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Observatory of Sustainability of the Algarve Region for Tourism: Proposal for Environmental and Sociocultural Indicators

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***Abstract*—**The Observatory of Sustainability of the Algarve Region for Tourism (OBSERVE) will be a valuable tool to assess the sustainability of this region. The OBSERVE tool is designed to provide data and maintain an up-to-date, consistent set of indicators defined to describe the region on the environmental, sociocultural, economic and institutional domains. This ongoing two-year project has the active participation of the Algarve's stakeholders, since they were consulted and asked to participate in the discussion for the indicators proposal. The environmental and sociocultural indicators chosen must indicate the characteristics of the region and should be in alignment with other global systems used to monitor the sustainability. This paper presents a review of sustainability indicators systems that support the first proposal for the environmental and sociocultural indicators. Others constraints are discussed, namely the existing data and the data available in digital platforms in a format suitable for automatic importation to the platform of OBSERVE. It is intended that OBSERVE will be a valuable tool to assess the sustainability of the region of Algarve.

***Keywords*—**Sustainability, observatory, environmental indicators, sociocultural indicators, development, tourism, Algarve.

I. Introduction

TOURISM has important impacts on society, the economy and environment. It also has a great potential to make progress across the Sustainable Development Goals (SDGs) [1].

Tourism destinations should promote their activities in a context of sustainable development. And this is a challenge to be taken into account in all activities [2].

In Portugal, tourism receipts achieved, in 2018, a value of 8.2% of per capita GDP and 328,500 employees. The Algarve is the most significant touristic region in Portugal and is responsible by a share of the overnights of 34%. The Algarve region covers 6% of Portugal's total area with an approximated 5000 km^2, being bathed by the Atlantic Ocean on West and South. The proximity of the Mediterranean Sea greatly influences the Algarve climate, considered as moderate. Due to these characteristics, the Algarve region is a well-known touristic destination, with good perspectives of growth. However, tourism has a major impact on the natural and built environment, as well as on the culture and wellbeing of population. Consequently, the sustainable development of the region is a crucial aspect for the future [3].

To ensure the sustainability of a region, there is a need for policies and plans, with the direct participation of stakeholders, involving, public administration, service providers, local communities, local citizens and tourists. Its evaluation must be continuously assessed with a basis on indicators [4].

This paper presents a brief description of the OBSERVE project (Section II), a literature review of sustainable indicators frameworks applied to tourism (Section III), the OBSERVE indicators proposal (Section IV) and the conclusions (Section V). The complementary information for environmental and sociocultural indicators is presented in Appendix.

II. Observe Project

OBSERVE [5], is an instrument to monitor and evaluate the sustainability levels of the region of Algarve for tourism. Its main goal is to provide environmental, economic, social-cultural and institutional indicators to support the decision-making process for the sustainable growth of the region.

This project has nine operational goals, directly indexed to the activities presented in the work plan:

1. To make more efficient and easy the process of systematizing and exchanging data on sustainable development and its implications on tourism.
2. To provide a broad base of sustainable development indicators relevant to the region, including environmental, economic, socio-cultural and institutional.
3. To support and observe sustainable development strategies of the region and the tourist activity.
4. To provide a decision support instrument.
5. To communicate technical information in an objective and reliable way.
6. To improve communication between stakeholders.
7. To evaluate the integration of sustainability in the different sectors of the tourism activity.
8. To involve actively all stakeholders in the assessment and reporting of sustainability.
9. To create a channel for the dissemination of information related to sustainability and tourism activity, aiming for the destination promotion (region of Algarve).

The OBSERVE platform is being designed to be dynamic, interactive and to be able to self-update data. It will have modules designed to interact with social platforms, like

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Facebook and Twitter; to manage and send periodic newsletters to the stakeholders; to validate data and detect system faults; to link to data sources so that indicators can be automatically self-updated.

To develop this project, the University of Algarve has a research team that incorporates human resources with high competence in several areas of knowledge and with consolidated experience in the areas of intervention. This two-year project seeks the widest possible participation from central and local administrations, universities and research centers, as well as, enterprises, associations, and tourists and citizens, aiming to add value for the stakeholders and for the region.

OBSERVE is intended to be an instrument of major importance for the future, as it reflects the reality of the region and supports the decision-making process, in order to improve environmental quality, social equity, economic efficiency and increase the public awareness and citizen participation.

III. Sustainability Indicators

Sustainability indicators are the new-born tool among all the others tools used to measure sustainability [6], [7]. Until now, there is no consensus among researchers regarding a universal list of indicators, which could be capable of revealing the sustainability level of the various touristic destinations [8], [9].

