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Assessing and managing scenery of the Caribbean Coast of Colombia

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HIGHLIGHTS

► Coastal scenery achieves great importance in the Colombian Caribbean littoral.
► Scenic assessment of 135 sites by means of 26 physical and human parameters.
► The scenic beauty was categorised from top (Class 1) to poor scenery (Class 5).
► 55% of coastal areas in Classes 1 and 2, 18% Class 3 and 47% Classes 4 and 5.
► Upgrade human parameters eliminating litter, sewage evidences, vegetation debris.

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ABSTRACT

This study provides the coastal scenery assessment of 135 sites along the Colombian Caribbean littoral by analysing 26 physical and human factors. Sites were categorised into five classes from Class 1, top grade scenery, to Class 5, poor scenery. Fifty five percent of the investigated coastal areas were included in Classes 1 and 2, 18% belonged to Class 3 and 47% of the sites fall into Classes 4 and 5. Classification of analysed sites depends on the geological setting and the degree of human occupation. Classes 1 and 2 sites are located in natural protected areas in La Guajira and Magdalena departments. Low classification recorded at Classes 3, 4 and 5 corresponds to a progressive decrease of both natural and (especially) human parameters. Concerning coastal management issues, emphasis should be given to the upgrading of human parameters eliminating litter and sewage evidences, vegetation debris and enhancing beach nourishment works.

1. Introduction

This paper provides a scenic assessment of 135 sites along the Colombian Caribbean coast (Fig. 1, Table 1), which used fuzzy logic analysis and parameter weighting matrices in order to overcome subjectivity and quantifying uncertainties (Ergin, Karaesmen, Micallef, & Williams, 2004). Location and characteristics of all investigated sites are indicated in Table 1 but unfortunately, it was not possible to present all sites in Fig. 1 due to space considerations.

The work deals with the main factors relating to an innovative scenic assessment methodology applied to a tropical area in a developing country whose intrinsic climatic characteristics and particular physical context, affect and control some of the natural factors considered in the classification and will result in a major thrust for coastal tourism. The technique opens new perspectives for analysis of the potential for coastal tourism development in natural areas and for scenic quality improvement of current tourist-developed areas.

1.1. Travel and tourism

This is the world's biggest industry (Klein, Osleeb, & Viola, 2004; World Tourism Organization WTO, 2001). In 2006, global tourism was worth US$733 billion, employed 8% of the global workforce and estimates were for 1.6 billion international tourists by 2020 (United Nations World Tourism Organization UNWT, 2008). Travel and Tourism worldwide, is expected to grow at 4.0% per year over the next ten years and it is one of the largest growth industries in the world (UNWT, 2008). Beaches are considered as a major player in this market (Houston, 2008; Lencek & Bosker, 1998). To benefit from this dynamic, many tourism oriented countries, e.g. in the

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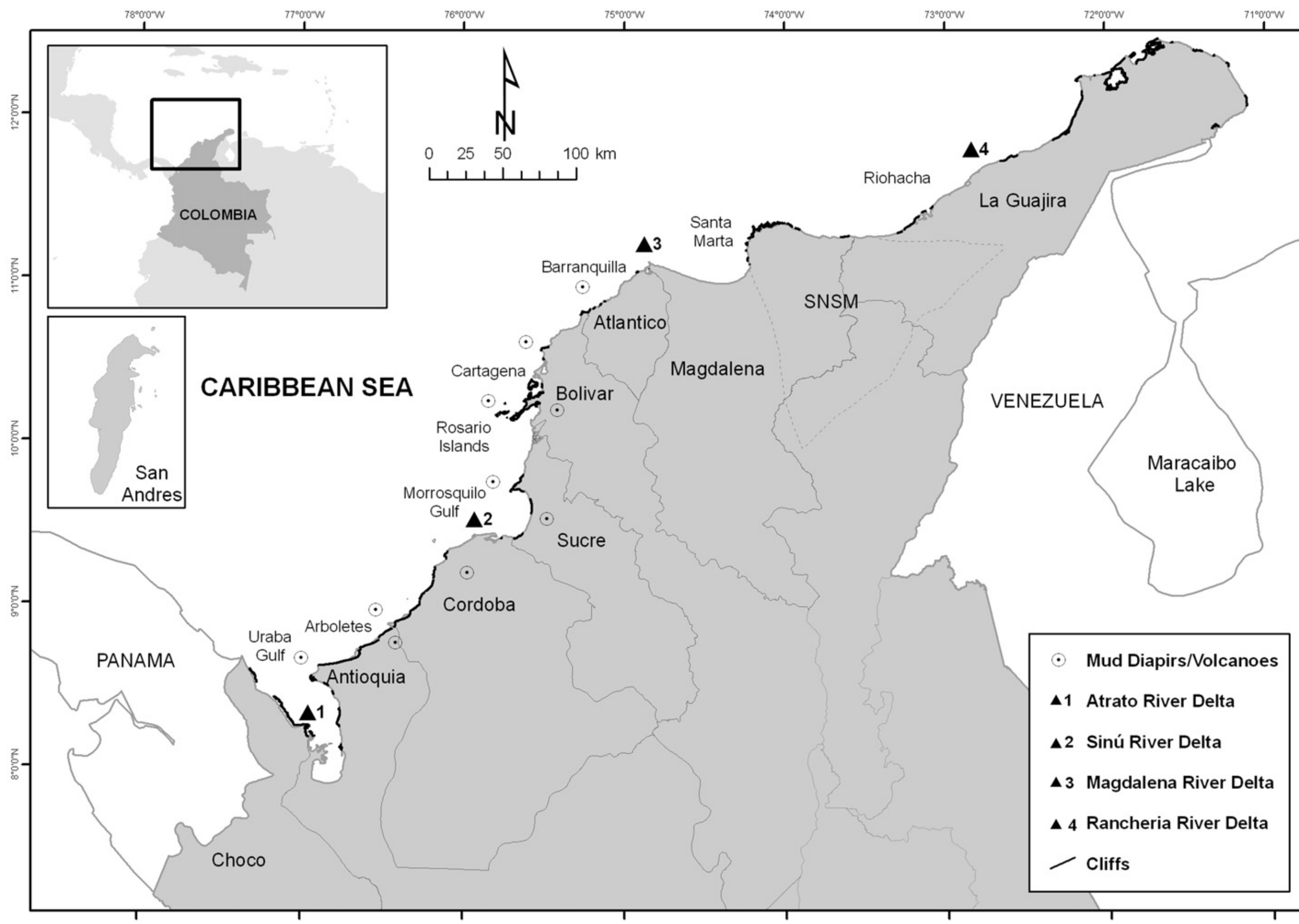

Fig. 1. Study area with indication of cliffed sectors and delta and mud volcanoes location.

Mediterranean, utilise proactive growth policies along the coastal strip (Benoit & Comeau, 2005). Highly seasonal tourism (three summer months and concentrated along the coast) is the most important activity in the Mediterranean coastal zone, in which visitors were estimated as some 250 millions (international and domestic) in 2008 and this number will increase substantially, in line with a forecasted 368 million tourists by 2020 (Unep & Unwto, 2008). In detail, in Spain, France, Italy, Greece and Turkey, tourism receipts account for some 5% of the gross domestic product (UNWTO, 2006), these countries accounting for '*the most significant flow of tourists.... a sun, sea and sand (3S) market*' (Doods & Kelman, 2008, p. 58).

Even in the UK, a '*non sun, sea and sand market*', more than 40% of all tourism is motivated by coastal visits and brings in £110 billion, providing employment for >1.3 million people (5% of all employed people; Netherlands Development Organisation, SNV, 2009). Travel and tourism in the USA generate an estimated US$746 billion per annum, providing 10% of the gross domestic product representing the second largest contributing industry (Houston, 1995). The US coastal areas receive annually 180 million recreational visitors, coastal states producing 85% of the national revenue related to tourism (Cicin-Sain & Knecht, 1998; Hughes, 2011). In California, USA, beach visits exceed 567 million/year compared to 286 million to *all* USA National Parks and in the 1995–1999 period brought annual tax revenues from tourism of more than US$14 billion (King, 1999). Along the Caribbean, tourist arrivals have increased five fold, from 166 million in 1970 to 935 million in 2010. Cruise arrivals grew more rapidly over the same period increasing from 1.3 in 1970 to 20 millions in 2010 (Caribean Tourism Organization, 2011). Barbados beaches are worth more than US$13 million to the local economy (Dharmaratne & Braithwaite, 1998). Despite the fact that Colombia has been affected by a number of social, political and security problems that have limited coastal development, actually this country plus Costa Rica, Brazil, Panama and the Dominican Republic accounts for the maximum average revenue per arrival, e.g. 1500 US$/per tourist (UNWTO, 2008). Therefore, beautiful beaches are worth billions of tourist dollars (Clark, 1996).

1.2. What do these tourists want from a coastal tourist location?

The main answer is the bathing area. According to Williams (2011), beach users are essentially interested in 'safety, facilities, water quality, no litter and scenery' and it is the later, as has been shown by studies of e.g. Ergin et al. (2004), that is the focus of this paper. These parameters have been found in surveys of beach users' preferences and priorities in many countries, e.g. Turkey, UK, Malta, Croatia, Portugal, and the USA. The *priority* changes, e.g., in resort areas safety and water quality are dominant; in rural areas bathing, scenery and litter absence are the main criterions: the 'Big Five' virtually dominate all other considerations (Williams, 2011; Williams & Micallef, 2009). Furthermore, surveys in the UK have shown that irrespective of social

Table 1
Location and main characteristics of investigated sites. Site name, location, setting, "*D*" value and class.

