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Research article

Sustainable tourism tags to reward destination management

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ABSTRACT

This paper presents a system of Sustainable Tourism Tags to evaluate the management of tourist destinations, using the information from a composite indicator called the *Differential Dynamic Index*. This vectorial indicator has two components: one dynamic which shows the advance or regress in time of each destination in terms of sustainability; the other static that compares the situation, at a moment of time, of each zone using multiple benchmarks according to each territory's physical characteristics and tourist activity. The sustainable tourism tags are awarded to the places which show advances, thus rewarding the work carried out by their managers. This system is a practical tool to link the evaluation of the indicator with the planning and management decisions of the destinations. We therefore define a linear programming problem which enables, for each destination, determining the minimum change necessary in the indicators to improve their qualification in the tag system. Finally, we present a case study for the urban destinations of Andalusia (Spain) that illustrates the practical application of the proposed tool.

1. Introduction

In the last sixty years, tourism has experienced a continuous diversification and expansion, becoming one of the world's greatest and fastest-growing economic sectors to attain sustainable development (Butler, 1999; Weaver, 2006; UNWTO, 2018).

In this growth context, the improvement of the competitive position of destinations is a very important factor to take into account when planning a tourism sector in a sustainable manner. We must bear in mind that for tourism to continue being in the medium- and long-term a sector with an extraordinary capacity to generate richness, it must respect the environment's loading capacity and the quality of life of the host citizens. Otherwise, we would face saturated destinations in which part of the local population would reject tourists. This is the reason for the importance of policies in this area having to be centered on making the conservation of the environment compatible with the local values, there being an improvement of competitiveness and tourist productivity (Exceltur, 2017). This is therefore why it is important to count on tools that foster and reward the destinations which start up a continuous improvement process of its activity, in that way favoring the sustainable management of tourist destinations.

The defining of effective policies to promote sustainable tourist development requires a measurement system that fulfills a double aim: to value the relative position of each territory and to know experiences, policies or projects elsewhere to reformulate the development processes. Tourist sustainability indicator systems are one of the tools most used. These enable a broad knowledge of the reality of destinations, analyzing the situation of different aspects in the social, economic and environmental area. At the same time, this tool assesses those actions that policy-makers undertake in different territories. On the other hand, we consider that tourist sustainability indicator systems are instruments which facilitate the work of local managers by allowing them to analyze the progress in the tourist sustainability of destinations. As these are periodically quantified, they can correct the weaknesses and enhance the strengths of each destination, at the same time as facing the threats and taking advantage of the opportunities that the sector presents at every moment (Oreja-Rodríguez et al., 2008; Vila et al., 2010; Zhang, 2012; Budeaunu et al., 2016).

Along with the indicator systems, and with the aim of counting on an instrument that is easier to interpret, it is also recommendable to calculate composite indicators which summarize the information. An international consensus when defining tourist sustainability indicator systems does not exist, there being a multitude of methodologies to construct the composite indicators associated with them. An intense debate remains about how sustainability must be evaluated (Ko, 2005; Lu and Nepal, 2009; Zhang et al., 2013). The most recent proposals tend to use measurements that combine statistic and dynamic evaluations (Mahdavi et al., 2013; Zhang et al., 2015; Blancas et al., 2016, 2018).

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Irrespective of the method used, the assessments of sustainable tourism via indicators (either in a panel or via composite measures) must be integrated into the planning and design process of new policies to improve the management of each destination. How to integrate this information for the design of more efficient sustainability policies remains an issue that is both critical and significant. Yet as this has been long neglected, it is necessary to develop new empirical research that tackles this issue in the search for practical solutions. These would facilitate the cooperation between destinations via the definition of more efficient benchmarking practices. Within the benchmarking of the tourist sector, in this study we are going to center on that of the tourist destination (Kozak and Nield, 2004), supported by the definition and quantification of indicators. The final aim is to incentivize continuous learning, improve the positioning of the destinations and enhance the transferability of the best practices.

Tourist Sustainability Tags could be a way of incentivizing an appropriate tourist management in each territory. These tags could make up a qualification system that officially certifies the destinations where the management carried out is translated into an improvement in terms of continuous sustainability. They can be a very useful tool to reward the effort made in the short- and medium-term by destinations and could improve each destination's image with a view to bettering its level of competitiveness. This is in line with what has been established by international institutions (European Commission, 2010). Assigning tourist sustainability tags will improve the competitiveness of destinations by attracting quality tourism that values the tourist activity's sustainable management. An increase in the number of travelers will be attained not only by attracting new foreign visitors but also via the consolidation of the volume of the internal tourist demand in each zone.

Starting out from these premises, this study's global aim is to show how the evaluation of sustainable tourism through indicators can be used to define a Tourist Sustainability Tags system, which rewards good management and facilitates the application of benchmarking to destinations.

Specifically, we define a system of tourist sustainability tags, setting out from the analytical information provided by a sustainable tourism indicators system that analyzes the sustainability of the destinations and evaluates the management of the policy-makers. This information is aggregated using the Differential Dynamic Index (DDI) (Blancas et al., 2018) that differentiates an evaluation of each destination using multiple benchmarks. To facilitate the integration of this tourist sustainability tags system into the decision making associated with the management of the destination, we define an *improvement linear programming model*.

This paper is structured as follows. In the next section, we present the methodological issues related to the definition of the *Tourist Sustainability Tags system* proposed: the system of sustainable tourism indicators, the methodology used to construct a composite indicator, the assigning criteria used to define the tags system and the associated improvement model. In Section 3, we offer the results of an illustrative case study where it is shown how the proposed instruments can be used. Section 4 presents the discussion and, finally, we dedicate a section to presenting the work's main conclusions.

2. Methodology

2.1. Sustainable tourism indicators system: a key proposal to evaluate destination management

The existence of a measurement infrastructure based on indicators has been the option adopted at the international level to evaluate the management in any tourist destination (UNWTO, 1993, 1996, 2004; United Nations Commission on Sustainable Development, 2001; United Nations Environment Programme, 2007; OECD, 2002, 2005, 2008; European Commission, 2003, 2007, 2010), as is gathered in the Agenda 21 itself (United Nations Sustainable Development, 1992). This work, that has been done for various decades, remains in force. For example, the UNTWO has defined a new statistical framework for measuring sustainable tourism, including the three dimensions of sustainable tourism (social, economic and environmental). The aim of this new framework is to delineate a policy that is more integrated in the goals of sustainability and to act in response to the requests from member states and the tourism sector's stakeholders (UNWTO, 2017).

Taking the previous international guidelines and other works in the matter as a basis (Tanguay et al., 2010, 2013; Rio and Nunes, 2012; Mikulic et al., 2015; Cucculelli and Goffi, 2016; Pérez et al., 2017; Paracchini et al., 2011), we define a system of indicators with scientific validity that provide the key information to manage sustainable tourism in any tourist destination.

Likewise, the choice of the indicators has been made using the following criteria: the information's usability, its frequency of use, relevance, conceptual cover, temporality, understandability, representativeness and the availability of the statistical information (Blancas et al., 2015, 2016, Nardo et al., 2005b, 2005a). So, we present a system made up of 65 indicators which quantify aspects included in the three dimensions of tourist sustainability: social, economic and environmental (Tables 1–3).

