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AN ANP APPROACH TO ASSESS THE SUSTAINABILITY OF TOURIST STRATEGIES FOR THE COASTAL NATIONAL PARKS OF VENEZUELA

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Abstract. Decision-making for sustainable development involves high levels of uncertainty. In the present paper a study about sustainable management of tourism in national parks is presented. A case study approach is applied to coastal national parks (NP) in Venezuela. Tourism can contribute to the sustainability of national parks but currently it is their main cause of environmental impact. The Government of Venezuela and its natural park managers are therefore looking for new sustainable tourism development strategies. To help managers in making decisions about NP sustainability a new multicriteria approach based on the Analytic Network Process (ANP) technique is proposed. ANP provides a more realistic approach for modelling complex situations such as decision making for sustainable tourism management because ANP allows the general study of the quantitative and qualitative explanatory variables and the incorporation of feedback and interdependence relationships among variables. A case study has been carried out with the help of two experts closely related to the 12 coastal NP analyzed and 8 stakeholders of "Los Roques" national park who provided most of the information needed.

Keywords: MCDA, Analytic Network Process (ANP), Sustainable Tourism, sustainability indicators.

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1. Introduction

According to several authors (Cottrell and Vaske 2006; Acerenza 2007), a certain type of tourism is desirable for the sustainable development of national parks (NP) as it can contribute to the economic development of the local community, provide funding for maintaining their

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environmental values, foster the environmental education of tourists, and even raise public awareness of the conservation of NP.

Nevertheless, tourism is an anthropic pressure which some authors consider as the main cause of environmental impact on some NP (Tubb 2003). In fact, pressure from tourism degrades the natural values of the protected areas most valued by tourists. Therefore, tourism must be considered (and proposed) as a driving force for sustainable development, not as an aim in itself. Coherently, there is a need to assess the contribution to sustainability of the tourism strategies, in particular for national parks.

Various research works can be found in the literature that analyze and suggest what sustainable tourism should be (i.e. Tubb 2003; Grundey 2008; Kelly *et al.* 2007). However, contribution of tourism to sustainability remains in a predevelopment phase with small visible changes, yet with much experimentation and discussion among the academic community (the authors agree with Cottrell *et al.* 2004). For the particular case of coastal national parks, some of the most outstanding reflections and proposals can be found in Nunes (2002), Ehler (2003) and Himes (2007).

According to all the reviewed literature, as starting point for this research, tourism brings sustainability to a national park if it contributes to the ecological, socio-cultural and economic objectives of the NP. According to Cottrell and Vaske (2006) this means:

– economic improvement for locals in a tourist area;
– preservation of the nature and natural resources (such as water, biota, landscape or energy);
– maintenance of the cultural values and liveability of the tourist destination.

With the aim of meeting these aims, assessing the sustainability of any proposed strategy or policy means having a model to which the proposal is compared: goals, thresholds, indicators, etc. It is well known that such a model is difficult to obtain because of the high number of variables to take into consideration and the relationships among them, which are usually complicated to set. Besides, it is necessary to estimate the evolution of the variables in a lifespan of at least several decades. Hence, assessing sustainability involves dealing with high levels of uncertainty (Hermann *et al.* 2007; Lavapuro *et al.* 2008). Firstly, because variables are arranged into nets, in which each one influences directly or indirectly many others, and secondly because of the large time spans.

Additionally, assessing sustainability also depends upon how policymakers and other stakeholders understand and interpret the process. Hence, gathering and considering their different opinions and judgments is another difficult task of these processes (Arvai and Gregory 2003; Sheppard 2005). While the literature deals extensively with the issues of sustainable development, there is a lack of an easy-to-use, yet rigorous, methodology (Quaddus and Siddique 2001; Yaw 2005). Finally, when the information available is biased and uncertain, as is the case in sustainable development modelling, assessment or planning (Lavapuro *et al.* 2008), it is necessary to make estimates. In such cases, experience and knowledge of the problem are as important as the assessment model itself. Therefore, it is preferable to focus the efforts on finding a renowned group of experts and get them involved in the process.

But not only experts on sustainable development are necessary, also the stakeholders must be taken into consideration. For any experts' model to be acceptable, it has to achieve consensus among the involved stakeholders. Stakeholders are the agents that will put the model into practice, will suffer or benefit from it, etc. Otherwise some of the development agents may feel that the assessments are biased, i.e. that the model is unfair, and they may not support the decisions or strategies selected using the model (Grundey 2008). Therefore, decision making in the field of sustainable development means designing models, plans, and building consensus by asking the main stakeholders to assess development strategies and discuss them together (Videira *et al.* 2003; Šavriņa *et al.* 2008).

To help managers making decisions about sustainable tourism strategies a new multicriteria approach (MCDA) based on the Analytic Network Process (ANP) technique and the participation of a group of experts and stakeholders is proposed.