The number of indicators to assess the sustainability of tourism still remains imprecise [10]. For the World Tourism Organization (UNWTO) [4], 12 to 24 indicators are accepted to be optimal, while Sors [11] argues that 20 to 50 indicators are quite enough.

In Europe, in 2013, the European Commission launched ETIS [12]. This system was created for monitoring and measuring the sustainable tourism performance of destinations is an important management tool. It is based on 27 main indicators and 40 possible extra indicators.

Indicators are used as performance markers, which tourists, residents, governmental agencies, tourism operators and stakeholders in general, use to deal with the pressure impose to the systems and to manage the sustainable development of the touristic regions.

According to UNWTO [4], indicators should be selected based upon relevance and feasibility, according to sustainability development targets, pointed out by national and international organizations.

A relevant system for the region of Algarve was SIDS Algarve (System of Indicators of Sustainable Development) [13]. The SIDS project stopped to update information in 2007, and, nowadays, is not an operational system. Unfortunately, it depended on information collected by different entities, which does not ensure the feeding of data continuity.

In Portugal, there are different entities, such as those listed below, that regularly collect data, and in some cases provide indicators:

- "Instituto Nacional de Estatística" (INE - National Statistical Institute of Portugal) [14].
- "Agência Portuguesa do Ambiente" (APA - Portuguese Environmental Agency) [15].
- "Comissão de Coordenação e Desenvolvimento Regional do Algarve" (CCDR-Alg - Algarve Commission of Coordination and Regional Development) [16].
- "Aeroportos de Portugal" (ANA - Airport Authority of Portugal) [17].
- "Infraestruturas de Portugal" (IP – Infrastructures of Portugal) [18].

"Entidade Reguladora de Águas e Resíduos" (ERSAR - Water and Waste Services Regulation Authority) [19].

"Instituto de Conservação da Natureza e Florestas" (ICNF - Institute for Nature Conservation and Forests) [20].

A. Indicators Proposal

As previously mentioned, the OBSERVE project seeks to provide indicators in four domains. However, in this paper, only the environmental and sociocultural indicators are explained.

The indicators are used to assess the effects of tourism on the sustainable development of the region of Algarve.

The indicators content and the methodology for data collection are extremely relevant for the management and regulation of the touristic activities.

The indicators adopted in OBSERVE were obtained from currently available data, preferably with a correspondence to national and international standard indicators, to which, it is possible to compare and analyze the results.

A detailed review of international and Portuguese framework indicators was initially performed, including, Algarve's Sustainable Development Indicators (SIDS Algarve) [4], UNWTO [5], European Tourism Indicator System (ETIS) [6], Models of Integrated Tourism in the Mediterranean Plus (MITOMED +) [7], Portugal Tourism Travel BI [8], Croatian Sustainable Tourism Observatory (CROSTO) [9] and the Portuguese National Statistical Institute (INE) [10].

B. Environmental and Sociocultural Indicators

The initial environmental and sociocultural indicators, proposed for OBSERVE are presented, respectively, in Tables I and II. They resulted from the analysis of the information presented in another framework (Appendix I).

IV. Discussion

This first approach will suffer a reduction after the discussion with the most relevant stakeholders of the Algarve region. Nevertheless, some of the following recommendations shall be taken into account.

TABLE I
ENVIRONMENTAL INDICATORS (INITIAL OBSERVE PROPOSAL)