2.2. Aggregation of sustainability information: Differential Dynamic Index

The second phase to define Sustainable Tourism Tags is summarizing all the system's information in a composite indicator. There are different methodologies which obtain synthetic indicators from a group of indicators. The choice of the aggregation method used is determined by the practical application and the usefulness which one wishes to give to the composite indicator. In our case, the aim is to design a composite indicator that enables the user to: simplify the use of the information; know the rankings of destinations in terms of sustainability, combining the static and dynamic evaluations of each territory.

There are proposals at the international level, which present composite indicators to evaluate the extent of closeness to or distance from goals of sustainability, avoiding only the rating of the absence of sustainability (Ko, 2005; Mahdavi et al., 2013; Zhang et al., 2015). Among them, we can highlight for their practicality the proposals where vectorial indicators are used, combining static and dynamic components, such as the so-called Differential Dynamic Index (Blancas et al., 2018; see Appendix). The static evaluation is used to analyze the relative position of each destination in terms of sustainability compared to the competitor destination. The dynamic component measures the changes over time of the social, economic and environmental issues, thus determining the evolution of the destination (progress or regress) in line with its tourist activity's global level of sustainability.

These components are computed using goal programming. The value attained in each tourist zone in a specific indicator is compared with an aspiration or reference level. It is evident that when doing this comparison the value of the indicator may be higher or lower than the reference value. In the case of the indicator being positive, a value above the aspiration level means a strength for the zone analyzed, while if the value is under it, we have a weakness in this aspect. In the case of the indicator being negative the opposite would occur.

The difference between the value of the indicator and its corresponding aspiration level (denoted by u_j) is measured using deviation variables denoted by n_{ij} (the negative deviation variable) and p_{ij} (the positive deviation variable).

The deviation variable n will take a value greater than zero if our indicator is below the aspiration value and if the indicator surpasses the aspiration level variable p will take a value greater than zero. It is impossible for the two variables to take a positive value. These variables quantify the strengths and weaknesses of each territory evaluated. The composite indicator that we use for each zone adds the strengths and subtracts the sum of the weaknesses, both weighted by the importance that each of the system's indicators has.

Table 1
Lines of social management for the destination: indicators of evaluation.
Source: Own elaboration.

Baseline aspects	Indicator	I_j	Sign	Final weight
Socio-cultural effects of tourism on host community	Health care equipment	I_{S1}	Positive	0.01965
	Number of passenger transport vehicles per inhabitant	I_{S2}	Positive	0.01971
	Number of services sector establishments per inhabitant	I_{S3}	Positive	0.01594
	Number of pharmacies per inhabitant	I_{S4}	Positive	0.01965
Local public safety	Evaluation of destination safety by tourists	I_{S5}	Positive	0.02689
	Number of accidents involving fatalities on urban roads per 1000 persons (including resident and visiting population)	I_{S6}	Negative	0.02376
Conservation of cultural heritage	Number of protected designated sites	I_{S7}	Positive	0.03764
	Pressure on cultural heritage	I_{S8}	Negative	0.03764
	Number of festivals and customs preserved	I_{S9}	Positive	0.03371
Effect on local population structure	Variation of population level	I_{S10}	Negative	0.00548
	Percentage of young population	I_{S11}	Positive	0.00547
	Percentage of non-active older population	I_{S12}	Negative	0.00522
	Number of individuals per unit destination area	I_{S13}	Negative	0.00547
	Net migration rate	I_{S14}	Negative	0.00547
	Rate of natural increase	I_{S15}	Negative	0.00560
Social carrying capacity of the destination	Percentage of foreign population	I_{S16}	Negative	0.02712
	Ratio of tourists to locals	I_{S17}	Negative	0.03344
Effects on level of well-being in the local population	Variation of available income	I_{S18}	Positive	0.01360
	Percentage of population enrolled in non-compulsory education	I_{S19}	Positive	0.01429
	General demographic dependency index	I_{S20}	Negative	0.01466
	Cadastral value of real estate per inhabitant	I_{S21}	Negative	0.01454

An important aspect is the choice of the aspiration levels. In the case of the Differential Dynamic Index (Blancas et al., 2018), this choice is different for each component of the vectorial composite indicator.

Firstly, the aspiration level is chosen to assess the situation attained by all the zones analyzed at a moment in time. Therefore, we obtain the first component (the static component, SC) of the composite indicator, seeing the strengths and weaknesses of the corresponding zones at the moment considered.

We consider that when there are important differences between the destinations that are being compared, it is suitable to carry out a cluster analysis before setting the aspiration levels of the static evaluation. Cluster analysis is a multivariate technique which classifies the destination forming groups (or clusters) whose elements are the most homogeneous possible, aiming for the different groups to be dissimilar. Specifically, we implement Ward's method, which is the method that has been most widely used in practice. Its use guarantees an excellent categorization which is more correct than other hierarchical methods (Kuiper and Fisher, 1975). Furthermore, this procedure provides efficient classifications with groups that are in general homogenous, similar in dimension and small.

To carry out this multivariate classification, we use the statistic information related to the volume of tourist activity and its physical characteristics as a basis, in such a way that it is possible to identify different typologies of destinations. It is accordingly much easier to choose the different aspiration levels for each group of destinations in each indicator, using the information of the group to set the reference

Table 2
Lines of economic management for the destination: indicators of evaluation.
Source: Own elaboration.

Baseline aspects	Indicator	I_j	Sign	Final weight
Economic benefits of tourism for the host community and destination	Total number of tourist arrivals	I_{E1}	Positive	0.01411
	Average length of stay	I_{E2}	Positive	0.01485
	Tourism revenues	I_{E3}	Positive	0.01632
	Proportion of employees in the service sector	I_{E4}	Positive	0.01558
	Unemployment rate	I_{E5}	Negative	0.01240
	Declared net income per inhabitant	I_{E6}	Positive	0.01183
Sustaining tourist satisfaction	Global satisfaction level of tourists	I_{E7}	Positive	0.02460
	Evaluation of the price-quality relationship by tourists	I_{E8}	Positive	0.02116
Development control	Existence of land use planning, including tourism	I_{E9}	Positive	0.01725
Tourism facilities on offer - provision of a variety of experiences	Vacancies in official tourism accommodation establishments	I_{E10}	Positive	0.00413
	High quality vacancies of official tourism accommodation establishments	I_{E11}	Positive	0.00440
	Number of non-official tourism accommodation establishments	I_{E12}	Negative	0.00321
	Vacancies offered in restaurants	I_{E13}	Positive	0.00417
	Number of tourist information offices per tourist	I_{E14}	Positive	0.00458
	Existence of a website that provides information about the destination	I_{E15}	Positive	0.00458
	Varied offer of experiences (number of tourist attractions)	I_{E16}	Positive	0.00458
Seasonality of tourism activity	Percentage of official tourism accommodation establishments that are open all year	I_{E17}	Positive	0.01114
	Ratio of low-season tourists to peak-season tourists	I_{E18}	Positive	0.01265
	Ratio of low-season tourism employment to peak-season tourism employment	I_{E19}	Positive	0.01303
Tourism employment	Total number of individuals employed in the tourism sector	I_{E20}	Positive	0.02910
	Percentage of employees in the tourism sector relative to total employment	I_{E21}	Positive	0.02798
Tourism-related transport	Number of passenger transport vehicles per inhabitant	I_{E22}	Positive	0.01317
	Density of roads	I_{E23}	Positive	0.01308
Destination competitiveness	Average occupancy rate for official tourism accommodation establishments	I_{E24}	Positive	0.01622

Table 3
Lines of environmental management for the destination: indicators of evaluation.
Source: Own elaboration.

