things and Big Data platform, as its technological basis. Based on data obtained from multiple sources and devices, it can integrate and manage these data under predictive rules and models and transform them into relevant information, not only for citizens, but also for managers, who will help them make decisions that are better adapted to the city's needs.

These new city capabilities, which translate into improvements for citizens and visitors, are based on intelligent rules that are applied to the information captured by the thousands of sensors deployed throughout the city.

Within the framework of the "LPA Blue Intelligence" project, several vertical services are also being developed and integrated in areas such as intelligent mobility, urban services and citizen relations, mostly linked to the improvement of environmental quality, with special attention paid to the intelligent management of beaches, a key pillar of the tourist activity of Las Palmas de Gran Canaria.

To this end, the implementation of a "Smart Beach Scorecard" around Las Canteras Beach is contemplated, which takes advantage of, and develops, information so that municipal technicians can adapt the services of that area to real needs. The deployment of a sensor network and software to send data will make it possible to optimize everything from cleaning and waste collection to parking management based on traffic flow.

Intelligent management of surface parking spaces and waste collection services are two other vertical services that will be integrated into the urban platform. In the first case, Indra's solution will

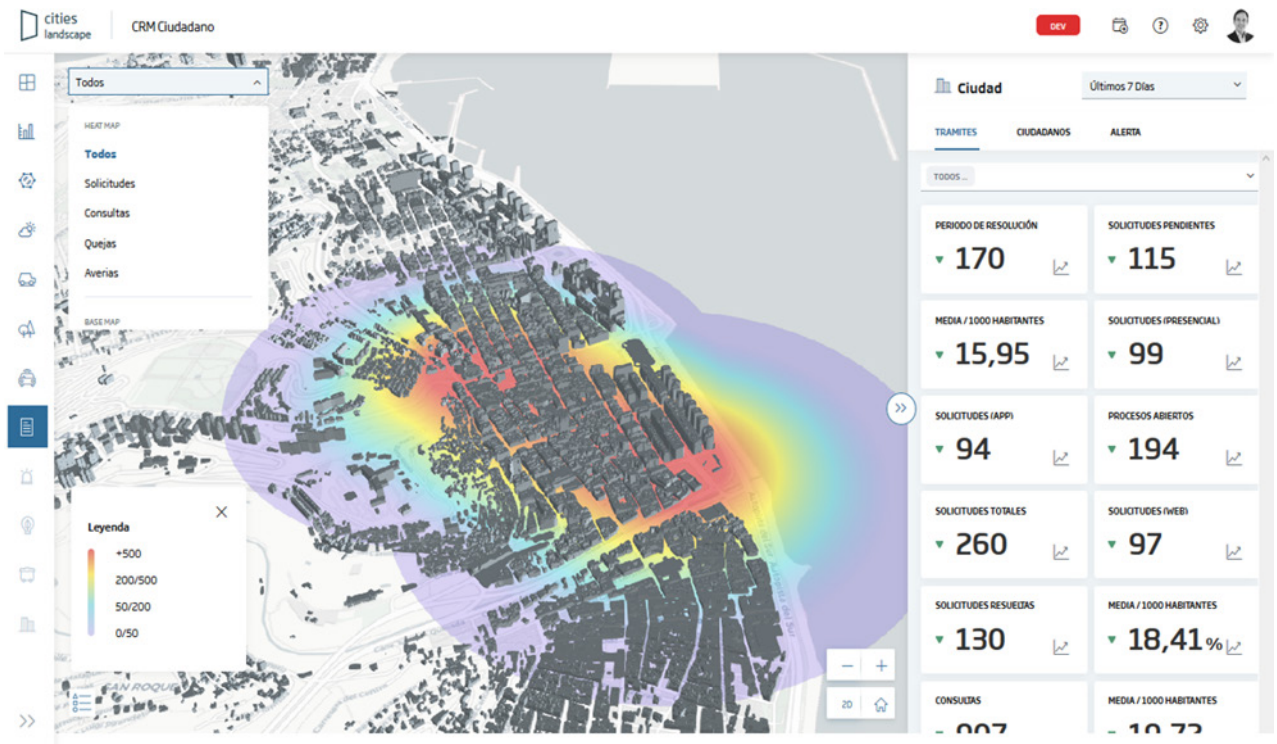
provide citizens with real-time information on free parking spaces thus reducing the time spent searching for them and reducing polluting emissions.