Sub-Domain	No.	Indicator	Data Availability
Climate and climate change	A01	Average air temperature	*
	A03	Temperature extremes	*
	A02	Average precipitation (max and min)	*
Environment management	A04	Nº Beaches and marinas with blue flag	*
	A12	Municipal expenses in Environment per 1000 inhabitants	*
	A07	Coastline evolution	**
	A06	Nº Bathing waters and quality classes	*
	A10	% Establishment with certifications	***
	A05	Bathing season duration	*
	A11	Environment expenses	*
	A08	Coastal management measures	**
	A09	% Establishments providing environmental training to employees	***
Carbon management	A13	Carbon footprint	***
	A14	GEE emissions	**
Mobility	A20	Nº Embarked and Disembarked Passengers (Faro Airport)	*
	A26	Daily traffic on A22 and EN125	**
	A16	Cycle routes or Cycle Infrastructure	**
	A25	Nº and location of charging stations for electric vehicles	**
	A22	Nº Passengers-kilometer carried by enterprises exploring inland transportation	*
	A21	Nº Passengers boarded at airports	*
	A19	Nº Rail passengers disembarked per inhabitant	*
	A18	Nº Number of passengers per month of rail transport	**
	A23	Nº Passenger movement per port	*
	A24	Movement of goods (t) in ports	*
	A15	% Tourists using different means of transport	**
	A17	Estimation of the monthly number of users in cycling routes	**
Energy management	A28	Electricity consumption per inhabitant	*
	A30	Q% Gross Electricity Production	*
	A27	Direct energy consumption	**
	A29	Power consumption (kWh)	*
	A34	Emissions (direct energy)	**
	A33	% Use of energy efficiency measures	***
	A31	% Establishments with low consumption systems	***
	A32	% Establishments with energy reduction objectives	***
	A35	Emissions (electricity consumption)	**
Water Cycle management	A39	% Safe water	*
	A47	Quality indicators of the wastewater sanitation service	*
	A40	Water consumption per inhabitant	*
	A36	% Establishments that optimize water consumption	***
	A43	% Use recycled water	***
	A38	% Water controlled and good quality	***
	A44	% Wastewater treated	**
	A41	% Population served	*
	A37	% Establishments with consumption reduction objectives	***
	A45	Volume of wastewater treated	**
	A46	% Lodging served by sewage drainage	*
	A42	% Use of water-efficient measures	***
Materials and waste management	A49	% Urban waste prepared for reuse and recycling	*
	A53	% Establishments that make waste separation	***
	A50	% Urban waste collected selectively	*
	A52	Urban waste selectively collected per inhabitant	*
	A48	Urban waste collected	*
	A54	% Establishments with environmental criteria	***
	A51	Urban waste collected per inhabitant	*
Natural capital management	A55	Burnt area	*
	A61	Investments on protection of biodiversity and landscapes of municipalities	*
	A57	% Tourism companies that support actions for the protection, conservation and management of biodiversity and landscape	***
	A60	Land use (vegetation)	**
	A59	Nº Endangered species and priority habitats	**
	A58	Invasive Species vs. Autochthonous Species	**
Territory management	A56	% Forest cover	**
	A62	Nº Green spaces for public use	**
	A63	% Reconstructed total area	**
Air quality and noise	A64	Air Quality Index	*
	A67	Levels of population exposed to noise	*
	A66	Air Quality: Particles < 2.5 ug	*
	A65	Air Quality: Particles < 10 ug	*

Data availability: *Available data; ** Requires protocol or advanced calculation; *** Information does not exist

TABLE II
SOCIOCULTURAL INDICATORS (INITIAL OBSERVE PROPOSAL)

Sub-Domain	No.	Indicator	Data Availability
Tourist satisfaction	S01	% Tourist satisfaction	***
	S02	Tourists who repeat their visit to Portugal	***
Resident satisfaction	S03	% Satisfaction of inhabitants with tourism	***
	S04	% Satisfaction of inhabitants with impacts of tourism	***
Wellness in destination	S05	Units classification (booking and tripadvisor)	**
Pressure	S06	Tourist Intensity	**
	S09	Tourist Density	**
	S07	Nº Tourist beds per 100 inhabitants	*
	S08	Lodging capacity in hotel establishments by 1000 inhabitants	*
ACCESSIBILITY	S10	Occupancy rate	**
	S12	Nº Accessible beaches	*
	S11	% Accessible rooms	**
Culture	S13	Nº Events that promote local culture	**
	S19	Expenditures on cultural heritage of municipalities	*
	S18	Nº Cultural properties	*
	S20	Expenditures on cultural heritage of municipalities	*
	S14	Nº Zoos, botanical gardens and aquariums	*
	S15	Nº Museums	*
	S17	Nº Visitors of museums	*
	S16	Nº Visitors of zoos, botanical gardens and aquariums	*
Education	S21	Population aged 15 and over by level of schooling	*
Health care	S22	Nº Hospital beds	*
	S23	Nº Personnel employed in universal access hospitals	*
	S24	Nº Pharmacies per 1000 inhabitants	*
Safety	S25	Nº Pharmacies	*
	S26	Crime rate	*
	S27	Nº Registered crimes	*
Social cohesion	S28	Regional development composite index (Cohesion)	*
	S33	Nº Secondary Houses per 100 Houses	*
	S30	Beneficiaries of the social integration income	*
	S32	Nº Personnel employed in hotel establishments	*
	S29	% Beneficiaries of guaranteed minimum income and social integration income	*
	S31	Social Security disability subsidy allowance	*
DEMOGRAPHY	S34	Resident population	*
	S35	Annual population growth: total, natural and migratory	*
	S36	Foreign population with status of residence	*