Baseline aspects	Indicator	I_j	Sign	Final weight
Protection of the natural ecosystems	Percentage of the destination's surface considered to be a protected natural area	I_{EN1}	Positive	0.03955
	Number of species in the destination	I_{EN2}	Positive	0.03490
Energy management	Final energy consumption attributable to tourism	I_{EN3}	Negative	0.01987
	Percentage of renewable energy consumption with respect to the total attributable to tourism	I_{EN4}	Positive	0.02117
Water management	Water consumption attributed to tourism	I_{EN5}	Negative	0.01934
Wastewater management	Volume of reused water	I_{EN6}	Positive	0.01961
	Volume of treated wastewater	I_{EN7}	Positive	0.02073
Management of solid urban waste	Volume of waste generated	I_{EN8}	Negative	0.00724
	Volume of recycled waste compared to total volume of waste	I_{EN9}	Positive	0.00788
	Number of paper and cardboard recycling bins	I_{EN10}	Positive	0.00788
	Volume of collected paper and cardboard	I_{EN11}	Positive	0.00788
	Number of glass recycling bins	I_{EN12}	Positive	0.007878
Atmospheric pollution	Daytime noise levels	I_{EN13}	Negative	0.01180
	Night-time noise levels	I_{EN14}	Negative	0.01180
	Pollutant emission levels	I_{EN15}	Negative	0.01144
Management of the visual impact of facilities and infrastructure	Construction density per unit area	I_{EN16}	Negative	0.00770
	Total area of natural landscape	I_{EN17}	Positive	0.00862
	Unoccupied buildings	I_{EN18}	Negative	0.00770
Intensity of tourist use	Total tourists per unit area	I_{EN19}	Negative	0.01406
Environmental management	Existence of an environmental administrative unit	I_{EN20}	Positive	0.01388

point. Our proposal is to use the group's benchmark defined by the best results recorded for each indicator within the group. In this way, the composite indicator provides relevant information to foster the co-operation between destinations via the most effective benchmarking practices, as we are comparing destinations that are similar in their characteristics.

The second component is obtained using as an aspiration level the value attained in the indicator in a period taken as a reference prior to the assessment moment fixed for the SC. By comparing the value attained in a final instant with the baseline value one can value the actions which have been carried out to improve the level of sustainability for the destination. As a result, the so-called dynamic component (DC) of the composite indicator is obtained.

We consider that at least four years must pass between the evaluation period fixed for the SC and the reference period used in the DC. This breadth of the period allows us to evaluate the effectiveness of the initiatives that public managers have implemented within the framework of the strategic tourism plans. The results of the decisions that the agents of the sector have made cannot be noticed in a very short term. A period of four years covers at least the period of implementing the Strategic Tourism Plans that have been defined. If we measure the DC for a period of evolution during which various tourist plans are carried out, it is not possible to evaluate the individual effectiveness of the actions, investments or decisions that have been adopted in the framework of each plan.

2.3. Sustainable tourism tags: definition criteria

The analytic information provided by the DDI's two components can be used for the creation of a System of Sustainable Tourism Tags (Table 4). We thus mean to respond to the need to configure a qualification system that officially identifies and certifies the destinations in which continuous improvements have been made in terms of sustainability. To specify this proposal, it is necessary to set objective criteria which facilitate the task of identifying the type of management done in each zone.

We consider that efficient management has been carried out in a destination if, over the period of time evaluated, an improvement in terms of sustainability has taken place. We analytically quantify this progress through the DC. For that reason, we consider that only the territories that have recorded a net advance and, therefore, present a positive value in their DC will achieve a recognition of their management via the award of a tourist sustainability tag. Not obtaining the tag does not mean a totally inefficient management but that, in net terms, an advance has not been achieved.

In this situation we can find destinations with a better starting situation or that attains a high score after improving for several years, which do not register new advances. These destinations will not get labels, to encourage them not to get stuck in a situation. With this it may seem that we discourage good destinations, but since the evaluation period is several years, not making any progress in it, in such a competitive world, cannot be rewarded. Not obtaining a label is in this case an incentive for managers to develop tourism plans that allow a gradual and continuous progress towards more sustainable situations.

After adjusting and qualifying the management of each zone, we propose to carry out a disaggregated analysis of the advance recorded in terms of sustainability, quantifying the net evolution registered in the indicators of each dimension (social, economic and environmental). We thus distinguish three tags of sustainability which represent distinct levels of efforts to increase the degrees of tourist activity sustainability:

1) Tag C, in the case of the advance being limited to a single dimension. This qualification of management is based on the enhancement of the main strengths of the territory but produces regresses in the dimensions with less strengths.
2) Tag B, if they advance in only two dimensions. This tag identifies that group of actions of progressive improvement where the weaknesses are reduced to a single dimension in which the net regresses are recorded. In addition to the strengths, in this case the development of aspects with a certain weakness is promoted to achieve more positive net advances.
3) Tag A, if the destinations present advances in the three dimensions. The territories with this tag implement a comprehensive and global improvement strategy to record a positive evolution in all the dimensions. This denotes a greater effort to improve their sustainability.

Given that the advance of each destination is graded according to the situation of the territory itself in the reference period, we incorporate the information supplied by the SC to rank the extent of this advance in keeping with the degree of closeness shown with respect to its benchmark. To do so, within each type of tag we establish different sub-categories, taking into account the position that each destination occupies in the ranking elaborated with the SC. The higher the position

Table 4
Sustainable Tourism Tags Proposal: allocation criteria.
Source: Own elaboration.

Tags	Requirements				Subcategories			
	CD_i	Dimensions - Evolution			Tags	SC_i - Ranking		
						First positions	Middle positions	Last positions
		Social	Economic	Environmental	A1	X		
A	Positive	**Progress**	**Progress**	**Progress**	A2		X	
					A3			X
					B1	X		
B	Positive	**Progress**	**Progress**	Regress	B2		X	
		Progress	Regress	**Progress**	B3			X
		Regress	**Progress**	**Progress**	C1	X		
C	Positive	**Progress**	Regress	Regress	C2		X	
		Regress	**Progress**	Regress	C3			X
		Regress	Regress	**Progress**				

attained by the destination in the static ranking, the closer its level of sustainability will be with respect to the situation set as a benchmark. Given that this reference point is set by the best possible results of each group, each destination is hierarchized according to its weaknesses compared to the group's benchmark. Accordingly, this system of tags not only rewards the effort made by the destinations in the short- and medium-term, but introduces an incentive to design measures that reduce the number of weaknesses and enhance approaches to the situation of each benchmark.

2.4. An improvement linear programming model: an objective tool to define management strategies

For the qualification system proposed to fulfill its aims, it is necessary to use the information which it provides in practice to define short- and medium-term improvement strategies. The question that we propose here is how to use the information of the indicators to achieve a better qualification in the tag system.