No	Beach	Department	Type	*D* value	Class
1	SAPZURRO	Choco	Village	0.72	2
2	CAPURGANA	Choco	Village	0.57	3
3	AGUACATE	Choco	Rural	0.82	2
4	ACANDI	Choco	Urban	0.02	4
5	ACANDI	Choco	Rural	0.85	2
6	PLAYONA	Choco	Rural	1.06	1
7	TRIGANA	Choco	Village	0.64	3
8	TITUMATE	Choco	Village	0.53	3
9	PUNTA YERBASAL	Antioquia	Rural	0.46	3
10	TURBO	Antioquia	Urban	−1.11	5
11	RIO TURBO	Antioquia	Rural	0.28	4
12	EL TOTUMO	Antioquia	Rural	0.18	4
13	NECOCLI	Antioquia	Urban	−0.46	5
14	RIO NECOCLI	Antioquia	Rural	0.11	4
15	EL VENADO	Antioquia	Rural	0.69	2
16	ZAPATA	Antioquia	Village	0.09	4
17	DAMAQUIEL	Antioquia	Village	0.53	3
18	UVEROS	Antioquia	Village	−0.27	5
19	SAN JUAN DE URABA	Antioquia	Rural	0.8	2
20	ARBOLETES	Antioquia	Resort	−0.28	5
21	ARBOLETES	Antioquia	Urban	−0.95	5
22	VOLCAN DE LODO	Antioquia	Rural	−0.07	5
23	LOS CORDOBAS	Córdoba	Rural	0.63	3
24	RIO CORDOBA	Córdoba	Rural	0.05	4
25	SAN RAFAEL	Córdoba	Rural	0.68	2
26	RIO CANALETE	Córdoba	Rural	0.51	3
27	PUERTO ESCONDIDO	Córdoba	Urban	0.04	4
28	RIO CEDRO	Córdoba	Village	0.3	4
29	BROQUELES	Córdoba	Village	0.11	4
30	MOÑITOS	Córdoba	Urban	−0.38	5
31	MOÑITOS	Córdoba	Rural	0.49	3
32	EL SALVADOR	Córdoba	Village	−0.1	5
33	SAN BERNARDO DEL VIENTO	Córdoba	Rural	0.46	3
34	PLAYA BLANCA	Córdoba	Urban	−0.35	5
35	EL CALAO	Córdoba	Rural	0.78	2
36	PUNTA BOLIVAR	Córdoba	Village	0.09	4
37	PIEDRA	Sucre	Village	−0.14	5
38	VICTORIA REAL	Sucre	Resort	0.07	4
39	TOLU	Sucre	Urban	−0.79	5
40	EL FRANCES	Sucre	Village	0.19	4
41	BERRUGAS	Sucre	Urban	−0.35	5
42	LA CANGREJERA	Sucre	Rural	0.79	2
43	PUNTA SECA	Sucre	Rural	0.84	2
44	BALSILLAS	Sucre	Rural	0.59	3
45	EL RINCON	Sucre	Urban	−0.66	5
46	ISLA PALMA	Bolívar	Resort	0.57	3
47	PLAYA BLANCA[a]	Bolívar	Rural	0.63	3
48	PLAYA BLANCA DECAMERON[a]	Bolívar	Resort	−0.12	5
49	ISLA BONITA	Bolívar	Rural	0.79	2
50	TIERRA BOMBA	Bolívar	Urban	−0.58	5
51	CASTILLOGRANDE	Bolívar	Urban	−0.33	5
52	BOCAGRANDE	Bolívar	Urban	−0.42	5
53	MARBELLA	Bolívar	Urban	−0.6	5
54	LAS AMERICAS	Bolívar	Resort	0.14	4
55	LA BOQUILLA	Bolívar	Village	−0.62	5
56	MANZANILLO	Bolívar	Rural	−0.07	5
57	MANZANILLO DEL MAR	Bolívar	Resort	0.45	3
58	BOCACANOAS	Bolívar	Resort	0.29	4
59	ARROYO DE PIEDRAS	Bolívar	Village	0.49	3
60	GALERAZAMBA	Bolívar	Village	0.23	4
61	LOMITA DE ARENA	Bolívar	Village	0.36	4
62	PUNTA CANOAS	Bolívar	Village	0.65	2
63	AGUA MARINA	Atlántico	Resort	0.1	4
64	PLAYA VELERO	Atlántico	Resort	0.38	4
65	BOCATOCINOS	Atlántico	Village	0.34	4
66	SALINAS DEL REY	Atlántico	Village	0.49	3
67	SANTA VERONICA	Atlántico	Village	−0.47	5
68	PALMARITO	Atlántico	Urban	−0.05	5
69	PTO CAIMAN	Atlántico	Village	0.31	4
70	CAÑO DULCE	Atlántico	Village	0.38	4
71	PUERTO COLOMBIA	Atlántico	Urban	−0.17	5
72	SALGAR	Atlántico	Village	−0.18	5
73	SABANILLA	Atlántico	Urban	0.21	4
74	SALAMANCA[a]	Magdalena	Village	0.77	2
75	TASAJERA[a]	Magdalena	Village	0.73	2
76	PUEBLO VIEJO	Magdalena	Village	0.71	2
77	CIENAGA	Magdalena	Urban	0.72	2
78	VILLA TANGA	Magdalena	Resort	0.31	4
79	AEROPUERTO	Magdalena	Urban	−0.33	5
80	IROTAMA	Magdalena	Resort	−0.02	5
81	POZOS COLORADOS	Magdalena	Urban	0.13	4
82	RODADERO	Magdalena	Urban	0.04	4
83	GAIRA	Magdalena	Urban	0.25	4
84	PLAYA LIPE	Magdalena	Remote	0.88	1
85	LOS COCOS	Magdalena	Urban	−0.46	5
86	SANTA MARTA	Magdalena	Urban	−0.48	5
87	TAGANGA	Magdalena	Village	−0.3	5
88	PLAYA BRAVA[a]	Magdalena	Remote	1.12	1
89	BAHIA CONCHA[a]	Magdalena	Village	1.08	1
90	MACUACA[a]	Magdalena	Rural	1.36	1
91	CHENGUE[a]	Magdalena	Remote	1.29	1
92	GAYRACA[a]	Magdalena	Remote	0.96	1
93	7 OLAS[a]	Magdalena	Remote	1.18	1
94	CINTO[a]	Magdalena	Remote	1.14	1
95	NEGUANJE[a]	Magdalena	Remote	1.14	1
96	PLAYA DEL CABO[a]	Magdalena	Remote	1.17	1
97	SAN JUAN DE GUIA[a]	Magdalena	Remote	0.98	1
98	LA PISCINA[a]	Magdalena	Remote	0.97	1
99	PLAYA ARENITA[a]	Magdalena	Remote	0.86	1
100	PARAISO[a]	Magdalena	Remote	0.93	1
101	ARRECIFES[a]	Magdalena	Remote	1.08	1
102	CAÑAVERAL[a]	Magdalena	Remote	1.03	1
103	CASTILLETES[a]	Magdalena	Remote	1.07	1
104	RIO PIEDRAS[a]	Magdalena	Remote	0.85	2
105	LOS NARANJOS[a]	Magdalena	Remote	0.81	2
106	MENDIHUACA	Magdalena	Resort	0.41	3
107	GUACHACA	Magdalena	Village	0.41	3
108	QUEBRADA VALENCIA	Magdalena	Village	0.58	3
109	BURITACA	Magdalena	Village	0.11	4
110	DON DIEGO	Magdalena	Village	0.59	3
111	PERICO	Magdalena	Village	0.59	3
112	LOS MUCHACHITOS	Magdalena	Village	0.4	3
113	MARQUETALIA	Magdalena	Village	0.56	3
114	PALOMINO	La Guajira	Rural	0.39	4
115	REPUNTON GRANDE	La Guajira	Rural	0.56	3
116	PLAYA DE LOS HOLANDESES	La Guajira	Rural	0.68	2
117	TERMOELECTRICA	La Guajira	Urban	0.07	4
118	DIBULLA	La Guajira	Urban	0.65	2
119	CAMARONES	La Guajira	Remote	0.69	2
120	RIOHACHA SUR	La Guajira	Urban	−0.85	5
121	RIOHACHA NORTE	La Guajira	Urban	−0.34	5
122	VALLE DE LOS CANGREJOS	La Guajira	Remote	0.52	3
123	MAYAPO	La Guajira	Remote	0.67	2
124	MANAURE VIEJO	La Guajira	Urban	0.19	4
125	MANAURE NUEVO	La Guajira	Urban	−0.2	5
126	CARRIZAL	La Guajira	Rural	0.62	3
127	CABO DE LA VELA SUR	La Guajira	Rural	1.06	1
128	CABO DE LA VELA NORTE*	La Guajira	Village	1.15	1
129	BAHIA HONDA	La Guajira	Rural	1.09	1
130	PUNTA GALLINAS	La Guajira	Remote	1.2	1
131	PUERTO LOPEZ	La Guajira	Remote	1.1	1
132	CASTILLETES	La Guajira	Remote	1.13	1
133	COCOPLUM	San Andres	Resort	0.77	2
134	MANZANILLO	San Andres	Rural	1.02	1
135	SAN ANDRES	San Andres	Urban	0.07	4

[a] Sites located in Natural Protected Areas.

class and whether the user is anywhere in the spectrum from resort to remote beach location, the ideal bathing area is the one with simple basic facilities (Williams, 2011).

Effective management involves knowledge of what are the preferences and priorities of one's customers. If it is possible to change matters for the better, then this should be carried out. For scenery, the main parameters for change would mainly be the human aspects, although matters such as strand line vegetation, nourishing a beach area with golden sand, etc., is not beyond the remit of any management plan. An example of this is Miami Beach, which was transformed in the 1970s via such nourishment and now brings in tourists who benefit the economy enormously, as each year some 85 million tourists to Florida contribute US$65 billion to the state's economy (Houston, 2008).