Data availability: *Available data; ** Requires protocol or advanced calculation; *** Information does not exist

1. Information access and API: The information availability is a crucial aspect. The OBSERVE team greatly learned from the example of a previous project (SIDS Algarve). Although it contained very relevant information, the project ended because it became obsolete; it only contained information until 2007 [13], due to the impossibility of guaranteeing updated data over the years The SIDS team considers essential to guarantee automatic access to sources of data through an API (Application Programming Interface), or at least for a substantial part of the indicators.
2. Repository of information and data analysis: OBSERVE is a repository of available information. It also should include potential benchmarks, references and data analysis. In addition, sectorial meetings will seek to identify possible new sources of information and, if necessary, protocols will be developed to ensure the regular provision of such information.
3. Competitiveness: Competitiveness is an essential issue of the project. OBSERVE has to contribute to the competitiveness of the region and to the stakeholders, as well as to provide a significant added value. Actually, it is not possible to be competitive without being sustainable. OBSERVE will allow to identify trends and compare the relative performance of other regions in environmental, social, economic and institutional domains. In addition, it will allow to think about the sustainability of the Algarve region in an integrated way.

V. CONCLUSIONS

This paper presents an extended review of systems of sustainability indicators and reports the first approach of environmental and sociocultural indicators for the OBSERVE.

The data availability and the ability to self-update of the information are essential to assure the future of the platform. This will require access to information through APIs for a substantial number of indicators and is considered in the

selection of the indicators. The expected organized information is useful to relevant stakeholders of the Algarve tourism region. As an example for competitiveness, some aspects are highlighted, namely: Understand regional trends and the compare it to other regions; spatial differentiation and the domains that need (or could) be improved.

APPENDIX

TABLE III
INTERNATIONAL AND PORTUGUESE FRAMEWORK INDICATORS

			Indicators Systems								
	Subdomain	Indicator	Travel BI	MITOMED+	MITOMED	CROSTO	SIDS Algarve 2007	UNWTO Baleares	ETIS	ETE	Other
Environmental	Mobility	Percentage of tourists and same day visitors using different modes of transport to arrive at the destination	√	√	√			√	√		
		Carbon footprint	√					√	√		
		Percentage of tourists and same day visitors using local/soft mobility/public transport services to get around the destination							√	√	
		Airport passenger arrivals and departures	√								
		Harbor passenger arrivals and departures	√								
		Km of cycling routes (versus km's of roads)		√	√						
	Energy	Percentage of establishments with low consumption systems	√					√	√		
		Percentage of tourism enterprises that take actions to reduce energy consumption	√					√	√	√	
		Percentage of use of energy efficiency measures	√						√		
		Electricity consumption	√								
		Emissions (direct energy)	√								
		Emissions (electricity consumption)	√					√			
		Production of energy from renewable sources					√	√	√		
		Energy Intensity					√	√			
		Percentage of electric energy consumed by renewable sources (%)		√	√						
		Energy consumption (KWh) per person per day		√	√	√		√	√		
	Climate and Climate Change	Emissions of atmospheric pollutants					√				
		Emissions of Greenhouse Gases					√				
		Temperature (maximum and minimum)					√				
		Precipitation					√				
		Percentage of days when the NO√ threshold is trespassed (%)		√	√						
Environmental	Water Cycle and Marine Environment Management	Percentage of establishments that optimize water consumption	√					√	√		
		Percentage of tourism enterprises using recycled water	√					√	√		
		Percentage of tourism enterprises taking actions to reduce water consumption	√					√	√		
		Percentage of controlled water and good quality	√	√	√			√			
		Percentage of use of water efficiency measures	√						√		
		Number of blue flags in relation to the number of beaches as that part of the coastline considered bathing area	√	√	√			√	√		
		Percentage of excellent and good bathing waters	√								
		Quality of the aquatic system in estuaries and coastal lagoons					√				
		Percentage of bathing water quality in the interior									√