Obtaining a tag is determined by achieving a strictly positive value in each dimension's dynamic component (social, economic and/or environmental). So, to get a better qualification within this system it is necessary to register advances in the indicators of the dimension in which the DC shows a regression over time. But which indicators must be modified and by how much? To solve this question we define a linear programming model that helps to determine the minimum change necessary to attain a positive value in the DC of the dimension considered.

To formulate the model, we consider the case of a destination i which shows a negative dynamic component within the dimension s: $DC_i^s < 0$ (see Appendix to correctly interpret the notation). This dimension s is composed of the indicators belonging to the subset $J_s \subset J$ (J being the set of the positive indicators) and by the indicators belonging to $K_s \subset K$ (K being the set of the negative indicators). The amount of improvement necessary in the indicators of the dimension will be an increase in the case of the positive indicators (which we denote as $\Delta I_{ij}^+, \forall\ j \in J_s$) and a decrease for the negative indicators (denoted by $\Delta I_{ik}^-, \forall\ k \in K_s$). The improvement linear programming model for the destination considered is formulated as follows:

$$Min \sum_{j\in J_s} \frac{\Delta I_{ij}^+}{I_{ij\ t_0}^+} + \sum_{k\in K_s} \frac{\Delta I_{ik}^-}{I_{ik\ t_0}^-}$$

$$\text{s.t.} \quad I_{ijt_n}^+ + \Delta I_{ij}^+ + n_{ij}^+ - p_{ij}^+ = I_{ijt_0}^+ \tag{1a}$$

$$I_{ikt_n}^- - \Delta I_{kj}^- + n_{ik}^- - p_{ik}^- = I_{ikt_0}^- \tag{1b}$$

$$\sum_{j\in J_s} \frac{w_j \cdot p_{ij}^+}{I_{ijt_0}^+} + \sum_{k\in K_s} \frac{w_k \cdot n_{ik}^-}{I_{ikt_0}^-} - \sum_{j\in J_s} \frac{w_j \cdot n_{ij}^+}{I_{ijt_0}^+} - \sum_{k\in K_s} \frac{w_k \cdot p_{ik}^-}{I_{ikt_0}^-} > 0 \tag{2a}$$

$$\Delta I_{ij}^+ = 0,\ \forall\ j \in J_s / I_{ijt_n}^+ > I_{ijt_0}^+ \tag{3a}$$

$$\Delta I_{ij}^+ \le I_{ijt_0}^+ - I_{ijt_n}^+,\ \forall\ j \in J_s / I_{ijt_n}^+ < I_{ijt_0}^+ \tag{4a}$$

$$\Delta I_{ik}^- = 0,\ \forall\ k \in K_s / I_{ikt_n}^- < I_{ikt_0}^- \tag{5a}$$

$$\Delta I_{ik}^- \le I_{ikt_n}^- - I_{ikt_0}^-, \forall\ k \in K_s / I_{ijt_n}^- > I_{ikt_0}^- \tag{6a}$$

$$with\ \ n_{ij}^+, p_{ij}^+, n_{ik}^-, p_{ik}^-, \Delta I_{ij}^+, \Delta I_{ik}^- \ge 0,\ n_{ij}^+ \cdot p_{ij}^+ = 0,\ n_{ik}^- \cdot p_{ik}^- = 0$$

The objective function of the improvement model is to minimize the total change necessary to attain a positive dynamic component in the dimension. Given the different unit of measurement of each initial indicator, we minimize the total relative change in the objective function taking as a basis the value of the indicator in the reference period (t_0). To incorporate the requirement of improvement into the model we include a first set of restrictions (1) which define the goals associated with each indicator after having carried out the change.

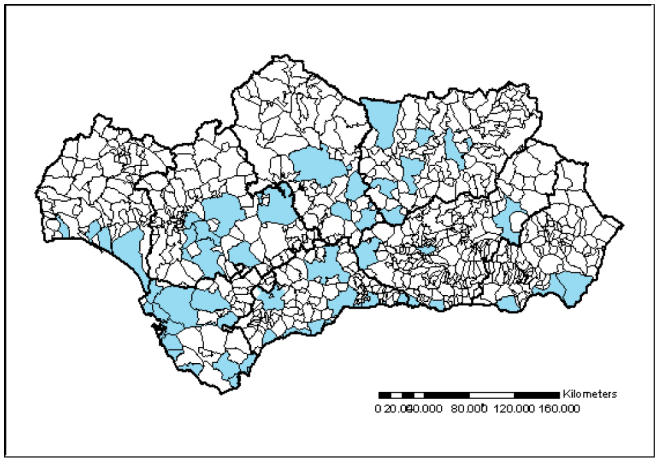
Using the previous deviation variables, we incorporate a new restriction where we require that the value of the dynamic component, which results from the change for the dimension, be positive (2).

Finally, it is necessary to include restrictions that limit the extent of the change allowed in each indicator, because if a great margin of change is needed, the solutions of the model may be not very realistic or even cause problems of unfeasibility. Our proposal is to set a threshold of change that is different according to the evolution registered by the destination in the period considered ($t_n - t_0$). In the cases in which the destination has experienced an improvement, we require the indicator not to change (3) (5), demanding a return to the values of the reference period in the cases in which the destination worsens its situation (4) (6). Hence, the short-to medium-term strategy resulting from the solution of this problem aims to center the efforts of the destination managers on recuperating the regressions registered in the evaluation period.

3. A case study for urban tourist destinations of Andalusia: results

To show how to aggregate the information using the DDI methodology and to indicate how to carry out the assignation of these tags, in this section we present a case study centered on the region of Andalusia (Spain). We have selected a region which is characterized by having a consolidated tourist activity of great importance from the economic point of view.

Within the Andalusian tourist destinations, we are going to apply the proposed methodology to the urban municipalities of Andalusia. These are typified for having a greater tourist relevance in line with official information concerning the tourist demand. By urban municipalities we are referring to those that have more than 20,000 inhabitants and are either on the coast or not. We have included 54



Source: Own elaboration.

Fig. 1. Andalusian Urban Municipalities of greater touristic relevance.

municipalities in the study (Fig. 1), representing 67.5% of all the municipalities in the region.

To quantify the components of the DDI indicator, we evaluate the SC in the period 2014, taking the year 2006 as a reference. By using this period, we can measure the evolution registered by the destinations during the implementation of the so-called General Plans of Tourism.

To quantify the 65 indicators which make up the system in 2006 and 2014 for the 54 urban municipalities considered, it has been necessary to elaborate a database. This has been obtained from the statistical information available and via field work. 61.54% of the indicators have been measured using the official information. In several cases, the authors have used this official statistical information to measure specific variables which are not available locally. For 26.15% of the indicators, statistical information was compiled from micro-data supplied by the Institute of Statistics of Andalusia. Lastly, 12.31% of the remaining indicators were quantified by field work at the local level that was done by the authors.

Once the system was quantified, to be able to calculate the DDI indicator we set the weightings and the aspiration levels of each indicator.

As to the weightings of the indicators, in order for them to best represent the reality, we have selected a panel made up of a total of 57 experts, who work in or investigate tourist sustainability both in the private and the public area.