Landscape degradation is currently a big issue because, in order to benefit from tourism arrivals, many countries utilise proactive growth policies along the coastal strip (Benoit & Comeau, 2005). In the Mediterranean region, by 2000, 40% of the coastline had been lost to buildings and by 2025, 50% would be irreversibly artificial. A high density of buildings can currently be observed along several coastal areas of France, Italy and Spain, where the built up area exceeds 45% (EEA, 2006). Following the work of Benoit and Comeau (2005), some 60% of locals interviewed in Italy and Spanish studies, have commented upon not only poor planning with respect to growth but also *landscape* degradation. It is almost an axiom that when an island, such as Malta, triples its summer population, some landscape degradation is bound to occur and this will ultimately affect tourism.

Landscape degradation affects scenery immensely. Scenery is a very important component for beach tourism and drives the economy of many coastal countries as beaches are under pressure from anthropogenic development and utilisation (Ergin, Williams, & Micallef, 2006). The evaluation of coastal scenery is an important instrument for coastal preservation, protection and development, as evaluation outcomes provides a scientific basis for any envisaged management plan. Scenery can be defined as '*the appearance of an area*' (Council of Europe, 2000, p. 4) and is a part of a coastal landscape inventory available for different coastal zone disciplines. Similarly, coastal landscapes can be described as '*a littoral area, as perceived by people, whose character results from the numerous interactions of natural and/or human factors*' (Council of Europe, 2000, p. 32).

1.3. Previous landscape studies

Many techniques have been used for the assessment of landscape values. These include photographs, landscape assessment numbers, scenic uniqueness, best–worse scores from grid squares, public attitudes and perception and associations among the natural, aesthetic and cultural landscape features. Some of the many people who have developed techniques are Leopold (1969), Carlson (1977), Williams (1986), Penning-Rowsell (1982), Kaplan and Kaplan (1989), The Countryside Commission (1993) and the Countryside Council for Wales (CCW, 1996, 2001). In the UK, the first scenic assessment was performed by J.A. Steers in 1944 that set out a coastal scenery and scientific interest assessment (Steers, 1944) that led in 1974 to the founding of the England and Wales Heritage Coast movement. This management philosophy, which now covers over a third of the coastline, is based upon the concept of scenic beauty (Williams, 1992; Williams & Ergin, 2004). This assessment was down by one man's views, albeit a great geographer (Williams, Sellars, & Phillips, 2007), but the coastal landscape scenery evaluation technique given in the Methods section of this paper is much more objective and garnered from beach customers themselves, i.e. the market customer.

2. Study area

The Caribbean coastal margin of Colombia is a geologically complex region where tectonic movements have defined a physiographic framework with contrasting landscape units including extensive low-relief deltaic plains and medium to high relief mountain areas (Cediel & Cáceres, 2000; Cediel, Shaw, & Cáceres, 2003; Duque-Caro, 1990). The coastline has a 1600 km-length and extends from Cabo Tiburon at the north-eastern Panama–Colombia border to Castilletes on the western border with Venezuela (Fig. 1). This littoral zone is a relatively developed area with 3,874,858 inhabitants mainly concentrated in five large commercial and touristic cities: Cartagena, Barranquilla, Santa Marta, Riohacha and Turbo (DANE, 2010).

Quaternary interactions among tectonic, tropical climate and oceanographic processes in this region shaped a varied and unstable littoral geomorphology (Fig. 1) characterised by spits, bars and beaches along the low coastal plains and present deltas and cliffed (commonly terraced) coastlines along the coastal rock areas (Correa & Alcántara, 2005; Correa & Morton, 2010, chap. 4.11; Martínez et al., 2010). The geomorphology of several coastal areas has been deeply influenced by numerous offshore and onshore diapiric intrusions evidenced by weakened rock zones, domes and mud volcanoes, several of them active and with historical records of violent mud eruptions and explosive events often triggered by seismic events (Correa, Acosta, & Bedoya, 2007). Some of these mud volcanoes (Galerazamba, Gulf of Morrosquillo, and Arboletes) outcrop presently at or near the coastline conferring a dirty mud coloured character to coastal waters.

The supply of coarse (sand and gravel) terrigenous sediments to the Colombian Caribbean beaches comes from four large rivers (Atrato, Sinú, Magdalena and Rancheria) and numerous small distributaries, which drain the Andean region and from the erosion of granular rock shore segments, outcropping north of Cartagena. Sand from rivers and cliff erosion are the major sediment component of local beaches and availability is partially controlled by the seasonal wave regimens. At insular areas of Colombia (San Andres Islands, San Bernardo and El Rosario archipelagos) and between Cartagena and the southern tip of the Morrosquillo Gulf, abundant calcareous materials are provided to the coastline and shallow platform, by sub-aerial and marine erosion of Plio-Pleistocene to recent coral reefs terraces and living reefs.

Tides along the Caribbean coast are of the mixed semi-diurnal type, with maximum amplitudes of 60 cm (Andrade, 2008, chap. 4; IDEAM, 2004) and Trade winds (*alisios*) predominate during summer times. Waves with average heights of 1.5 and 2 m and 6–9 s associated periods approach the coast from the third and fourth quadrants (INVEMAR, 2006). Net longshore sand drift along the Caribbean coast has a dominant south-westward component, minor reversals to the northeast occurring during the rain periods when southerly winds become dominant in some sectors and set up short, high-frequency waves able to cause significant shore erosion along cliffed mud coastlines (Correa, 1990; Correa & Morton, 2010)

The seasonal precipitation shows usually two rain periods (winter seasons, e.g. April–May and October–November) and two dry periods (summer seasons, e.g. November–April and July–September). The maximum annual values of precipitation for the Caribbean littoral do not exceed 2500 mm while mean temperatures are less than 27 °C, turning it into an attractive place for tourism due to pleasant weather conditions.

Tourism currently represents in Colombia one of the most important activities with 974,721 international arrivals (mostly from the U.S.A., Canada and the European Union) and 3,411,523 domestic tourism arrivals to its coastal areas in the 2009–2011 period (PROEXPORT – Ministerio de Comercio, Industria y Turismo, 2011), the capacity for growth appearing to be almost limitless. When comparing 2009 and 2010 (Fig. 2a), an increase of 25,323 national and international arrivals is observed and the same trend is currently recorded with an increase of 14,274 arrivals

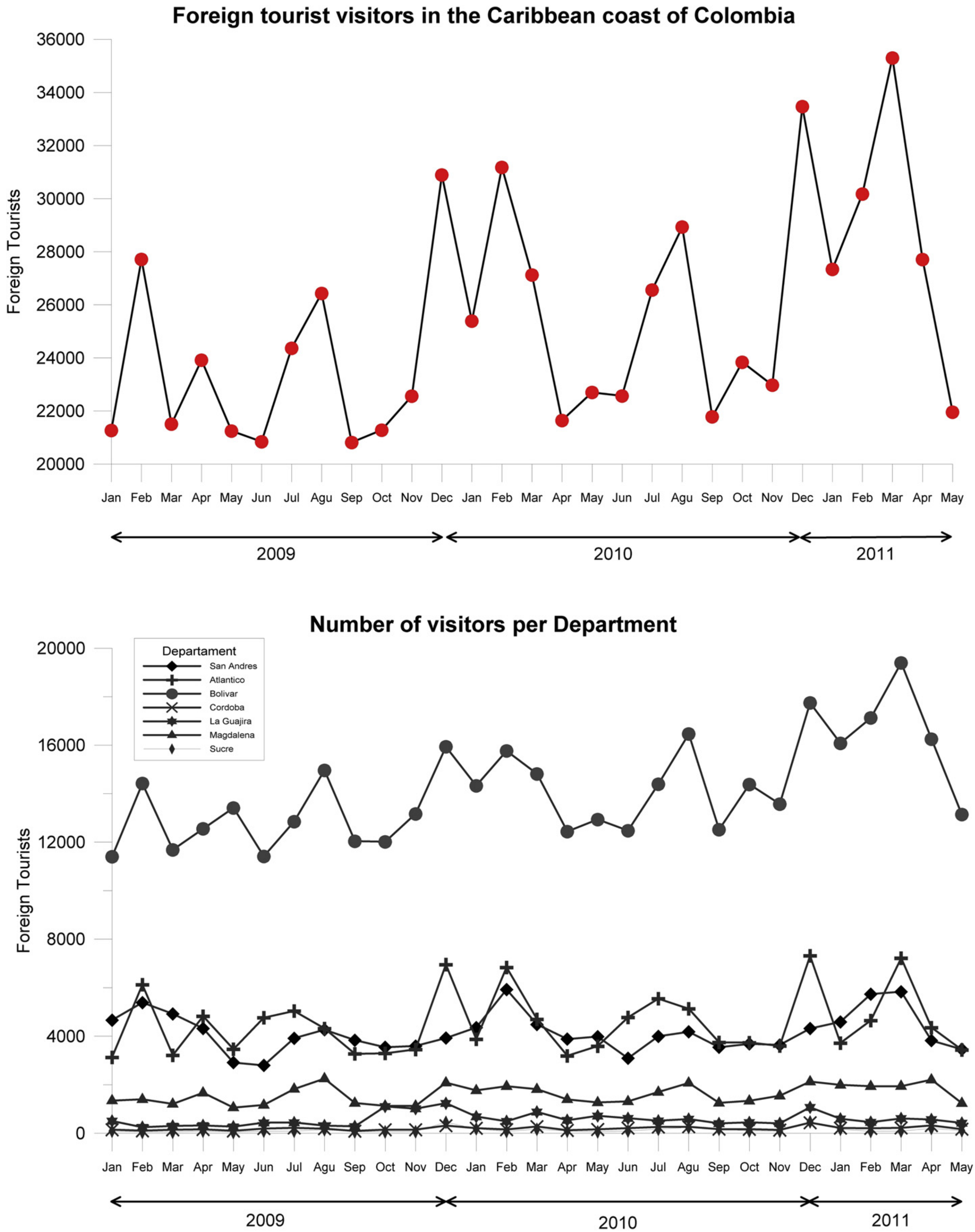

Fig. 2. Total foreign coastal tourist arrivals in the Caribbean coast Colombia (a) and data recorded at each department (b).

during the first months of 2011 (ANATO, 2011). This rapid growth of the tourist industry means an increase of US$ 250 million per year in the Colombian gross domestic product (BANREP, 2011).