			Indicators Systems								
	Subdomain	Indicator	Travel BI	MITOMED+	MITOMED	CROSTO	SIDS Algarve 2007	UNWTO Baleares	ETIS	ETE	Other
Environmental	Water Cycle and Marine Environment Management	Quarterly consumption by municipality per year					√				
		Quality of surface and groundwater by water body					√				
		Percentage of safe water per municipality					√				
		Percentage of population served by public water supply systems					√				
		Percentage of compliance with the license discharge									
		Percentage of population served by wastewater treatment plants					√				
		Percentage of wastewater treated				√	√	√			
		Monthly values of the water volume ratio stored in the reservoir/storage capacity					√				
		Coastline evolution					√				
		Coastal management measures					√				
	Territory Management	Water consumption in liters per person per day		√	√	√			√		
		Number of pollution in seawater per 100 ml		√	√				√		
		Number of berths and moorings for recreational boating in relation to total length of coastline		√	√				√		
		Volume of sand nourishment		√	√						
		Percentage of sand nourished (%)		√	√			√	√		
		Use of land: area of developed and building land in relation to land designated as not for building		√	√			√			
	Territory Management	Percentage of the area of the destination with a sustainable tourism strategy/action plan, with agreed monitoring, development control and evaluation arrangement (%)		√	√				√	√	
	Natural Capital Management	Fauna and flora species threatened and protected					√				
		Management and nature conservation actions					√	√			
		Percentage of local enterprises in the tourism sector actively supporting protection, conservation, and management of local biodiversity and landscapes.	√						√	√	
		Percentage of the destination area that is designated for protection (%)		√	√					√	
		Percentage of the destination area under a biodiversity protection plan (%)		√	√			√		√	
	Waste Management	Percentage of tourism enterprises separating different types of waste	√					√	√	√	
		Solid urban waste produced by destination	√	√	√		√	√			
		Waste production per person				√			√		
		Volume of solid urban waste recycled		√	√		√				
	Environment and Economy	Environmental expenditure	√								
		Percentage of tourism enterprises in the destination using a voluntary verified certification/labeling for environmental/quality/sustainability and/or CSR measures (%)	√	√	√			√	√	√	
	Environment and Economy	Percentage of establishments with environmental criteria in the acquisition of goods and services	√								

			Indicators Systems								
	Subdomain	Indicator	Travel BI	MITOMED+	MITOMED	CROSTO	SIDS Algarve 2007	UNWTO Baleares	ETIS	ETE	Other
Sociocultural	Education	Percentage of establishments that provide environmental training to employees	√								
	Employment	Personnel employed	√			√		√			
		Employment rate					√	√		√	
		Unemployment rate					√	√			
	Social Cohesion	Percentage of jobs in tourism that are seasonal	√	√	√			√	√		
		Percentage of men and women employed in the tourism sector	√	√	√				√	√	
		Average wage in tourism for women compared to men's employment		√	√						
		Percentage of commercial accommodation establishments participating in recognized accessibility information schemes		√	√		√		√		
		Percentage of tourism enterprises where the general manager position is held by a woman		√	√				√		
		Percentage of beaches accessible to all	√	√	√				√		
		Percentage of tourist attractions that are accessible to people with disabilities and/or participating in recognized accessibility schemes (%)		√						√	
		Percentage of coastline km of free access beaches relative to total km of beaches (%)		√	√			√	√		
	Social cohesion	Percentage of public transport that is accessible to people with disabilities and with specific access requirements							√	√	
		Number of second homes per 100 homes		√	√			√	√		
		Percentage of initiatives to support the local community	√							√	
	Safety	Percentage of tourists who register a complaint with the police						√	√		
	Culture	Number of museum visitors									√
		Percentage of the destination's events that are focused on traditional/local culture and heritage					√		√		
		Number of cultural sites and practices considered at risk according to UNESCO WHS list/total number of cultural resources		√							
		Proportion of cultural sites and practices under some protection label related to the total number of cultural resources		√	√		√		√	√	
	Wellness in Destination	Visitors satisfaction	√	√	√			√	√	√	
		Percentage of repeat/return visitors	√						√	√	
		Percentage of residents that are satisfied with the impacts of tourism on the destination's identity	√			√			√		
		Number of beds available in commercial visitor accommodation per 100 inhabitants	√	√	√				√	√	
		Tourist intensity	√					√			
		Tourist density	√								
		Occupancy rate in commercial accommodation (%)	√	√	√	√			√	√	
	Wellness in Destination	Percentage of rooms in commercial accommodation establishments accessible for people with disabilities	√						√		

Subdomain	Indicator	Indicators Systems									
		Travel BI	MITOMED+	MITOMED	CROSTO	SIDS Algarve 2007	UNWTO Baleares	ETIS	ETE	Other
	Number of overnight stays	√					√			
	Percentage of accommodation establishments open all year	√								

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