To show their opinions, each expert has a budget of 100 points which he/she must distribute among the indicators which make up the baseline system, assigning most points to those that represent aspects which they consider should be granted a greater importance (Jesinghaus, 1997). The assignation of points was carried out by each person independently to not influence the results obtained (Hermans et al., 2008), using a closed computerized questionnaire. The experts show their opinion establishing three weighting levels: dimensional, factorial and of the quantification of the indicators. The consensus achieved by the group was determined using the average score awarded for each indicator. Its representativeness was analyzed and, whenever necessary, new assignations were applied until a representative result was obtained.

To define the SC's aspiration levels, we obtain a classification of the destinations analyzed using cluster analysis to be able to set different aspiration levels in each one of them. To form the groups, we have taken into account the information provided by seven variables: population, number of tourists, places of regulated accommodation offered, surface of the territory, festivals of tourist interest, amount of property (heritage) and there being a beach or not. Four groups have resulted from the application of a hierarchical cluster by Ward's method (Fig. 2).

Group 1 includes the destinations with a high tourist activity in terms of supply and demand, highly populated, small and located mostly in coastal zones. Group 2 is mainly made up of non-coastal zones, with a large surface on average, which record the lowest levels of tourist activity. Group 3, mostly made up of coastal zones, classifies the destinations with a not very intense tourist activity where there is a highly protected material and immaterial heritage. Group 4 correspond to provincial capitals that in general have greater levels in all the classification variables considered.

For the quantification of the SC's aspiration levels necessary to define the goals, we take as a benchmark the best possible result recorded in each group: the maximum in the case of the positive indicators and the minimum in the negative indicators.

As to the DC, the goals are defined taking a different aspiration level in each indicator for each destination. This panel of aspiration levels is given by the values of the indicators of the system quantified in the reference period: 2006.

Using the information of the variables of deviation associated with each goal set, the value of the DDI indicator's components are determined by using equations (5) and (8) (see Appendix). Setting out from the information provided by the components calculated for each destination, we qualify the management carried out in each territory, using the proposed system of Sustainable Tourism Tags.

Following the assignation criteria set in this system (Table 4), the tourist sustainability tags are assigned to the destinations which have a positive DC of the composite indicator, differentiating three tags (A, B and C). Within each tag category we establish subcategories, according to the position that they attain in the SC ranking. This ranking is divided into three parts, value 1 corresponding to the first 18 positions, value 2 to 19 to 36 and value 3 to 37 to 54 (Fig. 3).

22.22% of the destinations achieve a type A qualification. Territorially, these destinations are concentrated in Groups 2 and 3 that gather 83.3% of the tags of this category, the rest belonging to Group 1. The greatest number of tags is concentrated in category B which contains 44.44% of the destinations analyzed. These are especially placed in Groups 1 and 2 which have 66.6% of the tags awarded in this category. Finally, 20.37% of the urban destinations analyzed are qualified with type C tags. As to the territorial distribution, these destinations belong to Groups 2 and 3 in 81.8% of cases.

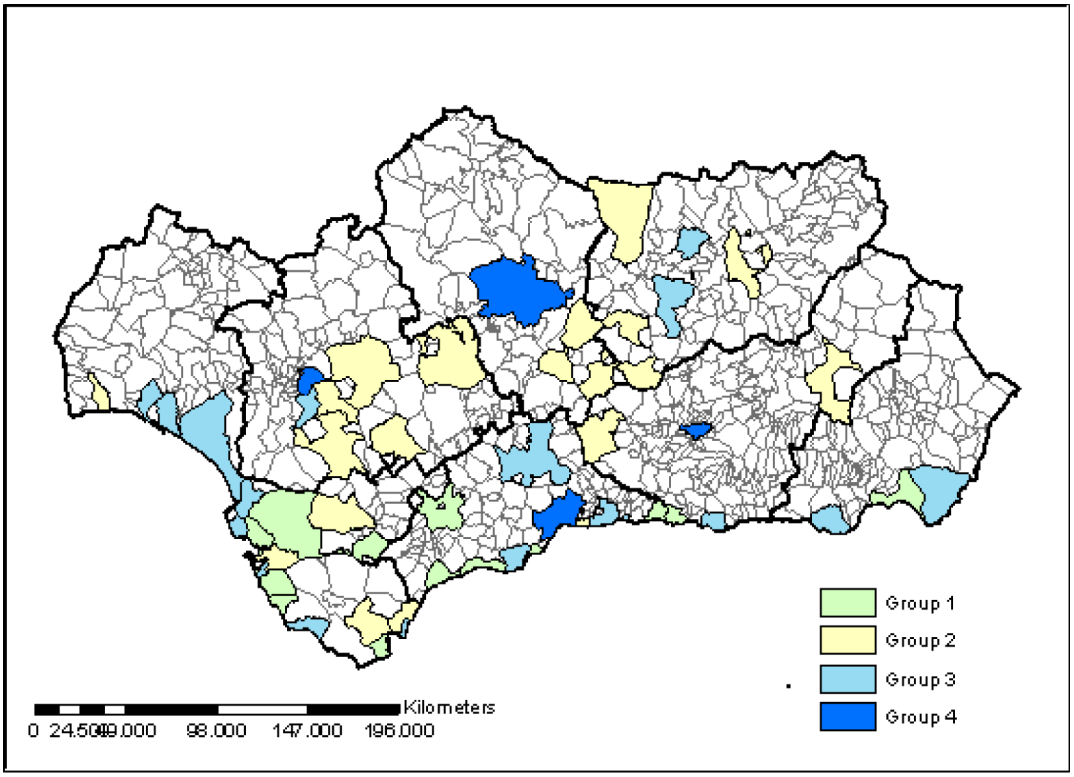
Having qualified the management carried out in each destination via the tag system, our plan is to use the improvement linear programming model proposed to objectively determine the strategy of the most appropriate minimum change for each destination. To do so, we disaggregate the DC value by dimensions and we identify the set of destinations that have a negative value of this component.

The results of the improvement model for each destination are presented in Tables 5–7. Each row shows the decisions corresponding to the strategy to be followed for each destination. To facilitate the interpretation of the results, the values of the increases or decreases necessary in the indicators is expressed as a percentage of the value of this indicator in the evaluation period (2014).

4. Discussion

In this study we contribute empirical evidence which shows how we can evaluate the sustainability of the tourist destination using a Tourist Sustainability Tags system. This evaluation system recompenses good management and expedites the benchmarking practices between destinations. The proposal of this system improves other, prior proposals (Blancas et al., 2015) based on the conceding of tags from static evaluations.