Additionally, an intelligent waste-management solution has been implemented in the Canary Islands capital, which facilitates, among other advantages for the city, the establishment of dynamic collection routes, and obtaining estimates of the increase or decrease of waste per route and per container, depending on the time of year or the demographic composition of the area.

The smart park and garden management system deployed will bring significant economic and environmental benefits and contribute to making the city more sustainable thanks to the incorporation of humidity sensors and other devices that will trigger irrigation only when necessary.

It also highlights the implementation of a CRM that will act as a central tool for citizen access to information and will make it possible to extract data from all interactions to improve public services.

Figure 11: Scorecard – Citizen CRM



Another innovative solution contemplated by the project is the implementation of advanced ticketing systems in public transport to take advantage of the growing digitalization of citizens and their means of payment, which will reduce costs and improve the user experience.

5.2.5 Impact / added value contributed

The project has been developed in a city with unique insular, economic and social characteristics, which pose very important challenges in terms of water management, mobility, tourism, employment and economic development, and has become a reference for island and tourist cities and territories.

Minsait's smart management solutions provide an integrated and transversal vision of the city, bringing together a large amount of data generated from different sources to make Las Palmas a benchmark in tourism and the environment, and to improve the quality of life of its citizens daily. These will achieve benefits such as savings in water risk, optimization of waste collection routes, management of parking spaces, intelligent payment of public transport or management of the fleet of all municipal services, and better management of the Las Canteras beach.

More specifically, the impacts of this project derive from the efficiencies generated in multiple services. According to company estimates, it is possible to achieve savings of more than 35 per cent in water consumption thanks to the cross-referencing of data with the environmental and meteorological service; or to reduce by at least half the time spent by drivers in the search for parking.

5.3 Vatican museums

5.3.1 Summary

The Indra company Minsait is the key partner in the digitization of the Vatican Museums, one of the most visited venues in the world. The company, a leading consultancy in the fields of Digital Transformation and Information Technology, is implementing a system to integrate the services of the Vatican Museums, improving the protection of works of art and the safety of its visitors.

The project consists of the implementation of digital solutions and technologies managed by an intelligent platform that enables the sharing of information among all the agents in the value chain to offer users more attractive and safer experiences that will attract more visitors and boost the museum's economy while respecting its environment.

5.3.2 Entity

Vatican Museums.

5.3.3 Region and location

Vatican City.

5.3.4 Definition / explanation of the case

The project is part of a five-year digitization plan aimed at improving the services offered to the public and involves, in addition to the Vatican Museums, the Directorate of Safety and Civil Protection Services, the Directorate of Technical Services and the Directorate of Telecommunications, all within the "Governatorato" of the Vatican City State.

The complex system of sensors already in place in the museums will be enhanced and developed technologically, and integrated into the comprehensive Onesait management platform, providing useful data to the safety systems as well.

A team of Minsait experts in Smart Security and Smart Tourism completed an initial study defining the safety plan that has been implemented progressively. In addition, a Data Centre was built to receive and integrate information from the different systems, centralizing the management of safety processes.

Museum Connectivity

A complex fibre-optic network, which now stretches some 20 kilometres, connects the complex system of flow and environmental control sensors, video surveillance, and safety, fire and evacuation

systems. In addition, the wireless connection is available to the thousands of visitors who enjoy the Museums' works every day, offering new visiting experiences through dedicated applications and a “safety place”.

A comprehensive digital Safety & Security system

In its initial phase, the project addressed the digitization of all safety and visitor flow management systems, positioning the Vatican Museums as a global benchmark in Safety & Security thanks to Minsait technology.

The integration of the various sources and systems makes it possible to centralize the monitoring and control of all the areas of the institution, guaranteeing an immediate diagnosis of each incident based on the situation detected, the place and context in which it occurred, and the number of visitors affected.

In addition, the public has the best guarantees in emergency situations[5] thanks to a digital and multimedia warning system capable of intelligently channelling visitors according to the levels of concentration of people in the rooms, accelerating and automating evacuation procedures and protocols.

"Integra Museum", the experience of the Vatican Museums together with Minsait technology.

The deal reached between Minsait and the Vatican Museums also includes the joint development of “Integra Museum”, an innovative digitization and safety platform that will be available to museums and centres around the world.

The platform adds the knowledge and experience of the Vatican Museums to Minsait's technology, based on the Onesait platform technology, which incorporates the most innovative Internet of Things, Big Data and Artificial Intelligence technology for the digitization, safety and management of visitor flows.