Visitors' peaks are essentially linked to national tourism and are observed in December–February and July–August that represent holidays periods. Most visited departments are (Fig. 2b): Bolivar, Atlántico, San Andres and Magdalena. La Guajira, Cordoba and Sucre presented similar trends (Fig. 2b). Cartagena de Indias (Dep. of Bolívar) is the most visited destination both for cultural and beach associated tourism. As a result, the area is experiencing a great increase of 'elite' tourism developments essentially consisting of hotels and golf courses. Further developments are observed in the departments of Magdalena and La Guajira consisting of enlargement of existing coastal towns and villages with associated impacts on landscape beauty. At present huge pressure is applied by important building construction holdings on Natural Parks (especially Tayrona and Rosario) to construct hotels and bungalows devoted to local and especially foreign tourists.

3. Methods

The scenic assessors (the first three authors) visited the various beaches given in this paper and ticked off the relevant parameter boxes given in Table 2. The background to the Table is the key to this assessment, so is given in detail below.

Table 2 was produced, because of a three year research project (British Council Report, 2003), which was subsequently rewritten and published by Ergin et al. (2004). Many sampling strategies and books exist, e.g. the seminal books of Malhotra and Birks (1999), Gregoire and Valentine (2008) and Kidder and Judd (1986). The latter identified the need to consider many issues in questionnaire design resulting in a ten-step process that determines interview guidelines. However, for the current research, more than 1000 bathing area users chosen by random number tables in Turkey, Malta, Croatia, Portugal and the UK, were interviewed, as to what were in their opinion, the main parameters essential for coastal scenery appreciation (in essence, formulation of the best/ugliest coastal scenery). These were either written down, or taped and written up later. Assessment results enabled comments regarding the number of times a parameter was mentioned, to be summed and replies condensed down to 26 'coastal scenic assessment parameters', determined from the break point of the resulting parameter summation curve and these given on the *y* axis in Table 2.

Further beach surveys were then undertaken in the same countries ($n \geq 500$) to *rank* these 26 parameters, thereby enabling a weighting parameter to be introduced (Table 3). The third step after obtaining the 26 *y* axis values of Table 2 was to attribute values (from low to high rating, as, 1, 2, 3, 4 and 5) along the *x* axis. This was carried out by the authors of Ergin et al. (2004) after detailed discussion with other coastal experts. Lastly, a fuzzy logic methodology (FLA) – a novel scientific approach where uncertainties in assessment are covered for all possible distributions (Zadeh, 1965) – was introduced to eliminate the possibility of the scenic value assessor (who ticks one box for each parameter), ticking the wrong attribute box due to uncertainty in the values shown. For example, cliff height can be: absent, between 0 and 30 m, 30–60 m, 60–90 m or >90 m and this mathematical technique overcomes the problem of the wrong attribute being selected and placed in the checklist box, i.e. a cliff height being recorded in the 30–60 m box when in fact it was >90 m. It is extremely unlikely that a jump of two attributes would be checked. These aspects are all given *in detail* in Ergin et al. (2004). The checklist was successfully field tested in the countries mentioned above, as well as, New Zealand, Australia, Japan, USA, the South Pacific and Pakistan (Ergin et al., 2006; Langley, 2006; Ullah, Johnson, Micallef, & Williams, 2010).

Final assessment matrices developed for all sites, are graphically presented as histograms, weighted average of attributes and membership degree of attributes. Histogram figures (Fig. 3) provide examples for sites at Macuaca, Playa Blanca and Santa Marta. These histograms provide a visual summary of both physical and human parameters obtained from Table 2 and are useful for immediate assessment of high and low rated attributes. Membership degree vs. attribute curve present overall scenic assessment over the attributes (Fig. 4) and weighted averages of attributes delineated relative comparison of physical and human parameters (Fig. 5).

The algorithm involving both weighting and fuzzy logic values and incorporating all of the above enabled a Scenic Evaluation Decision Value "D" to be obtained. Any site scenic value was categorised into five distinct classes, the limits among different classes coinciding with clearly identifiable cut-off points. The *D* value indicating the 'beauty' of any particular site (Table 1) is given from the following equation:

$$D = (-2 \cdot A_{12}) + (-1 \cdot A_{23}) + (1 \cdot A_{34}) + (2 \cdot A_{45})$$

Total area under curve.Where: A_{12} = total area under the curve between attributes 1 and 2. Similarly, areas under the curve may be calculated for $A_{23,}$ $A_{34,}$ and A_{45}.

Class 1. Extremely attractive natural sites with very high landscape values and an *Evaluation Index* >0.85.
Class 2: Attractive natural sites with high landscape value and an *Evaluation Index,* between 0.65 and 085.
Class 3: Mainly natural sites with little outstanding landscape features and an *Evaluation Index,* between 0.4 and 0.64.
Class 4: Mainly unattractive urban sites, with low landscape values and an *Evaluation Index* between zero and 0.39.
Class 5: Very unattractive urban sites, with intensive development, a low landscape value and an *Evaluation Index* below zero.

This coastal scenic classification can help improve human usage by locals and visitors to enjoy and can be utilised by coastal managers, planners, academics, and governmental agencies, in management of different coastal locations.

4. Results

In scenic assessment studies, parameter grading tends to be obtained from qualitative, subjective observations, which depend on factors such as the national/cultural background, age, gender, education and training. A classic study by Eletheriadis, Tsalikidis, and Manos (1990) indicated that European nationality groups agreed to the least preferred landscape types, but cultural traits could give differences. However, in research for this paper, the parameters shown in Table 1 came out virtually in all surveys and *no* differences were found, as a result of: age, sex, education, nationality, or local *vs.* tourist.

In the present study, scenic evaluation scores for 135 investigated sites were produced according to the described methodology, i.e. histograms grouped into physical and human parameters (Fig. 3), membership degree curves (Fig. 4), and weighted average of attributes (Fig. 5) and a *D* value calculated (Table 1). For example, Macuaca, a natural beach within the National Park of Tayrona (Dep. of Magdalena), showed high scores in both natural and human parameters. Playa Blanca (Dep. of Bolivar) recorded intermediate and low values for natural and human characters respectively, and the beach areas at Santa Marta (Dep. of Magdalena) presented low scores at both human and natural parameters (Fig. 3).

The Membership degree curve produces an overall scenic assessment over attributes. Interpretation of these curves (Fig. 4) is based on the skew; a curve skewed to the right–hand side reflects

Table 2
Coastal scenic evaluation system. Physical and human parameters.

No:			Rating 1	2	3	4	5
	Physical	**parameters**					
1		Height (m)	Absent	5–30 m	31–60 m	61–90 m	>90 m
2	CLIFF	Slope (°)	Absent	>45°	circa 60°	circa 75°	circa vertical
3		Special features[a]	Absent	1	2	3	Many (>3)
4		Type	Absent	Mud	Cobble/Boulder	Pebble/Gravel	Sand
5	BEACH FACE	Width (m)	Absent	≤5 > 100	>5 ≤ 25	>25 ≤ 50	>50 ≤ 100
6		Colour	Absent	Dark	Dark tan	Light tan/bleached	White/gold
7		Slope (°)	Absent	<5°	5°–10°	10°–20°	20°–45°
8	ROCKY SHORE	Extent (m)	Absent	< 5 m	5–10 m	10–20 m	>20 m
9		Roughness	Absent	Distinctly jagged	Deeply pitted and/or irregular	Shallow pitted	Smooth
10	DUNES		Absent	Remnants	Fore-dune	Secondary ridge	Several
11	VALLEY		Absent	Dry valley	(<1 m) Stream	(1–4 m) Stream	River/limestone gorge
12	SKYLINE LANDFORM		Not visible	Flat	Undulating	Highly undulating	Mountainous
13	TIDES		Macro (>4 m)		Meso (2–4 m)		Micro (<2 m)
14	COASTAL LANDSCAPE FEATURES[b]		None	1	2	3	>3
15	VISTAS		Open on one side	Open on two sides		Open on three sides	Open on four sides
16	WATER COLOUR & CLARITY		Muddy brown/ grey	Milky blue/green / opaque	Green/grey/ blue	Clear blue//dark blue	Very clear turquoise
17	NATURAL VEGETATION COVER		Bare (<10% vegetation only)	Scrub/garigue (marran/gorse, bramble, etc.)	Wetlands/meadow	Coppices, maquis (±mature trees)	Varity of mature trees/ mature natural cover
18	VEGETATION DEBRIS		Continuous (>50 cm high)	Full strand line	Single accumulation	Few scattered items	None
	Human	**parameters**					
19	NOISE DISTURBANCE		Intolerable	Tolerable		Little	None
20	LITTER		Continuous accumulations	Full strand line	Single accumulation	Few scattered items	Virtually absent
21	SEWAGE DISCHARGE EVIDENCE		Sewage evidence		Same evidence (1–3 items)		No evidence of sewage
22	NON_BUILT ENVIRONMENT		None		Hedgerow/terracing/ monoculture		Field mixed \cultivation ± trees/natural
23	BUILT ENVIRONMENT[c]		Heavy Industry	Heavy tourism and/or urban	Light tourism and/or urban and/or sensitive	Sensitive tourism and/or urban	Historic and/or none
24	ACCESS TYPE		No buffer zone/ heavy traffic	No buffer zone/light traffic		Parking lot visible from coastal area	Parking lot not visible from coastal area
25	SKYLINE		Very unattractive		Sensitively designed high/low	Very sensitively designed	Natural/historic features
26	UTILITIES[d]		>3	3	2	1	None

[a] Cliff Special Features: indentation, banding, folding, screes, irregular profile.
[b] Coastal Landscape Features: Peninsulas, rock ridges, irregular headlands, arches, windows, caves, waterfalls, deltas, lagoons, islands, stacks, estuaries, reefs, fauna, embayment, tombola, etc.
[c] Built Environment: Caravans will come under Tourism, Grading 2: Large intensive caravan site, Grading 3: Light, but still intensive caravan sites, Grading 4: Sensitively designed caravan sites.
[d] Utilities: Power lines, pipelines, street lamps, groins, seawalls, revetments.

a high quality assessment because of low ratings on attributes 1 and 2 (e.g. Macuaca beach). A left-hand skewed curve reflects a low quality assessment value because of the adverse impact of the physical or human parameter, with high ratings on attributes 1 and 2 (e.g. Santa Marta beach).