These tags are assigned from a vectorial composite indicator. This index aggregates the information of an indicator system that analyzes the sustainability of the destinations from the social, economic and environmental point of view, and evaluates the management of the

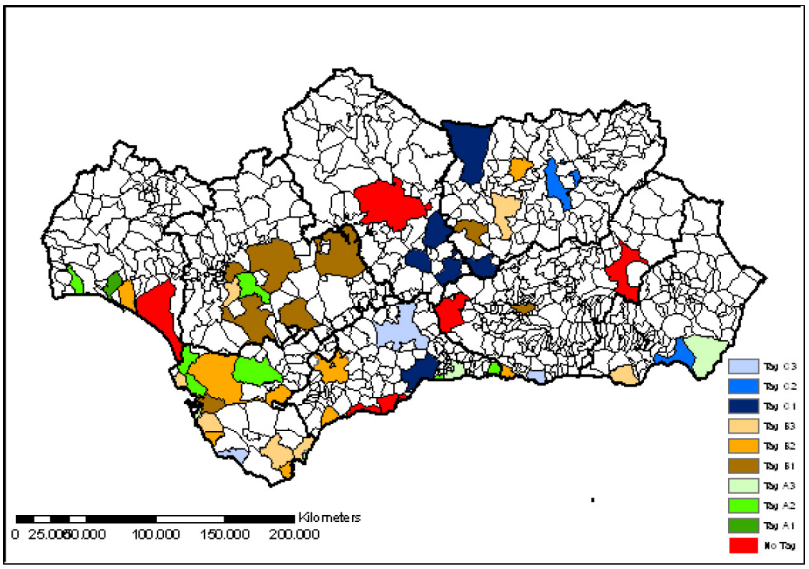


Source: Own elaboration.

Fig. 2. Andalusian urban destinations clusters.

policy-makers. This system synthesizes the advances in the field of the measurement of tourist sustainability whose aim has been the definition of a tool with a reduced number of indicators, measurable and which gathers key information. Nonetheless, questions such as the satisfaction of the local population, the loyalty of the demand and the direct environmental impact of the tourist installations have not been able to be included due to a lack of data. New advances in the production of official statistical information will enable future research to correct this limitation.

We use the DDI methodology (Blancas et al., 2018). This establishes rankings of destinations in terms of sustainability, combining the static and dynamic evaluations of each territory. This methodology is an improvement of the Vectorial Dynamic Composite Indicator (Blancas et al., 2016), as it incorporates different aspiration levels according to the destination's characteristics. In this context, this study is an advance in the field of the definition of composite sustainability indicators as it



TAGS	Percentage distribution
No Tags	12.96%
A1	1.85%
A2	12.96%
A3	7.41%
B1	14.81%
B2	16.67%
B3	12.96%
C1	11.11%
C2	3.70%
C3	5.56%

Source: Own elaboration.

Fig. 3. Sustainable Tourism Tags assignment: results for Andalusian urban destinations.

Table 5
Improvement linear programming model: results for social dimension.

$\frac{\Delta I_{ij}^{+}}{I_{ijt_n}^{+}}$ // $\frac{\Delta I_{ik}^{-}}{I_{ikt_n}^{-}}$	I_{S1}	I_{S2}	I_{S3}	I_{S4}	I_{S5}	I_{S6}	I_{S7}	I_{S8}	I_{S11}	I_{S13}	I_{S14}	I_{S16}	I_{S17}	I_{S18}	I_{S19}	I_{S20}	I_{S21}
Almería	59.56%	92.92%						-13.72%					-7.74%				
Ejido, El								-0.09%					-0.30%				
Algeciras	108.92%	181.78%	31.00%	11.27%					1.16%	-4.49%	-18.70%					-38.74%	-65.53%
Barbate	28.06%	105.31%						-7.23%									
Barrios, Los								-40.45%					-21.81%				
Cádiz		30.94%											-33.92%				
Chiclana de la Frontera	298.05%	45.10%	27.32%			-100.00%	11.68%									-1.19%	
Conil de la Frontera	121.85%	104.78%	3.28%					-18.58%				-2.86%	-20.75%			-35.73%	-41.53%
Jerez de la Frontera	135.83%	71.40%	10.77%										-14.32%			-30.92%	
Puerto Real								-13.13%					-51.67%				
Rota	114.00%	110.31%	9.93%			-100.00%			9.38%	-6.54%	-50.69%		-35.26%	7.83%		-36.15%	-13.40%
San Roque		72.42%															
Baena							0.42%						-54.06%				
Cabra	200.95%	234.38%	8.95%			-100.00%						-17.43%	-55.65%			-8.04%	0.00%
Priego de Córdoba	17.06%	31.96%										-22.69%	-10.71%				
Baza	105.70%	80.07%		59.99%			5.08%					-1.48%	-46.44%			-37.62%	-32.67%
Motril	115.28%	150.16%				-100.00%							-8.57%				
Almonte	43.23%	0.09%										-32.44%					
Moguer	19.14%	119.48%						-42.30%				-39.08%					
Alcalá la Real	110.17%	96.72%			10.53%	-100.00%	0.15%	-3.84%				-15.17%	-33.96%	9.92%		-33.62%	-66.70%
Andújar													-8.26%				
Martos	104.16%	28.71%		2.08%	10.53%	-100.00%		-12.42%	18.41%	-1.63%	-16.55%	-35.51%	-46.61%	43.36%		-22.99%	-21.65%
Úbeda	140.43%	0.71%			10.53%	-100.00%	0.50%	-1.04%	6.39%	-2.47%	-66.28%	-25.23%	-28.77%	66.54%		-32.90%	-69.20%
Antequera	101.62%	0.30%				-100.00%		-12.32%	3.48%	-2.17%			-9.20%	61.36%	4.06%	-33.81%	-54.46%
Estepona	165.04%	531.56%	17.15%			-100.00%							-8.74%			-8.79%	
Málaga		0.24%						-23.98%					-13.14%				
Marbella	275.65%	652.95%	18.43%	3.12%		-100.00%										-18.85%	
Ronda		0.15%						-36.46%					-25.19%				

Source: Own elaboration.

provides a quantitative tool which improves tourist planning. To do so we use the disaggregated values of the components of the DDI to set assignation criteria of Tourist Sustainability Tags. Likewise, we obtain a new system of weightings from a panel of experts, adapted to the study case.

To facilitate the use of the tags in the management of the tourist destinations, we define an *improvement linear programming model*, which is an unprecedented contribution to the literature in this field. This uses linear programming to determine the minimum change necessary of the value of the initial indicators in order to achieve a better category tag. This makes the definition of short- and medium-term action strategies for the destination analyzed easier.

The empirical study that we present means to show how to use the tools designed to analyze the situation of tourist sustainability in which destinations find themselves and how to assign the sustainability tags, showing the potentials for the improvement of each territory's situation via more efficient benchmarking practices.

To achieve this aim, the study case must be centered on a region with a certain background in the planning of tourism under sustainability objectives in which improvements can be introduced via the tag system defined. The changes which the adjudication of tags can mean in the design and application of sustainability policies is especially interesting for regions belonging to developed countries, in which the economic situation presents a deficient situation: high rates of unemployment, low income levels, an unequal distribution of wealth, and so forth. And this leads us to present a study case relative to the tourist sector in Andalusia (Spain), a region characterized by a high level of unemployment, that is among the highest in Spain and in Europe. Likewise, this region is typified by having a consolidated tourist sector. We consider that the improvement of the image which having tourist sustainability tags would mean and the reformulation of sustainability policies favors the creation and maintaining of direct and indirect

Table 6
Improvement linear programming model: results for economic dimension.