2. The use of MCDA techniques for sustainable planning

Authors like Reed *et al.* (2006) and Leskinen (2007) have indicated the importance of accurately modelling reality when making decisions on projects that will affect sustainability in one way or another. In particular, Leskinen (2007) analyzed the effects of the end model when the aim of the decision is the preservation of the environment. MCDA techniques are suitable for solving this type of problems. The expression MCDA is used as an umbrella term to describe a number of formal approaches which seek to take explicit account of multiple criteria in helping individuals or groups explore decisions that matter (Belton and Stewart 2002). More information about MCDA can be found in Barba-Romero and Pomerol (1997) or Belton and Stewart (2002). MCDA techniques help in the selection and interpretation of sustainability indicators, which will act as model criteria, and in the way they are assessed and clustered to elaborate a model of the decisors' preferences. This model must be properly designed to maximize the correlation between the model values obtained and the concept to be modelled.

Several authors introduced the use of MCDA techniques for Sustainability Assessment (Ginevicius and Podvezko 2009). Many of them focused on the use of the Analytic Hierarchy Process (Saaty 1996) which has been accepted as a leading multi-criteria decision model (Ramzan *et al.* 2008; Sólnes 2003; Mszavrl *et al.* 2009) to assign priorities to the criteria or indicators involved in the problem. Others introduced the use of outranking techniques such as Electre and Promethee in order to avoid the compensation problem of the conventional methods (Beccali *et al.* 2003; Georgopoulou *et al.* 2003) and some of them focused on other MCDA methods specifically developed for the assessment problem under study (Viteikiene and Zavadskas 2007). All these MCDA techniques work well under the assumption of the independence of criteria. However, this assumption is not always realistic, and for sure not in the field of sustainable assessment or planning. Thus, bias can occur when using any of these methods and this can lead to non-optimal evaluations. In this paper, the Analytic Network Process (ANP) is chosen as it takes into account the interdependence among the criteria and avoids the problem of compensation.

The Analytic Network Process (ANP) is a method proposed by Saaty (2001). It provides a framework for decision-making or evaluation problems. It presents its strengths when working in scenarios with scarce information. It is based on deriving ratio-scale measurements to be used for the allocation of resources according to their ratio-scale priorities, whereas ratio-scale assessments, in turn, enable considerations based on trade-offs (Keeney and Raiffa 1976). ANP generalizes the problem modelling process using a network of criteria and alternatives (all called elements), grouped into clusters. All the elements in the network can be related in any possible way, i.e. a network can incorporate feedback and interdependence relationships within and between clusters. This provides an accurate modelling of complex settings and allows handling the usual situation of interdependence among elements in sustainability assessment scenarios (Neaupane and Piantanakulchai 2006; Saaty 2001).

Some of the recent applications involving ANP in the field of sustainable development are found in strategic policy planning (Erdoğmuş *et al.* 2006); forest management (Partovi and Corredoira 2002); determination of the appropriate energy policy (Utulas 2005); or environmental pressure assessment (Gómez-Navarro *et al.* 2009).

3. Theoretical background of the ANP model

Details on the Analytic Network Process (ANP) can be found in Saaty (2001), however, the main steps are summarized here for completeness:

(i) Pairwise comparisons on the elements and relative weight estimation

The determination of relative weights in ANP is based on the pairwise comparison of the elements in each level. These pairwise comparisons are conducted with respect to their relative importance towards their control criterion based on the principle of AHP and measured using Saaty's 1-to-9 scale (see Table 1). The score of a_{ij} in the pairwise comparison matrix

Table 1. Saaty's fundamental comparison scale

Degree of importance	Definition	Explanation
1	equal importance	the two elements contribute equally to the objective
2	weak	
3	moderate importance	experience and judgment slightly favor one element over another
4	moderate plus	
5	strong importance	experience and judgments strongly favor one element over another
6	strong plus	
7	very strong or demonstrated Importance	an element is very strongly favored over another; its dominance is demonstrated in practice
8	very, very strong	
9	extreme importance	the evidence favoring one element over another is of the highest possible order of affirmation
Reciprocals of above	If element i has one of the above nonzero numbers assigned to it when compared with element j, then j has the reciprocal value when compared with element i	a reasonable assumption

represents the relative importance of the element in row (i) over the element in column (j), i.e., $a_{ij} = w_i/w_j$ where w_i is the weight of the element (i).