A weighted averages histogram of physical and human usage parameters allowed relative comparison of the different parameters. The assignment of a high weighted average to attributes, such as 4 or 5, reproduces a high scenic (high rating) value, this being the case for Macuaca beach (Fig. 5). In opposition, a high weighted average value on attributes, such as 1 or 2, signifies a low scenic (low rating) value, indicating the unfavourable impact of the physical and/or human usage parameters (generally the human ones), this being the case for urban beaches as Santa Marta (Fig. 5).

The 135 investigated sites belong to five classes, from Class 1, which includes sites of great scenic value, to Class 5, which includes sites of poor scenic value.

Class 1. Extremely attractive natural sites with a very high landscape value ($D > 0.85$). In this study, a total amount of 25 beaches achieved this category, 18 being in remote areas, 5 in rural areas and two are villages (Williams, 2011, Table 1). Most beaches within this class are well-known for their natural beauty and obtained high scores in both physical and human-utilisation subsets. Most sites are located in natural protected areas, e.g. Macuaca in the National Park of Tayrona, or in areas that are in the process of soon being declared protected (Fig. 6). Well known beaches around the world, such as, Long Reef (Australia), Ihla de Santa Catarina (Brazil), Doñana (Spain) and Sumner (New Zealand) belong to this category (Ergin et al., 2006; Williams, Micallef, Anfuso, & Gallego-Fernandez, 2012).

Class 2. Coastal area with D value between 0.65 and 0.85 (Fig. 6); corresponds with natural or semi-natural/urban sites with high landscape values, mainly natural sites with a low intrusion of human presence (acceptable anthropogenic activities/structures). Along the investigated littoral, 22 beaches were classified within this category (i.e. Sapzurro, Los Naranjos, Salamanca, Mayapo, Cocoplum, etc., Table 1). They are located in rural (10), village (5), urban (2), resort (1) and remote (4) areas, and most are located in

Table 3
Assessment matrix for Turbo (Department of Antioquia).

Turbo beach																		
Assessment matrices																		
No;	Assessment parameters	Graded attributes	Weights of parameters	Input matrices d_i					Fuzzy assessment matrices									
									G matrices	Grade matrices G_i					R matrices	Fuzzy weighted assessment Matrix R_m				
										Attributes (1–5)						Attributes (1–5)				
										1	2	3	4	5		1	2	3	4	5
	Physical																			
1	Cliff height (1-1)	1	0.02	1	0	0	0	0	G_P	**1.00**	0.00	0.00	0.00	0.00	$\boldsymbol{R}_P$	**0.019**	0.000	0.000	0.000	0.000
2	Cliff slope (1-2)	1	0.02	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.017**	0.000	0.000	0.000	0.000
3	Special Features (1–3)	1	0.03	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.028**	0.000	0.000	0.000	0.000
4	Beach type (2-1)	5	0.03	0	0	0	0	1		0.00	0.00	0.00	0.00	**1.00**		0.000	0.000	0.000	0.000	**0.034**
5	Beach width (2-2)	3	0.03	0	0	1	0	0		0.00	**0.20**	**1.00**	**0.20**	0.00		0.000	**0006**	**0.029**	**0006**	0.000
6	Beach colour (2-3)	3	0.02	0	0	1	0	0		0.00	0.00	**1.00**	**0.60**	0.00		0.000	0.000	**0.024**	**0014**	0.000
7	Shore slope (3-1)	1	0.01	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.014**	0.000	0.000	0.000	0.000
8	Shore extent (3-2)	1	0.01	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.015**	0.000	0.000	0.000	0.000
9	Shore roughness (3-3)	1	0.02	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.022**	0.000	0.000	0.000	0.000
10	Dunes (4)	1	0.04	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.039**	0.000	0.000	0.000	0.000
11	Valley (5)	1	0.08	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.079**	0.000	0.000	0.000	0.000
12	Landform (6)	1	0.08	1	0	0	0	0		**1.00**	**0.20**	0.00	0.00	0.00		**0.085**	**0017**	0.000	0.000	0.000
13	Tides (7)	5	0.04	0	0	0	0	1		0.00	0.00	0.00	0.00	**1.00**		0.000	0.000	0.000	0.000	**0.036**
14	Landscape features (8)	2	0.12	0	1	0	0	0		0.00	**1.00**	**0.20**	0.00	0.00		0.000	**0121**	**0.024**	0.000	0.000
15	Vistas (9)	4	0.09	0	0	0	1	0		0.00	0.00	0.00	**1.00**	**0.30**		0.000	0.000	0.000	**0095**	**0.029**
16	Water colour (10)	2	0.14	0	1	0	0	0		**0.20**	**1.00**	**0.20**	0.00	0.00		**0.028**	**0140**	**0.028**	0.000	0.000
17	Vegetation cover (11)	1	0.12	1	0	0	0	0		**1.00**	**0.20**	0.00	0.00	0.00		**0.117**	**0023**	0.000	0.000	0.000
18	Seaweed (12)	2	0.09	0	1	0	0	0		**0.20**	**1.00**	0.00	0.00	0.00		**0.017**	**0086**	0.000	0.000	0.000
FUZZY WEIGHTED AVERAGES MATRIX FOR SUBSET PHYSICAL V_P																**0.481**	**0393**	**0.105**	**0115**	**0.098**
	Human																			
19	Disturbance factor (1)	2	0.14	0	1	0	0	0	G_H	**0.20**	**1.00**	0.00	**0.20**	0.00	$\boldsymbol{R}_H$	**0.027**	**0137**	0.000	**0027**	0.000
20	Litter (2)	2	0.15	0	1	0	0	0		**0.20**	**1.00**	**0.20**	0.00	0.00		**0.030**	**0149**	**0.030**	0.000	0.000
21	Sewage (3)	2	0.15	0	1	0	0	0		0.00	0.00	0.00	0.00	0.00		0.000	0.000	0.000	0.000	0.000
22	Non-built environment (4)	1	0.06	1	0	0	0	0		**1.00**	0.00	**0.20**	0.00	0.00		**0.064**	0.000	**0.013**	0.000	0.000
23	Built environment (5)	2	0.14	0	1	0	0	0		0.00	**1.00**	**0.20**	0.00	0.00		0.000	**0137**	**0.027**	0.000	0.000
24	Access type (6)	2	0.09	0	1	0	0	0		**0.20**	**1.00**	0.00	**0.20**	0.00		**0.018**	**0091**	0.000	**0018**	0.000
25	Skyline (7)	1	0.14	1	0	0	0	0		**1.00**	**0.40**	0.00	0.00	0.00		**0.137**	**0055**	0.000	0.000	0.000
26	Utilities (8)	1	0.14	1	0	0	0	0		**1.00**	0.00	0.00	0.00	0.00		**0.137**	0.000	0.000	0.000	0.000
FUZZY WEIGHTED AVERAGES MATRIX FOR SUBSET HUMAN V_H																**0.412**	**0569**	**0.070**	**0046**	0.000
Fuzzy weighted averages matrix																				
Elements of fuzzy weighted averages matrix										**Weights of subsets W_F**						**Attributes (1–5)**				
																1	**2**	**3**	**4**	**5**
Fuzzy weighted averages matrix of subset physical V_P										1/2					**Matrix *K***	**0.481**	**0393**	**0.105**	**0115**	**0.098**
Fuzzy weighted averages matrix of subset human V_H										1/2						**0.412**	**0569**	**0.070**	**0046**	**0.000**
Final fuzzy assessment matrix ($W_F \times K$)																				
Final assessment matrix (C)																**0.447**	**0481**	**0.087**	**0080**	**0.049**
$\boldsymbol{D = -1.11}$																				