$\frac{\Delta I_{ij}^{+}}{I_{ijt_n}^{+}}$ // $\frac{\Delta I_{ik}^{-}}{I_{ikt_n}^{-}}$	I_{E1}	I_{E2}	I_{E3}	I_{E4}	I_{E5}	I_{E8}	I_{E9}	I_{E18}	I_{E19}	I_{E20}	I_{E21}	I_{E22}	I_{E24}
Almería										401.34%	118.18%		
Barbate										22.59%			
Baena										1432.15%	980.96%		
Cabra	6.79%				-7.11%			87.72%	142.30%	600.18%	572.52%	234.38%	11.69%
Priego de Córdoba	29.05%	22.81%	27.53%							147.17%	186.51%		191.16%
Almuñécar		12.46%	20.03%		-12.45%		100.00%		26.96%	66.23%	55.83%	56.89%	34.97%
Baza										986.26%	883.94%		
Granada										229.11%	183.25%		
Motril		47.77%	38.88%	7.21%	-35.58%			53.69%	80.70%	314.43%	285.04%	150.16%	185.92%
Alcalá la Real	423.09%	15.19%	216.80%			5.00%	100.00%	10.15%	84.98%	1077.17%	1140.75%	96.72%	338.46%
Jaén			0.62%			5.00%				751.16%	794.62%		80.77%
Linares										1760.72%	821.80%		
Úbeda		0.56%				5.00%	100.00%			307.43%	339.45%	825.96%	103.93%
Antequera		27.99%		12.46%				18.32%	4.10%	203.12%	214.90%	210.50%	18.78%
Málaga										670.19%			
Carmona	61.33%	7.35%	30.31%				100.00%		17.03%	329.04%	312.67%	31.87%	340.14%
Dos Hermanas										2585.97%	2252.37%		
Écija										1115.95%	383.36%		
Morón de la Frontera	38.50%						100.00%			5346.61%	4484.35%		225.34%
Sevilla										365.38%	387.01%		30.84%
Utrera										1426.25%	23.49%		

Source: Own elaboration.

Table 7
Improvement linear programming model: results for environmental dimension.
Source: Own elaboration.

$\frac{\Delta I_{ij}^{+}}{I_{ijt_n}^{+}}$ // $\frac{\Delta I_{ik}^{-}}{I_{iktn}^{-}}$	I_{EN1}	I_{EN2}	I_{EN4}	I_{EN5}	I_{EN6}	I_{EN7}	I_{EN13}	I_{EN14}	I_{EN15}
Córdoba	↑ 1.30%		↑ 44.36%	↓ -22.55%	↑ 30.23%				
Loja	↑ 0.01%	↑ 100.00%	↑ 278.46%		↑ 93.33%	↑ 8.21%	↓ -7.60%	↓ -9.87%	↓ -21.66%
Almonte			↑ 108.98%	↓ -93.95%					
Benalmádena			↑ 67.16%	↓ -24.06%	↑ 1.57%	↑ 33.08%			
Marbella			↑ 58.61%	↓ -50.86%	↑ 4.82%	↑ 19.04%			
Mijas			↑ 102.72%	↓ -62.74%	↑ 22.36%				

Source: Own elaboration.

employment.

The empirical analysis covers the period 2006–2014 to evaluate the general tourism plans implemented by the regional government. These plans were defined by the Andalusian regional government, in order to enhance the local tourist models of each municipality in terms of sustainability. As a result, the proposed tools contribute appropriate information to plan short- and medium-term strategies which will better the level of sustainability, reinforcing or altering the action lines delineated in the new General Plan of Sustainable Tourism in Andalusia 2014–2020. Choosing a post-2014 evaluation period would have meant the overlapping of various tourist plans that have been implemented, as a result of which the individual effectiveness of each one could not have been assessed separately. Moreover, considering the delay in publishing official statistics at the local level, an evaluation period set in 2014 enables us to quantify the initial system homogeneously.

The results obtained by applying the Tourist Sustainability Tags system show that 22.22% of the destinations carry out an integral and global improvement of management which records a positive evolution in all the dimensions (type A). Nevertheless, the greatest advances are recorded in the case of the environmental dimension for all the municipalities of this category. This demonstrates the effectiveness of the environmental action lines set out in the General Plan of Sustainable Tourism in Andalusia which finished in 2014.

The highest number of tags (44.44%) is concentrated in category B. In these destinations, the measures of progressive improvement implemented by the managers reduce the regresses to social questions (in 58.3% of the type B destinations) and economic matters (in the remaining 41.7%). Again, the advances by the management highlight the effectiveness of the actions of the General Plan of Sustainable Tourism in Andalusia.

The urban destinations qualified with type C tags (20.37%) carry out a management based on enhancing the territory's strengths. Nonetheless, in the case of Andalusia the backing of the regional government for the improvement in environmental questions means that this is the dimension in which the unique advances of this type of territory are recorded. The main regresses are registered in the social dimension (for 72.7% of the destinations of this category), a maintaining of the economic strengths being observed where the net regress is very close to zero.

The management carried out in 12.96% of the destinations is considered inappropriate as a regress is recorded in sustainability terms during the period 2006–2014 and for this reason these destinations do not achieve any tourist sustainability tag. In this case, the destinations without tags can be grouped into two types according to their management. In one group we find destinations where the environmental questions have not been sufficiently enhanced, so the regress registered in this dimension offsets very slight advances in economic and social terms. In a second group, we find destinations with a general and significant regress in social and environmental terms that contrasts with a slight advance in economic terms.

After the assignation of the sustainability tags, we use the results of the *improvement linear programming model* to define short- and medium-term action strategies for the destinations considered. The policies proposed in each dimension are the following.

In the social dimension, the strategies to be followed include as outstanding actions: a greater provision of services (health and transport), a stronger control of the capacity of the social burden via a decrease of the ratio of tourists per inhabitant and a reduction of the influence of the tourist activity on the structure of the population and its access to housing. A higher reduction of the pressure on heritage and the improvement of the visitors' safety in their movements within the destination are questions to be worked on in the coming years.

From an economic point of view, the strategies are for the most part centered on recuperating tourist employment and its relative weight within the employment of each destination. The improvement of competitiveness is another aspect to consider, opting for a strategy which enables recuperating high values in the degree of occupancy in the regulated accommodation establishments.

From an environmental perspective, the strategies involve implementing a better energy policy that supports recuperating the weight of renewable energies. Likewise, a better management of the water resources is necessary. This would enable the reduction of the levels of consumption attributable to tourism and enhance the volume of reused water.

The results of this model can be used not only to redirect the management carried out at the local level but also to define new action axes in the sector's planning processes designed at the regional and national level.

5. Conclusions

Sustainable tourism implies carrying out a medium- and long-term planning of the activity, defined using benchmarking practices aimed at improving competitiveness.

To configure effective benchmarking practices, Sustainable Tourism Tags are used in our theoretical proposal to qualify the appropriateness of the management carried out in a specific tourist destination and, therefore, to evaluate the effectiveness of the strategic plans designed by the regional governments to enhance a sustainable development of tourism. The proposed system of tags used, as a basis, analytical information provided by a set of sustainable tourism indicators to assess tourist destinations. This system contains key objective information quantified from official statistical sources. However, this basic system can be modified to include locally-derived indicators that capture the subjective perspectives of stakeholders. Thus, the proposed tool can be adapted to the needs of the destination managers.