With respect to any criterion, pairwise comparisons are performed in two levels, i.e. the element level and the cluster level. If there are *n* elements to be compared, the comparison matrix *A* is defined as:

$$A = \begin{bmatrix} w_1/w_1 & w_1/w_2 & \ldots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \ldots & w_2/w_n \\ & & & \\ w_n/w_1 & w_n/w_2 & \ldots. & w_n/w_n \end{bmatrix} = \begin{bmatrix} 1 & a_{12} & \ldots. & a_{1n} \\ a_{21} & 1 & \ldots. & a_{2n} \\ \ldots. & \ldots. & \ldots & \ldots. \\ a_{n1} & a_{n2} & \ldots. & 1 \end{bmatrix} \ldots. \qquad (1)$$

After all pairwise comparisons are completed the priority weight vector (*w*) is computed as the unique solution of

$$A \times w = \lambda_{\max} \cdot w, \qquad (2)$$

where λ_{max} is the largest eigenvalue of matrix *A* and *w* is its eigenvector.

(ii) Construction of the original supermatrix (unweighted supermatrix)

The resulting relative importance weights (eigenvectors) in the pairwise comparison matrices are placed within a supermatrix that represents the interrelationships of all elements in the system.

(iii) Construction of the weighted supermatrix

The following step consists of the weighting of the blocks of the unweighted supermatrix, by the corresponding priorities of the clusters, so that it can be column stochastic (weighted supermatrix).

(iv) Calculation of the global priority weights

The limit supermatrix is obtained by raising the weighted supermatrix to limiting powers until the weights converge and remain stable. In this matrix, the elements of each column represent the importance of each criterion in the model with a dimensionless value.

4. Case study: Evaluation of sustainable tourism strategies for coastal national parks in Venezuela

In this paper we present an ANP-based procedure to help national park managers assess the sustainability of tourism strategies when they have to face strategic development planning. It is very important to count on the stakeholders involved in the evaluation and interpretation processes. Therefore, the aim of this proposal is not to substitute the task of the assessment experts but, on the contrary, to ease and facilitate it. The experts' opinions and judgments are the only ones to be taken into account and used as input data in the evaluation model.

4.1. Methodology for the case study

The procedure (Fig. 1) starts with the modelling of the problem of assessing sustainable tourism strategies for national parks with similar characteristics by the experts' panel (in this case the coastal NP). For the model, the experts were asked to identify the criteria for the assessment of tourism strategies in NP. The set of criteria must meet the following requirements: to be related to sustainability indicators (pressure, state, response, impact and driving forces), to be structured into clusters and be complete, to be non-redundant and to be easy to understand by the different stakeholders.

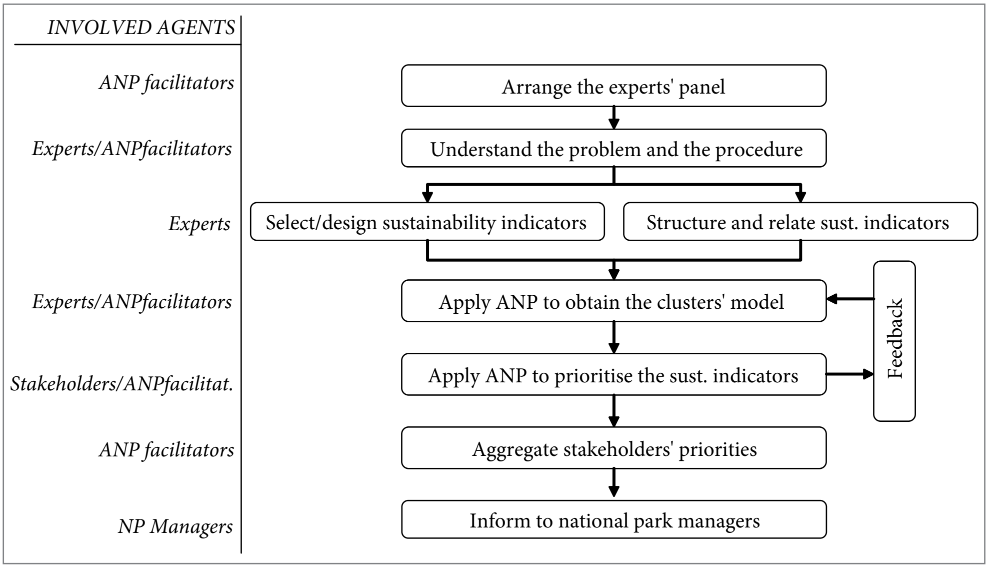

Fig. 1. General assessment procedure

The procedure was then presented to the stakeholders involved in the tourist exploitation of a particular coastal NP: "Los Roques". They were asked to prioritize the elements of the model. In this step feedback is possible in order to include the stakeholders' suggestions in the experts' model. This prioritization is necessary as the model criteria are not of equal importance. Each stakeholder rated the criteria according to their preferences as explained in the discussion of the results. Then, in order to build consensus about the importance of the criteria, a discussion was promoted among stakeholders. The debate allowed stakeholders to defend their prioritizations and understand the others' preferences and choices. As suggested by Saaty (2001), the aggregation of all the individual judgements was conducted by means of the geometric mean.