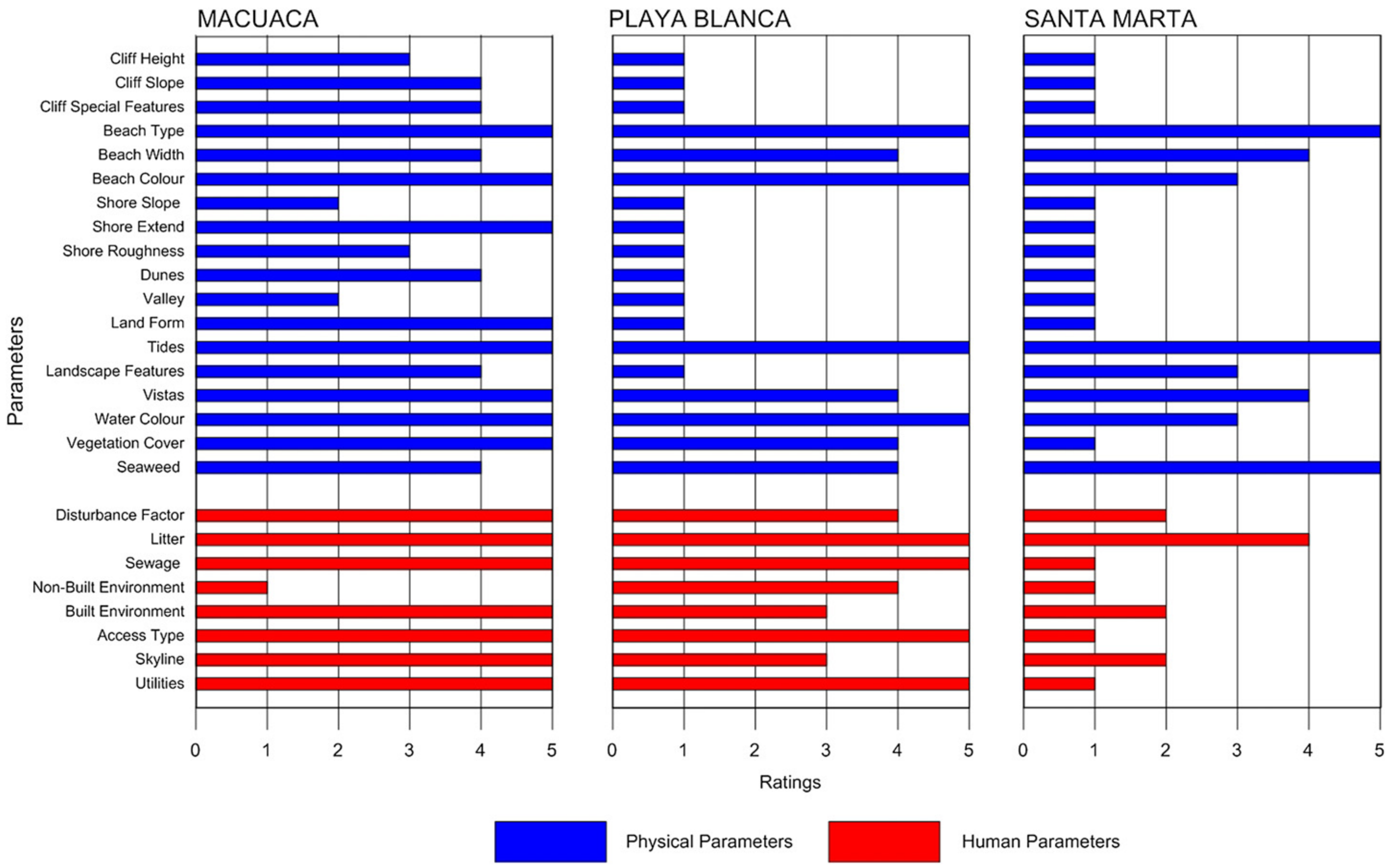

Fig. 3. Scenic evaluation rating histograms for Macuaca (Class 1), playa Blanca (Class 3), Santa Marta (Class 5).

the edge of protected areas (e.g. Rio Piedras). The Giants Causeway (Ireland) and Tojo Beach (Japan) belong to this category (Ergin et al., 2006).

Class 3. Includes 25 sites (12 villages, 9 rural, 3 resorts and 1 remote) with a *D* value between 0.4 and 0.64, which presented an attractive scenario, flawed by features such as non attractive buildings, no buffer zones, and presence of streams bringing pollution and litter to the beaches (Fig. 6). Magellan Foreland Tip (Ireland) and Austenmeer Beach (Australia) belong to this category (Ergin et al., 2006).

Class 4. This includes a large number of surveyed sites (31) with a *D* value between 0 and 0.39 (Table 1). It includes mainly village (11), urban (9), resort (6) and rural (5) sites with poor landscape values significantly damaged due to undesirable anthropogenic activities. Some examples are Necocli (Dep. of Antioquia), Punta Bolivar and Puerto Escondido (Dep. of Cordoba), El Frances (Dep. of Sucre), Bocacanoas, Las Americas and Galerazamba (Dep. of Bolivar), Playa Velero (Dep. of Atlantico), Villa Tanga and Gaira (Dep. of Magdalena) and Manaure (Dep. of La Guajira). Magellan Foreland and Burren Area in Ireland and Bondi Beach in Australia belong to this category (Ergin et al., 2006).

Class 5. Includes 32 sites, usually very unattractive urban beaches with intensive development and landscape values lower than zero (Fig. 6; Table 1). Inside this class 20 sites correspond with urban beaches (i.e. Cartagena de Indias, Santa Marta, Rodadero), 7 villages (i.e. La Boquilla, Santa Veronica, etc.), 3 resorts (i.e. Arboletes, Playa Blanca – Decameron, etc.) and 2 rural beaches (Manzanillo and Volcán de Lodo). Ergin et al. (2006) classified St George's Bay (Malta), Amroth (United Kingdom) and Manley (Australia) within this category.

5. Discussion

5.1. Site distribution

Thirty five percent of the investigated coastal areas were included in the first two classes (Class 1 and 2), 18% belonged to Class 3 and 47% of the sites fall onto lower classes (Class 4 and 5). Classification of analysed sites very much depends on the geological setting and the degree of human occupation as underlined by Williams et al. (2012) in similar studies carried out in Andalusia (Spain). In this sense, despite the non-homogeneous distribution of investigated sites, the following general trends can be highlighted.

Almost all sites belonging to Class 1 are located in natural protected areas. This fact increases their score for the human parameters because of the null or small degree of human occupation and total absence of human structures, sewage evidence and litter. From an administrative point of view, Class 1 sites are principally observed in the departments of La Guajira (Puerto Lopez, Cabo de la Vela, etc.) and Magdalena (i.e. Macuaca, Chengue, Siete Olas, Cinto, etc., Figs. 6 and 7), which are located in mountainous areas. The geological and relief setting favour formation of several features, such as coastal rock sectors, valleys and mountainous skyline landforms that increase the scenic value (Table 2). Specifically, rock sectors, essentially composed by igneous and metamorphic rocks, often enclose pocket beaches of spectacular beauty (e.g. Cinto), give rise to extended rock shore platforms (e.g. Macuaca) and present cliffs forming special features which further increase scenic values (point 14 in Table 2, e.g. Cabo de la Vela, Punta Gallinas). All sites within this category show sand beaches and (at very limited places) dune fields (e.g. Puerto Lopez). Clear water is often observed and

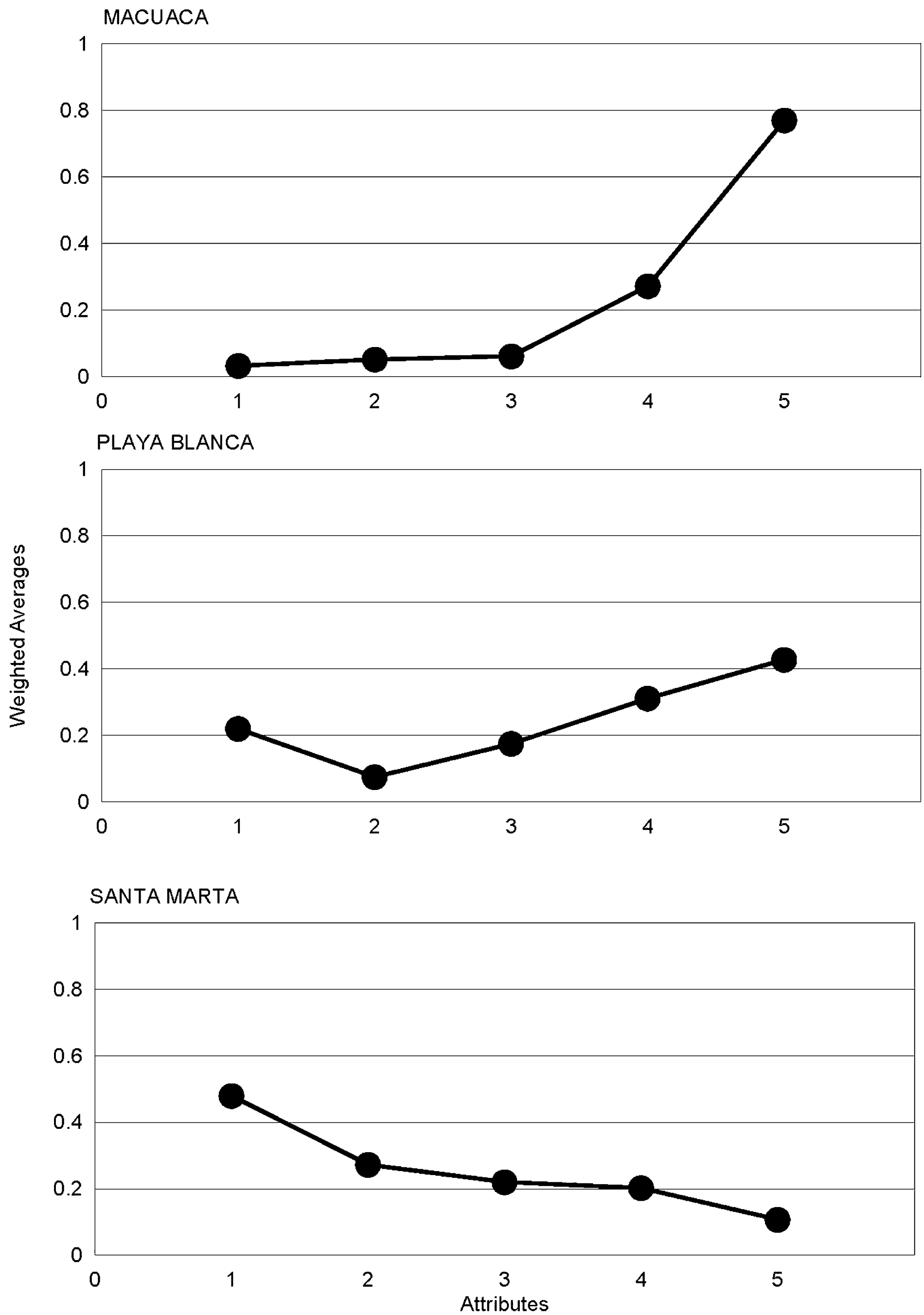

Fig. 4. Membership degree curve for Macuaca (Class 1), playa Blanca (Class 3), Santa Marta (Class 5).

related to the absence of suspended sediments because both the investigated sites are some distance from important rivers mouths and river/stream characteristics. This is especially so in La Guajira, where they drain rock areas, consequently relatively small amounts of fine sediments are supplied to the littoral (when compared with other larger rivers in the central and southern part of the Caribbean littoral). An additional increase in the classification of Magdalena sites is linked to the presence of prosperous vegetation (point 17 in Table 2) related to major precipitation due to the local relief, i.e. the presence of the Sierra Nevada de Santa Marta Mountains.