We aggregate the information of the indicators system via a global measurement which we call the *Differential Dynamic Index* (DDI). Specifically, this composite indicator involves the consideration of distinct benchmarks for heterogeneous destinations via the prior classification of the destinations obtained using clustering techniques.

Concretely, our proposal is to assign sustainable tourism tags using

the DDI's dynamic component given that, as we have seen, this component shows the advance or the regress in terms of sustainability. Tags are awarded to those zones where this component is positive in order to in this way reward the effort of the managers to advance toward the aim of sustainability. The setting out of this sustainable tourism tags system is the first methodological contribution of this paper to the literature.

A second methodological contribution of this study is the so-called improvement linear programming model. This enables defining for each destination the strategy of minimum change to attain a positive value in the dynamic component and, therefore, obtain a better qualification in the tag system proposed. We hence put forward a tool based on linear programming to objectively define short- and medium-term improvement strategies that guarantee the link of the tag system with decision making at a practical level. Moreover, this tool has a certain flexibility in the formulation of the restrictions provided that the feasibility of the model is guaranteed. A flexibility which would allow incorporating specific markers by the local managers themselves or considering the practical difficulties which exist when modifying the value of a specific indicator. This is an issue that is not always feasible in a short period of time.

The system of qualification via tags can mean an incentive to motivate local managers to carry out their work in an efficient and committed manner, as they see their work being objectively and effectively evaluated. Likewise, those destinations with higher qualifications within each group can be taken as a reference for the rest of the territories with similar characteristics to define more realistic benchmarking practices that help to improve the qualifications achieved in future evaluations.

The label system designed is an incentive even for destinations with a better starting situation or that attains a high score after improving for several years, if they do not register new advances. These destinations are incentivized to develop tourism plans that allow a gradual and continuous progress towards more sustainable situations, in order to avoid the not obtaining labels.

This system could be administered by governmental institutions at the regional or national level. Nevertheless, we believe that its administration by an independent and supranational body would be the ideal option for this type of qualification systems to fulfill its mission. As support material, it would be interesting for this managing body to make known good practices. These could be identified through explanatory cards that disaggregate the value of the DDI for the best qualified destinations. They could be made available to the rest of the destinations via a Geographic Information System which would facilitate inter-territorial analysis.

Although the proposed method for assessing sustainable tourism is consistent with a planning process based on scientific criteria, in practice a shift has been occurring toward more inclusive decision-making approaches, such as community-based and collaborative approaches that reflect the turn toward communicative action planning. The use of an initial system that includes locally-derived indicators could be the appropriate way to facilitate the application of the tool proposed in a participatory planning process. The study of how to integrate the proposed label system into these processes is a matter to study in future research.

6. Appendix. Differential dynamic index: mathematical formulation

Suppose an initial system of indicators of sustainable tourism that is used to evaluate a set of n destinations. Each of the system's indicators is categorized as positive or negative; this depends on its direction of variability. We designate by J the system's group of positive indicators and by K the group of negative indicators. I_{ij}^{+} is the value of the ith destination in the jth positive indicator with $j \in J$. As to the negative indicators, I_{ik}^{-} is designated as the value that comes from the kth indicator for the ith destination considered with $k \in K$.

Let us suppose that n destinations considered are sorted into G groups. After doing this, we define the first component of the DDI, the SC, employing G different aspirations levels fixed for each indicator.

Thus, if we represent by $(I_{i^g j}^{+})$ the value achieved in destination i, belonging to group g, in the positive indicator j, this indicator's aspiration level will be given by:

$$u_{gj}^{+} = \max_{i^g} \quad I_{i^g j}^{+} \tag{1c}$$

The aspiration level for the negative indicator k in group g is defined as:

$$u_{gk}^{-} = \min_{i^g} \quad I_{i^g k}^{-} \tag{2b}$$

Utilizing these aspiration levels, each indicator's goal is delimited. Hence, for destination i, belonging to group g, if the indicator is positive the goal could be defined as follows:

$$I_{i^g j}^{+} + n_{i^g j}^{+} = u_{gj}^{+} \quad \text{with} \quad n_{i^g j}^{+} \geq 0 \tag{3b}$$

If the indicator is negative, the goal is specified as:

$$I_{i^g k}^{-} - p_{i^g k}^{-} = u_{gk}^{-} \quad \text{with} \quad p_{i^g k}^{-} \geq 0 \tag{4b}$$

Using the information of the deviation variables, we quantify the value of the SC for the ith destination of the group g, via the following weighted sum:

$$SC_{ig} = \sum_{j \in J} \frac{w_j n_{i^g j}^{+}}{u_{gj}^{+}} + \sum_{k \in K} \frac{w_k p_{i^g k}^{-}}{u_{gk}^{-}} \quad \forall\, i \in \{1,2,\ldots,n\},\ \forall\, g \in \{1,2,\ldots,G\} \tag{5b}$$

where w_j and w_k are the weights that indicate each indicator's comparative importance. In this weighted sum we add the normalized values of the deviation variables. We get these normalized values by dividing the value of the deviation variable by its aspiration level; as a result, its value is indicated in a dimensionless scale.

Suppose we quantify the DC to the evolution recorded by each destination between the time of the assessment (t_n) and an initial reference period (t_0), with $|t_n - t_0| \geq 4$. Beforehand, we quantify the system of indicators for the two periods that have been considered. Then, we set a different aspiration level for each unit and each indicator, using t_0 as the base.

So, the goal associated with a positive indicator for destination i of group g, is given by:

$$I_{i^g j t_n}^{+} + n_{i^g j}^{+} - p_{i^g j}^{+} = I_{i^g j t_0}^{+} \quad \text{with} \quad n_{i^g j}^{+},\, p_{i^g j}^{+} \geq 0 \quad n_{i^g j}^{+} \cdot p_{i^g j}^{+} = 0 \tag{6b}$$

If the indicator is negative, the goal is formulated as follows:

$$I_{i^g k t_n}^{-} + n_{i^g k}^{-} - p_{i^g k}^{-} = I_{i^g k t_0}^{-} \quad \text{with} \quad n_{i^g k}^{-},\, p_{i^g k}^{-} \geq 0 \quad n_{i^g k}^{-} \cdot p_{i^g k}^{-} = 0 \tag{7}$$

Employing the normalized values of the deviation variables from before, the value of the DC for a destination i of a group g is given by the following weighted sum:

$$DC_{ig} = \sum_{j \in J} \frac{w_j p_{i^g j}^{+}}{I_{i^g j t_0}^{+}} + \sum_{k \in K} \frac{w_k n_{i^g k}^{-}}{I_{i^g k t_0}^{-}} - \sum_{j \in J} \frac{w_j n_{i^g j}^{+}}{I_{i^g j t_0}^{+}} - \sum_{k \in K} \frac{w_k p_{i^g k}^{-}}{I_{i^g k t_0}^{-}} \quad \forall\, i \in \{1,2,\ldots,n\},\ \forall\, g \in \{1,2,\ldots,G\} \tag{8}$$

Adding the first two quantifies the progress of the destination over time, showing the degree to which the territory improves the achievement level of the indicators as to the period of reference. The last two, calculated from the undesired variables of deviation, enable the quantification of the destination's regresses in sustainability terms.

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