As an illustration of the different points of view, the legal status, priorities and targets were only taken into consideration by some stakeholders, namely Los Roques manager ("INPARQUES representative") and the NGO environmentalist. Other stakeholders like the tourists and the tour operator knew little about those issues. Nevertheless, according to the literature, the participation of all the relevant stakeholders is strongly recommended, even if they emphasize aspects or criteria that do not easily match the NP objectives, as this information is equally valuable for managers.

4.2. Archipelago Los Roques National Park

Los Roques is a coastal National Park of Venezuela, located in the Caribbean, at 168 Km (100 miles) north of La Guaira, Caracas' port. (Fig. 2) It was decreed national park in 1972. Since 1991 it has had a strategic development plan in which tourism was one of the main bets. In the last 10 years tourism has replaced fishing as the main economic activity. The park has 1,200 inhabitants and every year it receives more than 75000 tourists who exert an unsustainable environmental pressure.

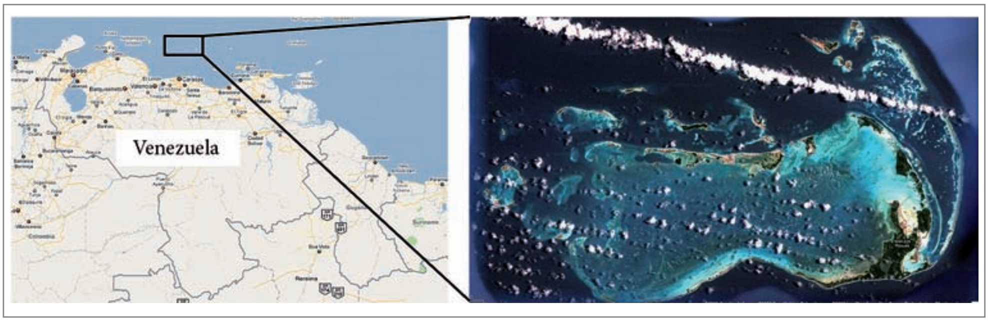

Fig. 2. *Archipelago Los Roques* National Park (obtained from Google maps)

4.3. Selection of the experts

Two experts designed the network model. Expert 1 is the manager of *Los Roques* coastal National Park. Expert 2 is, among others, the president of the environmental NGO *VITALIS*, technical consultant of the National Agency for National Parks Management *INPARQUES* and of the *World Bank Project-INPARQUES* on environmental education.

4.4. Representation of the evaluation problem as a network model

The experts' panel contributed to determine the network model according to the ANP procedure (see Fig. 3). Finally, the criteria used in the model were:

- c1 Water quality
- c2 Landscape beauty
- c3 Species' habitat
- c4 Education level
- c5 Available public services
- c6 Other economic activities, different from tourism
- c7 Per capita income
- c8 Solid waste generation
- c9 Water waste generation
- c10 Biodiversity changes
- c11 Private investment
- c12 Public institutions support
- c13 Existence of plans and regulations for the park

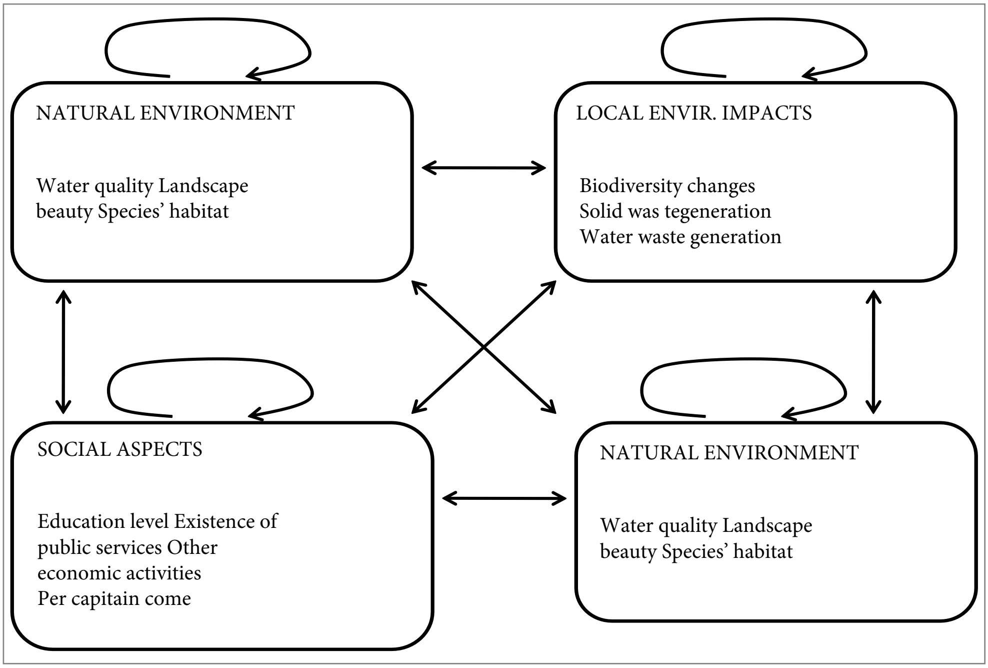

Fig. 3. Network model for the case study

The complex task of representing the evaluation problem as a network of interdependent elements distributed into clusters can be broken down into the following steps: (i) identify the elements (criteria), (ii) group them into clusters and (iii) determine the influences on each other. For our case study the following network with four clusters was built:

The two-way arrows indicate bi-directional influences between clusters, i.e. the criteria of one cluster (*i*) exert some influence on the criteria of another cluster (*j*) so that criteria *i* have to be weighted in order to estimate their contribution to criteria *j*. Feedback means that there is some influence among the criteria within a cluster.

4.5. Selection of the stakeholders

After making a list of all possible stakeholders with a total of 28 agents, a closer analysis of their interests, power and resources allowed us to select the stakeholders most directly involved with Los Roques NP sustainability assessment. These 8 principal stakeholders were:

1. local community representative,
2. local business representative,
3. INPARQUES representative. Los Roques manager,
4. national tourist,
5. international tourist,
6. tour operator,

7. NGO environmentalist,
8. sustainable development expert.

4.6. Prioritization of the sustainability indicators (model criteria)

The stakeholders were interviewed and informed on the ANP methodology and its applications in criteria prioritization. They were asked to evaluate the model and suggested changes which were taken into account in the final model design. After solving every question asked by the stakeholders, a questionnaire was designed using pairwise questions for further comparison analysis. Table 2 shows a sample of the questionnaire used for criteria comparison.

Table 2. Sample of questionnaire used for criteria comparison

C1: Water quality vs C2: Landscape beauty

With respect to the sustainability of "Los Roques" natural park, which criterion do you consider more important?				C1 X	C2
To what extent?	1	3	5 X	7	9

In order to alleviate the mathematical burden the following calculations were implemented through the software Superdecisions © (Superdecisions 2005). The following results (see Tables 3, 4 and 5) correspond to the global judgements, i.e. the aggregation of all individual judgements.

Upon completion of all pairwise comparison matrices, the unweighted supermatrix was built (Table 3).

The corresponding priorities of the clusters were then used to weight this matrix and to obtain the weighted supermatrix (Table 4).

The limit supermatrix was achieved by raising the weighted supermatrix to limiting powers until the weights converged and remained stable (Table 5).

The priority of each criterion is a dimensionless value that can be considered a Sustainable Tourism Indicator (STI). This priority can be obtained from the values in any of the columns of the limit supermatrix. Since eight stakeholders were interviewed, a total of eight individual limit matrices were obtained. each of which shows the ST indicators according to the opinion of one particular stakeholder. Table 6 shows the results of the 8 individual agents as well as the aggregated judgements with the global STI.

Group discussions are currently being held to reach consensus among key stakeholders. Meanwhile, aggregation through the geometric mean provides additional information on the preferences of the stakeholders. In this way, the list of criteria. Clustering, the relationships among criteria and the importance stakeholders give to the criteria constitute a first approximation to the stakeholders' model of sustainability to be taken into account when assessing development strategies and plans for *Los Roques* National Park.

Table 3. Unweighted supermatrix

			Water quality	**Landscape beauty**	**Species habitat**	**Education level**	**Existence of public services**	**Other economic activities**	**Per capita income**	**Solid waste generation**	**Water waste generation**	**Biodiversity impact**	**Private inversion level**	**Public institutions support**	**Existence of plans and regul.**
Natural environment	c1	Water quality	0	0	1	0	0	0	0	0	0	0.342	0	0	0
	c2	Landscape beauty	0	0	0	0	0	0	0	0	0	0	1	0.459	0
	c3	Species habitat	1	1	0	0	0	1	1	0	0	0.658	0	0.541	1
Social aspects	c4	Education level	0	0	0	0	0	0.275	0.166	0	0	0.187	0.328	0	0
	c5	Existence of public services	0.358	0.6452	0	0	0	0.366	0.648	0	0	0.314	0.252	0.575	1
	c6	Other economicactivities	0.642	0.3548	0.654	0	0.663	0	0.186	0.539	0.6	0.248	0.231	0.425	0
	c7	Per capita income	0	0	0.346	1	0.337	0.359	0	0.461	0.4	0.251	0.189	0	0
Local environmental impacts	c8	Solid waste generation	0.649	0.133	0.481	0	0	0.358	0	0	1	0.450	0	0.334	0
	c9	Water waste generation	0.351	0.307	0.267	0	0	0	0	0	0	0.550	1	0.379	0
	c10	Biodiversity impact	0	0.560	0.252	0	0	0.642	1	0	0	0	0	0.287	1
Political and administrative aspects	c11	Private investment level	0	0.220	0.347	0.526	0.152	0.135	0.176	0	0	0	0	0.559	0.680
	c12	Public institutions support	0	0.426	0.302	0.474	0.405	0.412	0.824	0	0	0.359	0	0	0.320
	c13	Existence of plans and regulations	0	0.354	0.351	0	0.443	0.453	0	0	0	0.641	1	0.441	0