Nearly half of Class 2 sites (10 out of 22) are located in Magdalena and La Guajira departments and rated lower than Class 1 because of the absence of special landscape features and an increase of human occupation. At San Andres Island, Cocoplum beach rating included spectacular water and beach colour and some landscape features. However, negative aspects of this site included the presence of litter, defence structures and tourist developments not in harmony with the natural environment.

Sites belonging to Classes 3, 4 and 5 are observed along all investigated departments and their low classification corresponds to a progressive decrease in both natural and (especially) human attributes. The increase of human pressure and occupation in sites with intermediate scores corresponding to natural parameters usually gives rise to Class 3 sites, Playa Blanca and Isla Palma (Dep. of Bolívar) being good examples. Both beaches are gorgeous areas with excellent water and beach colour, but have a very insensitive

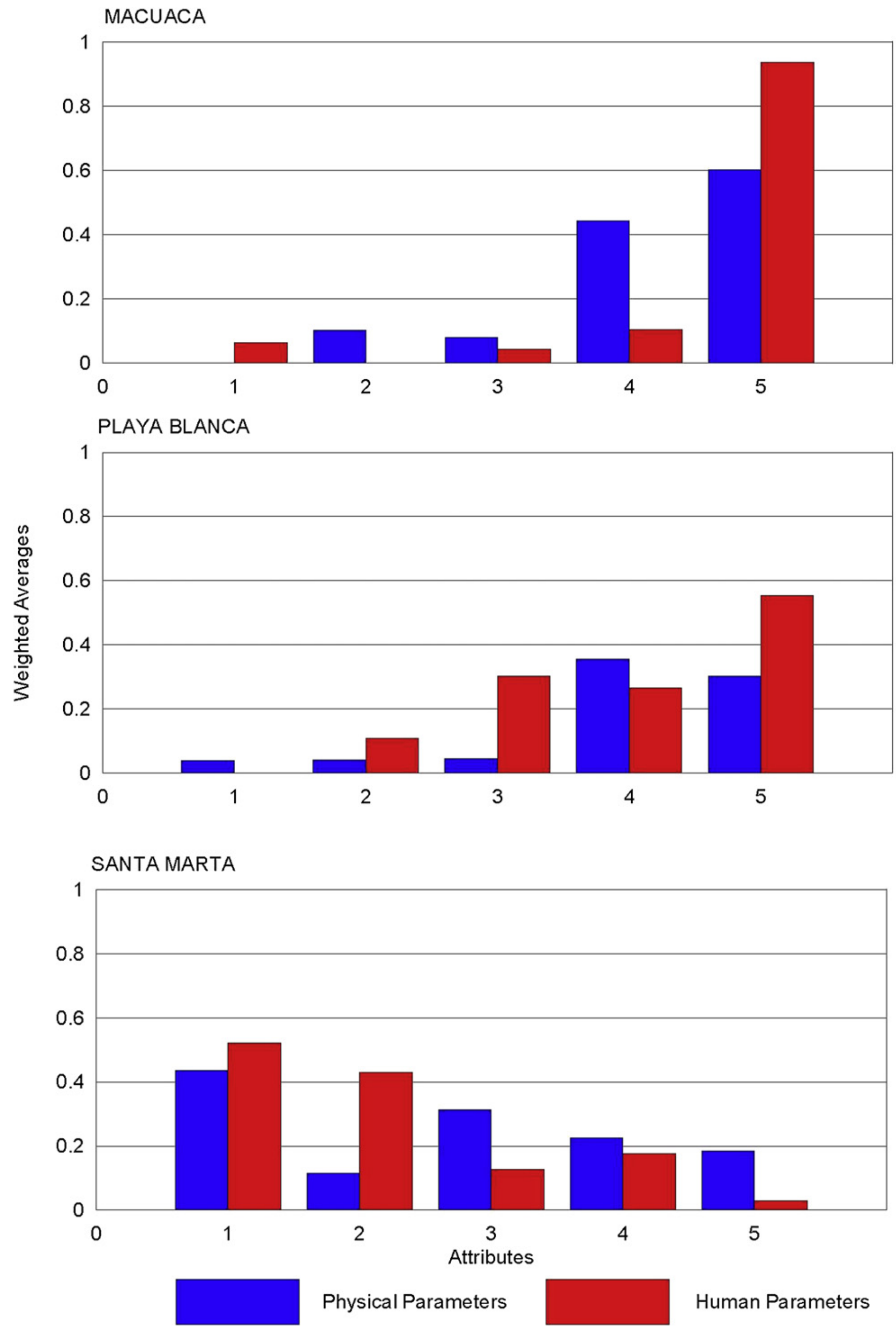

Fig. 5. Scenic histogram of weighted averages for Macuaca (Class 1), playa Blanca (Class 3), Santa Marta (Class 5).

urban development. Other examples such as Moñitos, Canalete (Dep. of Cordoba) and Buritaca (Dep. of Magdalena) are located near small villages and show small streams running into the beach, which brings debris and litter, impoverishing the scenic quality (Figs. 8 and 9).

Classes 4 and 5 generally present low scores at all human parameters with associated problems such as high litter amount, sewage, noise disturbance, absence of buffer zones, poor skyline quality and utilities (Table 2). In the central and southern sectors of the Caribbean littoral, several natural parameters are conditioned by the relatively flat landscape (points 11 and 12 of Table 2) and the absolute absence of elements such as cliffs and rocky shore platforms (points 1–3, 6–9, Table 2). At places, negative scores are also observed for sediment beach colour, water colour and quality and presence of vegetation debris (Table 2), because of rivers that discharge massive quantities of fine, dark sediments – that remain in suspension decreasing water quality, and great amounts of vegetation debris (e.g. Rio Turbo – Class 4, Arboletes – Class 5). At many places, rivers and streams negatively influence human parameters because they bring litter and sewage evidence.

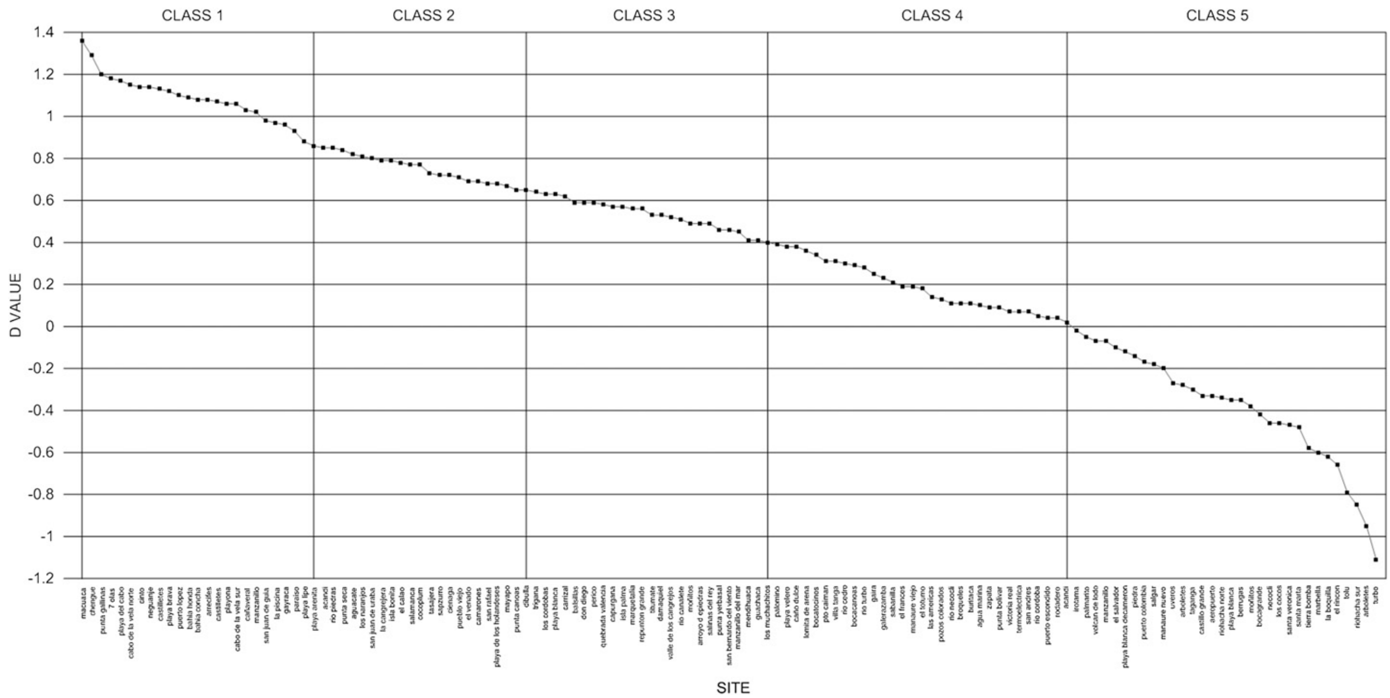

Fig. 6. Evaluation index curve for the Caribbean coast of Colombia.