It is a Physical Security Information Management (PSIM) platform that integrates sensors and systems in a single graphical interface, thus enabling unified and coordinated management of the safety and services offered by museums.

5.3.5 Impact / added value contributed

The system improves the safety of visitors, contributing to the protection of infrastructures and the conservation of the thousands of works of art on display. It also ensures the safety of spaces, and

[5] For more information and guidance on the importance health emergency management and ICT-based surveillance mechanisms to monitor and curb public health disasters, refer to the U4SSC Deliverable – Smart public health emergency management and ICT implementations.

establishes more efficient artistic and cultural heritage management models. Forecasts point to an increase in the number of tourists and visitors.

5.4 Decarbonizing tourism – the case of Valencia

5.4.1 Summary

The changes that have taken place in recent years are transforming the global tourism paradigm, which is the result of the challenge of climate change and is reflected in new national and international policies such as the UN's Agenda 2030, the Urban Agenda (Habitat III), the European Green Pact and the Climate Emergency declaration in Spain.

In this context, the industry and destinations must rethink the parameters of competitiveness in terms of safety, health and sustainability, as is the case of the city of Valencia (Spain), which has redirected its model of tourist destination, promoting the improvement of the quality of life of residents and the positive perception of tourism activity in the citizenry.

5.4.2 Entity

Valencia City Council.

5.4.3 Region and location

The Spanish city of Valencia is located on the Mediterranean coast of the Iberian Peninsula, on the banks of the Turia River, in the middle of the alluvial plain l'Horta, and its extension between east and west does not exceed 8 km. It provides mild winters and warm summers to enjoy in its sunny white sandy beaches that extend from the city itself along the Valencian Community, and that make it the epicentre of a large tourist area.

Valencia is a city with a population of more than 800 000 inhabitants (2020). The current economy of Valencia and its metropolitan area is closely linked to SMEs (small and medium-sized enterprises), and is centred on the service sector (commerce, leisure tourism and business tourism), since nearly 84 per cent of the active working population belongs to this sector. In addition, the city maintains an industrial base, with an employed population percentage of 5.5 per cent, and agricultural activities survive in the municipality with a total of 3 973 hectares, which are mostly occupied by orchards and citrus crops.

5.4.4 Definition/explanation of the case

Valencia is implementing a strategy based on a sustainable tourism development model, capable of extending profitability to the social and environmental level, so contributing effectively to the protection and enhancement of the cultural and natural heritage, with special emphasis on those resources that give the destination its greatest authenticity and uniqueness. This model aims to minimize negative impacts, always promoting the improvement of the quality of life of residents and a positive perception of tourism activities among the citizens.

In order to turn these goals into reality, and with a focus on the fulfilment of the SDGs, a scoreboard has been designed based on a broad international reference framework, which connects each SDG with the specific indicators for tourism that have been selected (GSTC criteria, European ETIS indicators, indicators included in the Spanish UNE 178502 standard, STD criteria), making it possible to identify areas for improvement to fulfil the SDGs.

Within this strategy, the aim is to become a benchmark as a carbon neutral tourist destination, offering real solutions to the public and private sector to be more competitive in the new paradigm. The roadmap for the decarbonization of tourism comprises three phases:

- The initial calculation of the footprint of the destination and its stakeholders.
- The implementation of a digital management system (tracking the footprint and its reduction).
- The development of compensation projects in the territory.

Applying the public-private collaboration model, Visit València (a foundation dependent on the City Council) collaborates with the Global Omnium group (an international group based in Valencia with divisions specializing in sustainable water management and tourism). As the first fruit of this collaboration, Valencia was the first destination in the world to verify the calculation of the carbon footprint of its tourism activity, in addition to calculating and soon certifying its water footprint.

Using a powerful Big Data tool, the carbon footprint has been calculated in relation to the three scope areas:

- Scope 1: The footprint of passenger transportation to and from the destination, and internal transportation.
- Scope 2: Indirect GHG emissions from energy consumption in tourism activities.
- Scope 3: Other indirect emissions: accommodation, tourist consumption, waste management and water management; and those related to cultural activities, festivals, sporting and cultural events, and tourist infrastructure.

In turn, the study has broken down the calculation into ten chapters, so that the footprint corresponding to each of the segments involved has been identified: a broad range of aspects not limited to transportation, restaurants, infrastructure, public services and leisure activities.