Table 4. Weighted supermatrix

			Water quality	Landscape beauty	Species habitat	Education level	Existence of public services	Other economic activities	Per capita income	Solid waste generation	Water waste generation	Biodiversity impact	Private inversion level	Public institutions support	Existence of plans and regul.
Natural environment	c1	Water quality	0	0	0.203935	0	0	0	0	0	0	0.088	0	0	0
	c2	Landscape beauty	0	0	0	0	0	0	0	0	0	0	0.200	0.092	0
	c3	Species habitat	0.252	0.204	0	0	0	0.167	0.167	0	0	0.169	0	0.108	0.200
Social aspects	c4	Education level	0	0	0	0	0	0.110	0.066	0	0	0.058	0.103	0	0
	c5	Existence of public services	0.109	0.159	0	0	0	0.147	0.259	0	0	0.097	0.079	0.180	0.314
	c6	Other economic activities	0.195	0.087	0.161	0	0.407	0	0.074	0.539	0.307	0.077	0.073	0.133	0
	c7	Per capita income	0	0	0.085	0.614	0.207	0.144	0	0.461	0.205	0.077	0.059	0	0
Local environmental impacts	c8	Solid waste generation	0.288	0.048	0.173	0	0	0.065	0	0	0.488	0.132	0	0.069	0
	c9	Water waste generation	0.156	0.110	0.096	0	0	0	0	0	0	0.161	0.207	0.078	0
	c10	Biodiversity impact	0	0.202	0.091	0	0	0.116	0.182	0	0	0	0	0.059	0.207
Political and administrative aspects	c11	Private investment level	0	0.042	0.066	0.203	0.059	0.034	0.044	0	0	0	0	0.156	0.190
	c12	Public institutions support	0	0.081	0.057	0.183	0.156	0.104	0.207	0	0	0.051	0	0	0.089
	c13	Existence of plans and regulations	0	0.067	0.067	0	0.171	0.114	0	0	0	0.091	0.279	0.123	0

Table 5. Limit supermatrix

			Water quality	**Landscape beauty**	**Species habitat**	**Education level**	**Existence of public services**	**Other economic activities**	**Per capita income**	**Solid waste generation**	**Water waste generation**	**Biodiversity impact**	**Private inversion level**	**Public institutions support**	**Existence of plans and regul.**
Natural environment	cl	Water quality	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
	c2	Landscape beauty	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
	c3	Species habitat	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Social aspects	c4	Education level	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	cS	Existence of public services	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115
	c6	Other economic activities	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155
	c7	Per capita income	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
Local environmental impacts	c8	Solid waste generation	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
	c9	Water waste generation	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
	c10	Biodiversity impact	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076	0.076
Political and administrative aspects	e11	Private investment level	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
	c12	Public institutions support	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086
	c13	Existence of plans and regulations	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079

Table 6. Individual and global prioritization for the case study

			TSI								
			National		**NGO environmentalist**	**INPARQUES**	**Sustainable development expert**	**International**	**Inhabitants**	**Business**	**JUDGEMENTS AGGREGATION**
Natural environment	c1	Water quality	0.110	0.090	0.039	0.018	0.002	0.023	0.009	0.014	**0.026**
	c2	Landscape beauty	0.015	0.184	0.026	0.009	0.007	0.010	0.045	0.057	**0.020**
	c3	Species habitat	0.221	0.054	0.098	0.116	0.029	0.048	0.105	0.057	**0.096**
Social aspect	c4	Education level	0.023	0.102	0.038	0.056	0.190	0.115	0.017	0.051	**0.036**
	c5	Existence of public services	0.053	0.046	0.111	0.061	0.065	0.061	0.062	0.059	**0.115**
	c6	Other economic activities	0.106	0.037	0.147	0.166	0.182	0.186	0.172	0.156	**0.155**
	c7	Per capita income	0.117	0.135	0.090	0.217	0.184	0.135	0.077	0.207	**0.130**
Local environmental impacts	c8	Solid waste generation	0.067	0.040	0.066	0.053	0.032	0.065	0.090	0.076	**0.074**
	c9	Water waste generation	0.047	0.069	0.062	0.035	0.018	0.048	0.078	0.065	**0.047**
	c10	Biodiversity impact	0.060	0.047	0.038	0.116	0.059	0.034	0.098	0.033	**0.076**
Political and administrative aspects	c11	Private inversion level	0.065	0.092	0.104	0.063	0.106	0.060	0.115	0.160	**0.061**
	c12	Public institutions support	0.052	0.067	0.060	0.036	0.087	0.116	0.044	0.037	**0.086**
	c13	Existence of plans and norms	0.064	0.037	0.120	0.054	0.041	0.100	0.091	0.029	**0.079**

5. Discussion of Results

The results of the individual and global criteria prioritization are presented in the following spider-web diagrams (Fig. 4). In each diagram the axes show the relative criteria weights assigned by each stakeholder (see Table 6 for values).

As depicted in the individual diagrams, the stakeholders hold very different points of view regarding the sustainable development of "Los Roques". For example, some of the stakeholders focused more on the environmental aspects of sustainable development. Like the National tourist; others like the Local business representative, focused on the economic criteria; and the Sustainable development expert gave more importance to the social criteria.

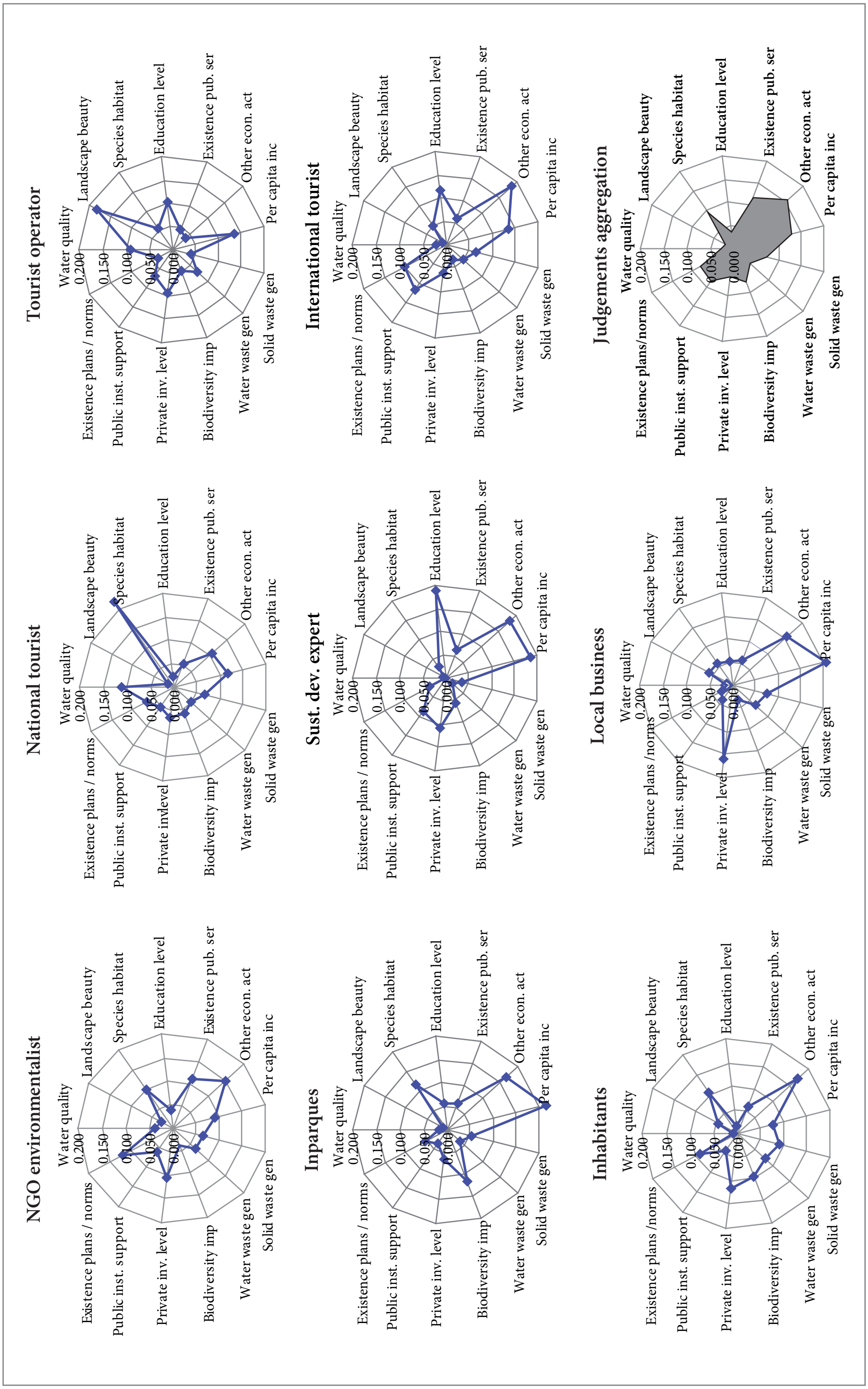

Fig. 4. Individual judgements of the stakeholders and the judgements aggregation

Also, although every individual prioritization shows differences and no agreement about the most important, the aggregated priorities show a more compensated profile.