The second phase entails implementing a digital carbon footprint management system, using smart tags that will record the emissions of each organization (calculating the carbon footprint in real time), feeding the digital platform that verifies and manages the information – using blockchain technology (recently awarded the Wakalua-UNWTO Innovation Award). A certified process that will allow individual and aggregated verification of the progress of the reduction, which can be passed on to users at any time.

5.4.5 Impact / added value contributed

Valencia has taken concrete steps to reduce the carbon footprint of tourism. The SDGs serve as a compass to guide Valencia towards the new paradigm; with a clear vision of becoming a safe, sustainable and healthy destination. By applying the knowledge, experience and resources of all the actors involved in this joint challenge to combat climate change.

5.5 La Nucía smart sports destination

5.5.1 Summary

The City Council of La Nucía wants to undertake its transformation towards Smart Tourist Destination with a specialization in sports tourism. The key point of this project is that, for the first time, the hyper specialization of a Smart Destination in sports takes place in the context of a Smart City project.

5.5.2 Entity, region and location

The municipality of La Nucía is in the province of Alicante, 50 km north of the capital and 150 km from Valencia. Located in the region of the Marina Baja, the municipality has a total of 18 242 inhabitants and shares borders with large tourist centres on the Costa Blanca like Benidorm, Altea, L'Alfàs del Pí and Villajoyosa. La Nucía is a residential municipality with little tourist tradition, and barely 851 beds. Most of its population lives in suburbs outside the downtown area, and 40 per cent of its companies are related to the service sector.

5.5.3 Definition/explanation of the case

The City Council of La Nucía is undertaking its transformation into a Smart Tourist Destination specializing in sports tourism. This implies a new way of selling, operating, and serving residents and visitors, and relating to the institutional, business and social environment. La Nucía Smart Sports Destination is a pioneering and innovative project, which relies on the power of the Camilo Cano Sports City to consolidate these facilities as a source of prosperity and well-being for the municipality.

5.5.4 Impact / value added contributed

The Smart Sports Tourist Destination model for La Nucía takes components from the Smart Cities and the Smart Tourist Destinations conceptual frameworks. The project impacts are:

- The strong specialization in sports tourism is already contributing to the quality of life and generating opportunities and benefits for the resident society.
- The strategy fosters the digital economy with initiatives around sports and innovation.
- Likewise, it contributes to the municipality's social objectives: a connected society, the promotion of well-being and quality of life through healthy lifestyles, intelligent mobility and, of course, sustainability.
- As a Smart Sports Tourist Destination, la Nucía will be increasing its contribution to the United Nations SDGs.

5.5.5 Applicable Technologies

- Connectivity: Connect all devices in the territory (e.g., sensors, mobile devices) to connect into a network, so that the data flows bidirectionally.
- Sensors: Transform the sports facilities and the city into a Smart space with functionalities to improve the sustainability of the DTI and to provide valuable information for the management of public services.
- Smart City Platform: Greater management capacities and control over services and processes to improve municipal management and decision-making in all areas of the city.
- Smart Economy: Develop the technological components that provide visibility and drive digital transformation of local commerce.
- Mobility: Implement technologies for efficient management of mobility in the municipality, especially in situations of potential road saturation.
- Safety: Improve the technological capacity of the municipality to protect people's integrity.
- Sustainability: Expand the use of technology for environmental protection.
- Facility management system: Install a comprehensive management platform to the Camilo Cano Sports City and other facilities.
- Technologies for sports disciplines: Provide the Camilo Cano Sports City with state-of-the-art technologies for training and competition.

- Accessibility: Guarantee universal access to all sports and tourism facilities.
- Boosting entrepreneurship: Encourage the creation of new startups associated with the sports sector.
- Tourist and sports data centre: Build a storage and processing platform for the data generated by the interaction of visitors with the destination systems to generate useful knowledge.
- Dashboards: Build the measurement & control system to generate process and operations intelligence for more efficient digital transformation management.

5.6 Rota smart tourism destination

5.6.1 Summary

The tourism sector is facing changes, and the administrations must undertake actions to create new business opportunities and to promote the diversification of markets and consolidate the successes obtained in traditional markets. In this context, with the experience of a Smart City model, the city of Rota as a unique enclave of beach tourism and the particularity of the US naval base, aims to create and implement a new concept of tourist territory.

5.6.2 Entity, region and location

The town of Rota is a Spanish municipality located in the province of Cádiz, in the autonomous community of Andalusia. It covers an area of 84 km² and is bordered by the towns of Chipiona, Sanlúcar de Barrameda and El Puerto de Santa María. It is located at an altitude of 9 metres above sea level and lies 51 kilometres from the provincial capital, Cádiz.