Nevertheless, the aggregation of the judgements allows setting thresholds regarding the prioritization of the criteria. Three criteria obtained more than 10% of the weight and thus can be considered as the most important for the stakeholders: *Other economic activities*. *Per capita income* and *Available public services*. By contrast, four criteria obtained less than 5% of the weight and can therefore be considered the least important: *Water quality, Landscape beauty, Education level and Water waste generation.*

Note that there was general consensus about the importance of some criteria: *Per capita income* and *Other economic activities* were the best rated by all stakeholders and *Solid waste generation* was average rated (these criteria present low standard deviation values). On the other hand, *Landscape beauty* or *Water quality* show standard deviation values higher than 100%.

6. Conclusions

This paper presents a new approach for the efficient and reliable assessment and planning of sustainable tourism development strategies. The aim of this proposal is to help national park managers (decision makers) to prioritize strategic tourism development actions. The model has been applied to coastal national parks and particularly to "Los Roques" national park. The model consists of the calculation and combination of sustainable tourism indicators (environmental. social. political and administrative) based on the ANP method and the experts' and stakeholders' opinions. It also allows dealing with the uncertainty of this kind of problems making use of experts' opinions and pairwise comparisons.

The panel of experts identified the sustainable tourism indicators to be used as ANP criteria and their relationships in the network model for sustainability. Besides, consensus among all stakeholders was gained by asking them to assess the importance of the model criteria using goal-oriented questionnaires designed by the authors.

Regarding the results obtained from the process, individual priorities show great differences among the stakeholders' opinions. This was expected since stakeholders hold very different points of view about the sustainable development of "Los Roques". The results evidence that the social and economic criteria *Other economic activities. Per capita income* and *Available public services* were rated the most relevant by all stakeholders. Whereas environmental indicators like *Landscape beauty* and *Water quality* were not highly rated except by the National tourist and the Tour operator representatives. In this paper the experts' priorities have been aggregated by calculating their geometric mean. Future work will be focus on gaining consensus among the key stakeholders of "Los Roques" National Park. This will allow the authors to compare the results of both procedures and analyze them together with the experts.

The criteria used in the model can be considered as Sustainable Tourism Indicators (STI). and their prioritization as a measure of their importance. Tourism strategies for Los Roques NP can be therefore ranked according to these STIs.

Although the methodology satisfied the experts as well as the decision makers, the ANP procedure was not free of criticism. During the ANP application to the case study some difficulties i.e. complexity of the ANP comparisons, were observed. Hence. The questionnaires must be carefully designed and the comparison process must be helped by a facilitator.

Despite these difficulties, the results obtained in this work allow us to conclude that ANP is a suitable tool for assessing sustainable tourism development strategies for the coastal national parks of Venezuela. Although the new proposal has been specifically applied to the coastal National Parks, this tool can be adapted to any type of sustainability decision-making problem, provided the criteria are properly identified and there are some dependencies among them. This tool constitutes a very promising future research line in the field of sustainability assessment and planning.

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VENESUELOS PAKRANTĖS NACIONALINIŲ PARKŲ DARNAUS TURIZMO STRATEGIJŲ VERTINIMAS ATP METODU

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Santrauka. Priimant darnios plėtros sprendimus kyla labai daug neapibrėžtumų. Straipsnyje pateikta darnios nacionalinių parkų turizmo vadybos analizė. Straipsnio tyrimo objektas – Venesuelos pakrantės nacionaliniai parkai. Turizmas gali prisidėti prie nacionalinių parkų darnos didinimo, tačiau šiuo metu jam būdingas tiesiog didelis poveikis aplinkai. Todėl Venesuelos Vyriausybė ir gamtos parkų vadovai ieško naujų darnaus turizmo plėtros strategijų. Nacionalinių parkų vadovams straipsnio autoriai siūlo taikyti daugiakriteriniais metodais sukurtą analitinio tinklo proceso (ATP) techniką. Jis padėtų vadovams priimti su nacionalinių parkų darna susijusius sprendimus. ATP leidžia tikroviškiau modeliuoti tokias sudėtingas situacijas, kaip sprendimų priėmimas darnaus turizmo vadyboje, nes su ATP įmanoma ištirti kiekybinius ir kokybinius kintamuosius, galima įdiegti grįžtamąjį ryšį ir tarpusavio ryšius tarp kintamųjų. Ištirtas „Los Roques“ nacionalinis parkas. Tyrime dalyvavo ekspertai ir minėto parko darbuotojai, kurie suteikė daugumą reikalingos informacijos.

Reikšminiai žodžiai: daugiakriterinė sprendimų analizė, analitinis tinklo procesas (ATP), darnus turizmas, darnos rodikliai.

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