With an enviable climate for most of the year and a 19 km- long beach, Rota is a very popular tourist destination for national and international tourists, especially from the United States, due to the demographic privilege imposed by the US naval base.

5.6.3 Definition/explanation of the case:

In Rota, the touristic data such as the influx of tourists or overnight stays, among others, show that the tourism sector is one of the main economic engines of the municipality. Rota is aware that the economic and tourist promotion of the municipality requires the incorporation of new technologies for its transformation into a Smart Tourist Destination, recognized nationally and internationally.

This transformation towards an intelligent tourist destination will allow Rota to increase its competitiveness and revalue itself as a destination, improve the use of its natural and cultural attractions, create new innovative tourist resources adapted to the current and future needs that tourists demand, improving their experience before, during and after the trip, favouring the interaction of the visitor with the municipality and improving the efficiency of services. It also enables the generation of opportunities for the business sector under an umbrella of intelligent, sustainable, innovative and integrated development.

Knowing how the tourist/visitor behaves in Rota and being able to act with the most appropriate strategy to improve the marketing of the destination and the visitor's experience during their stay, makes it crucial to know in a systematized way, among others, the following aspects:

- **The number of visitors it receives.** The location and size of Rota means that access to the municipality is mostly by road by private vehicle, which has limited information to date on the number of visitors and other data of interest such as origin due to the limited use of public transport. The information on which tourism-related actions are defined comes mainly from the INE and the IEA on hotel occupancy, from surveys carried out at the tourist office, which are not a very representative sample, and from listening to the RRSS.
- **Visitor behaviour:** What was visited? Duration of the visit? How long was the stay in the destination? Which parts of the destination were visited? Was the visit restricted to the historic centre? Did the visitor visit the most commercial streets? Did the visitor know all the offers? Did he or she visit as much as possible? What was not visited because of lack of interest, lack of time or lack of information? These are questions that need to be answered to diversify the offer, provide a higher quality service, attract more visitors, diversify the destination or undertake any action seeking to be successful. At present, this information is scarce, dispersed and unreliable.
- **Impact on the sector**. Knowing the supply of the service sector and its interrelationship with consumption in the Rota destination is another element that is essential to know. Tourist activity and the consumption model are related closely to the events that take place in the tourist destination, one-off events (e.g., festivals, markets, concerts, fairs, gastronomic events), as well as permanent events.
- **Real-time information.** Rota currently has a horizontal IoT platform, Elliot Cloud technology that brings together real-time information from IoT systems deployed in the city.

5.6.4 Impact / value added contributed:

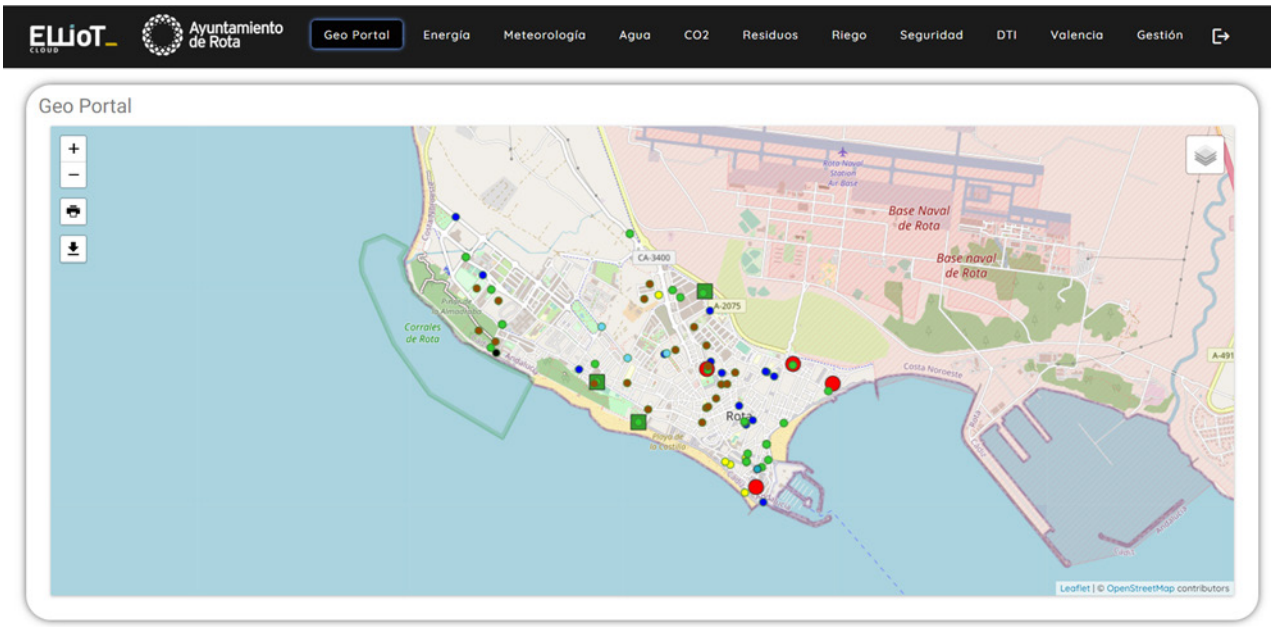
Quantitatively, these actions will have multiple impacts:

- **The number of visitors to the destination will increase through a better offer and marketing.** In addition, tools will be available to promote successful actions and correct those that are achieving poorer results.
- **The length of stay of visitors to the destination will be increased through an offer and marketing that is better adapted to demand.** The municipality will be provided with tools that will allow it to diversify and induce the visitor's desire to stay longer in Rota.
- **The average expenditure per visitor** per visit will increase as a direct consequence of the increase in the number of visitors and the average length of stay.
- **Visitor satisfaction** will increase as a direct consequence of the development of the actions, knowing the visitor's demand.
- **The active population in the service sector will increase per period of time** as a direct consequence of the increase in visitors and average length of stay.
- **Direct/indirect municipal income will be increased per period of time.** Due to the tools that will be implemented, a high impact on the direct income derived from this project is not expected at first. This trend will change as visitor numbers increase and visitor diversification initiatives grow.

5.6.5 Applicable Technologies

- IoT Platform collecting data in real time of the following sensors and systems:
    - Waste
    - Energy
    - Environmental
    - Irrigation
    - Security

Figure 12: Rotamunicipality IoT City Platform



- 20 signs with beacons.
- 5 interactive screens or totems.
- 2 cameras for people counting or rather to control the flow of vehicles and people.
- Tourist APP that interacts with the platform.
- Tourist destination vertical that goes inside the platform.

6 Conclusion

Accelerating digital transformation in the tourism sector is a priority for destination management, especially with reference to natural resource management, heritage and culture preservation, enhancement of social fabric and overall livability in tourism destinations. The advent of the fourth industrial revolution and the convergence of various data streams, have provided the opportunity to drastically metamorphise the multi-faceted domain of tourism. In the context of smart tourism, technologically-enhanced innovations can be leveraged to improve not only inhabitant engagement, but also drive decision-making, along with social inclusion, and delivery of citizen-centric services. In this context, cities should also consider tourists as "temporary inhabitants" and ensure the engagement of visitors in a holistic and fully integrated manner.

The examples elucidated in this Report highlight the importance of adopting digital technologies to improve ease of access to local information in multiple languages along with phasing out the need for physical currency. As is observed from the use-cases elaborated in this Report, the development of a centralized platform for accessing information as well as services for tourists is vital for any city seeking to build a smart tourism ecosystem and foster their transition to a smart and sustainable city. Having such a system in place, improves ease of travel, eliminates the probability of fraud and enriches the overall experience for tourists, thereby holding the potential for cities to promote themselves as tourist destinations. Some of the recommendations underscored in this Report include (but not limited to) the following:

- *Tourist Destination Framework:* Establishing and adhering to a specific smart tourist destination framework and adoption of relevant international standards relating to smart tourism.
- *Smart Tourism Destination Platform:* Creating a central smart tourism destination platform and management system which can provide a one-stop destination for the products and services at the disposal of the tourists. Such a system will allow for assessing tourist behavior patterns and enhance the overall planning process for driving smart tourism transitions.
- *COVID-19 Tracing:* In this post-COVID area, resumption of tourist-based activities, may lead to concerns relating to COVID spread. Existing tourist apps on COVID-19 tracing allow for sharing of COVID vaccination certificates under a decentralized system in which the owner of the information is the user. With the help of such a system, coordinated detection of COVID-19 infection is feasible along with the designation of containment zones.
- *Loyalty Programmes:* The creation of a loyalty programme or bonus programme will help highlight promotions, offers and services available at a specific destination through different channels including physical or virtual tourist cards or on the smart tourism destination platform itself.

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