The lowest rated values were observed in erosional coastal sectors. A great proportion of the investigated area show strong, erosional historical trends related to natural and human factors, including the incidence of storm waves; numerous mass movements (rock falls, mud flows, etc.). The latter are common along the cliffed mud sequences of the southern Caribbean (Gulf of Morrosquillo – Urabá Gulf); intensive sand/gravel mining in the past seven decades, and the building up of more than 500 groins and hard engineering structures have interrupted natural sand drift along most part of the Caribbean coastline to the south of Santa Marta.

Erosion processes reduce beach width (point 5, Table 2) and induce emplacement of different structures (point 26, Table 2). Examples of this are Santa Marta, Cartagena de Indias, Tolú and Turbo (Class 5, Fig. 9), where high erosion rates (sometimes greater than 1.5 m yr^{-1}) were counteracted in past decades by the progressive and disorganised emplacement of numerous groins

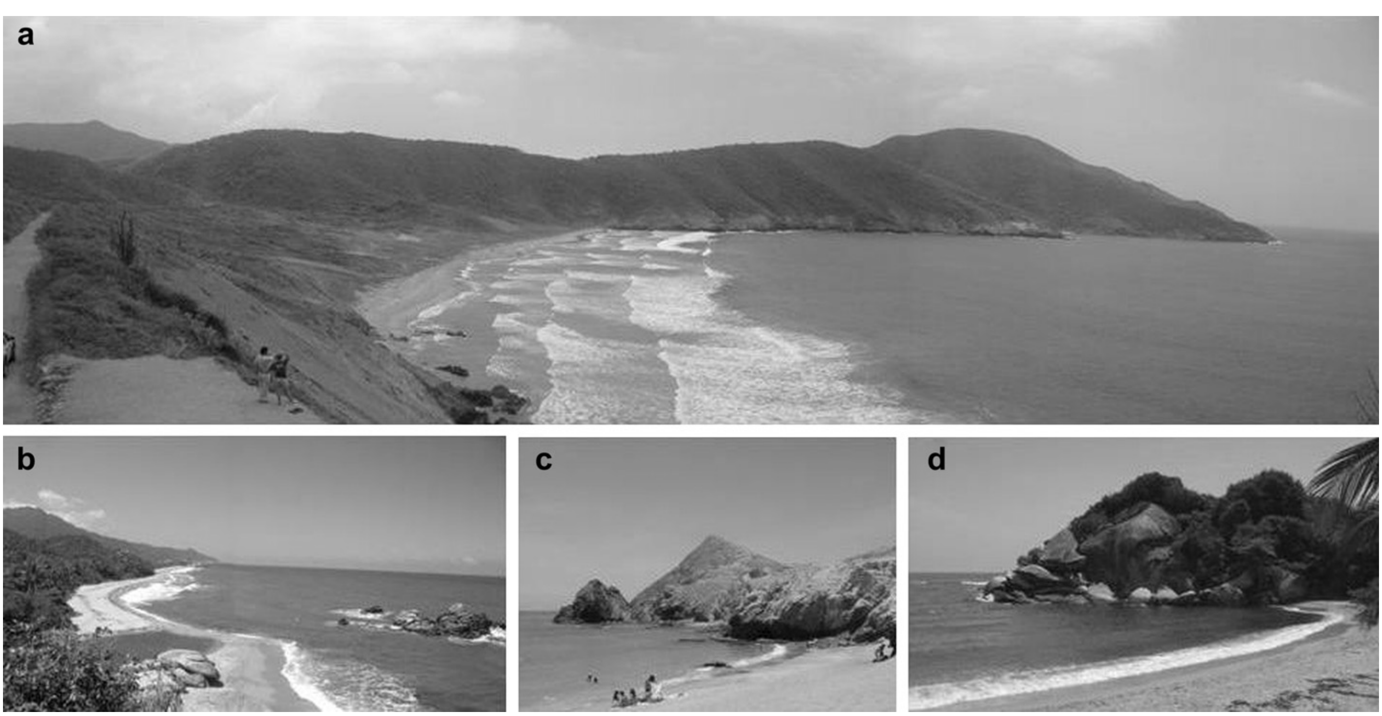

Fig. 7. Examples of Class 1 beaches. a) 7 Olas (Magdalena), b) Arrecifes (Magdalena), c) Cabo de la Vela (Guajira), d) San Juan de Guia (Magdalena).

Fig. 8. Examples of Class 3 beaches. a) Playa Blanca (Bolivar), b) Damaquiel (Antioquia), c) Don Diego (Magdalena).

and, secondarily, seawalls and rip–rap revetments (Rangel, 2009; Rangel, Stancheva, & Anfuso, 2011; Stancheva et al., 2011).

Finally, concerning beach sand and water colour, it is very interesting to highlight how the commonly idealised perception of the Caribbean littoral as a paradise coast showing white sand beaches and crystal clear turquoise waters was dismantled in this study. Very few sites located at San Andres and Providencia islands and specific areas of the Tayrona Park and Playa Blanca (off Cartagena de Indias) presented white sand and associated clear turquoise water (points 5 and 16 respectively, Table 2). Calcareous sands observed at the aforementioned sites are linked to the sediment supply from nearby coral reefs and algae communities. All other investigated locations showed terrigenous sediments dark tan to light tan/bleached in colour (Table 2). High sediment yields of big rivers and rapid (up to 4 m/year, Correa & Morton, 2011) cliff retreat along muddy shores of the southern Caribbean of Colombia are responsible for the dirty-brown colours of superficial waters over extended areas of the shallow platform, lowering indexes for scenery and landscapes quality evaluations.

5.2. Recommendations for coastal scenery improvement

In Colombia, coastal occupation commenced during the Spanish colonisation, i.e. in the 16th Century, with construction of human settlements and small coastal villages intended to be centres for commercial activities, especially maritime transport. Concerning recent developments along the Colombian Caribbean coast, most of the adopted practices and models regarding coastal tourism and occupation have been inherited from Europe. In this sense, over the past decades, the Caribbean coast of Colombia progressively recorded a great increase of human occupation mostly due to recreational and tourist purposes. Construction and emplacement of promenades, summer houses, hotels, restaurants, groins, jetties, seawalls, etc. decreased the landscape value and affected coastal ecological significance and biodiversity.

Evaluation of environmental physical and usage parameters makes possible identification and characterisation of those variables that must be managed in a better way in order to promote overall improvements of the scenic value. With respect to coastal management issues, high rated human usage parameters at low attribute values may be interpreted, for example, as there being too much litter present or evidences of sewage. Most sites have physical parameters for which coastal zone managers can do little or nothing to alleviate scenic impact, so emphasis should be given to assessing ways of improvement of upgrading the different human usage parameters.

Presented results highlight the need for effective planning and management of the Caribbean coast of Colombia. Most of the investigated littoral presented low scores because of anthropogenic settlements and developments degrading the physical parameters. This is the case of Playa Blanca (Class 3, *D*: 0.63, Fig. 8), the only beach located within a Natural Protected area that does not belong to Class 1. Improvement of the poor arrangement and design of cottages and bungalows observed at this site would upgrade the beach to Class 2.

Fig. 9. Examples of Class 5 beaches. a) Taganga (Magdalena), b) Bocagrande (Cartagena), c) Arboletes (Antioquia), d) Los Cocos (Magdalena).

A similar situation is observed at Santa Marta, Taganga and Cartagena de Indias, which showed high scores in physical parameters but unfortunately, human development had a negative impacted (Fig. 9a and d). As an example, at Santa Marta and Cartagena de Indias, marinas and harbours devoted to recreational, commercial and industrial activities, have been developed in recent years close to very attractive beaches, thereby impoverishing the scenic quality of the sites and creating a conflict between beach tourism (the 3 "S" market) and other kind of activities.

The low score at Irotama beach (Class 5, $D = -0.02$) is due to the presence of a port devoted to coal shipping and litter and sewage evidence. If the presence of these two latter items is reduced, the beach improves to Class 4. Specifically, in recreation beaches (e.g. urban and resort areas), it is usually imperative to clean the beach, even if this measure can be quite expensive, especially in the Caribbean area where people go to the beach all the year and not only during a short bathing season as in Europe. Perhaps, cleaning operations could be carried out with a daily periodicity only during more tourist periods and with a larger periodicity during the rest of the year. Moreover, in order to adapt a more durable solution, a key issue is to attribute litter and sewage evidences to a source and respond appropriately such as the regulation and control of waste water outflows onto the beach.

As previously observed, the lowest rated sites presented a much degraded environment because erosion processes have been counteracted by construction of a great number of groins that produced poor results and erosion in downdrift areas. Emblematic is the case of Palomino beach (Class 3, D: 0.39) where groins constructed of tractor tyres were illegally emplaced by land owners. Simply by removing these structures the beach moves up to Class 2. At many other places, existing protection structures, often oversized, could be lowered or totally removed and nourishment projects carried out with white/gold sand, this way favouring reduction of downdrift erosion problems and an improvement of the scenery classification of sites, because an increase of beach width and colour and elimination of structures (points 5 and 26, Table 2). Hence, with respect to future development, in order to increase values of physical versus human parameters, beach nourishment and dune restoration works could be preferred versus construction of hard protective structures. Breton, Clapes, Marqués, and Priestley (1996) have commented on the negative public perception of coarse sediment beaches in Catalonia, Spain, indicating that beach users prefer flat beaches and smaller waves that give safe bathing conditions, especially for children. In this sense, in the design of recreation beaches, special attention has to be given to social preferences and priorities and local environmental characteristics. Lastly, the emplacement of well vegetated dune ridges would constitute a buffer between the beach and the built environment, producing a diminution of noise disturbance, visual impact of buildings, etc., e.g. the increment of scores at points 10, 19, 22, 24, 25 and 26 in Table 2.

5.3. Classification used

When analysing the application of the coastal scenery evaluation to the investigated littoral, several points must be highlighted since the classification used was originally based on enquiries carried out in Europe (Williams & Micallef, 2009). In particular, a few specific aspects of the used classification are strictly – directly

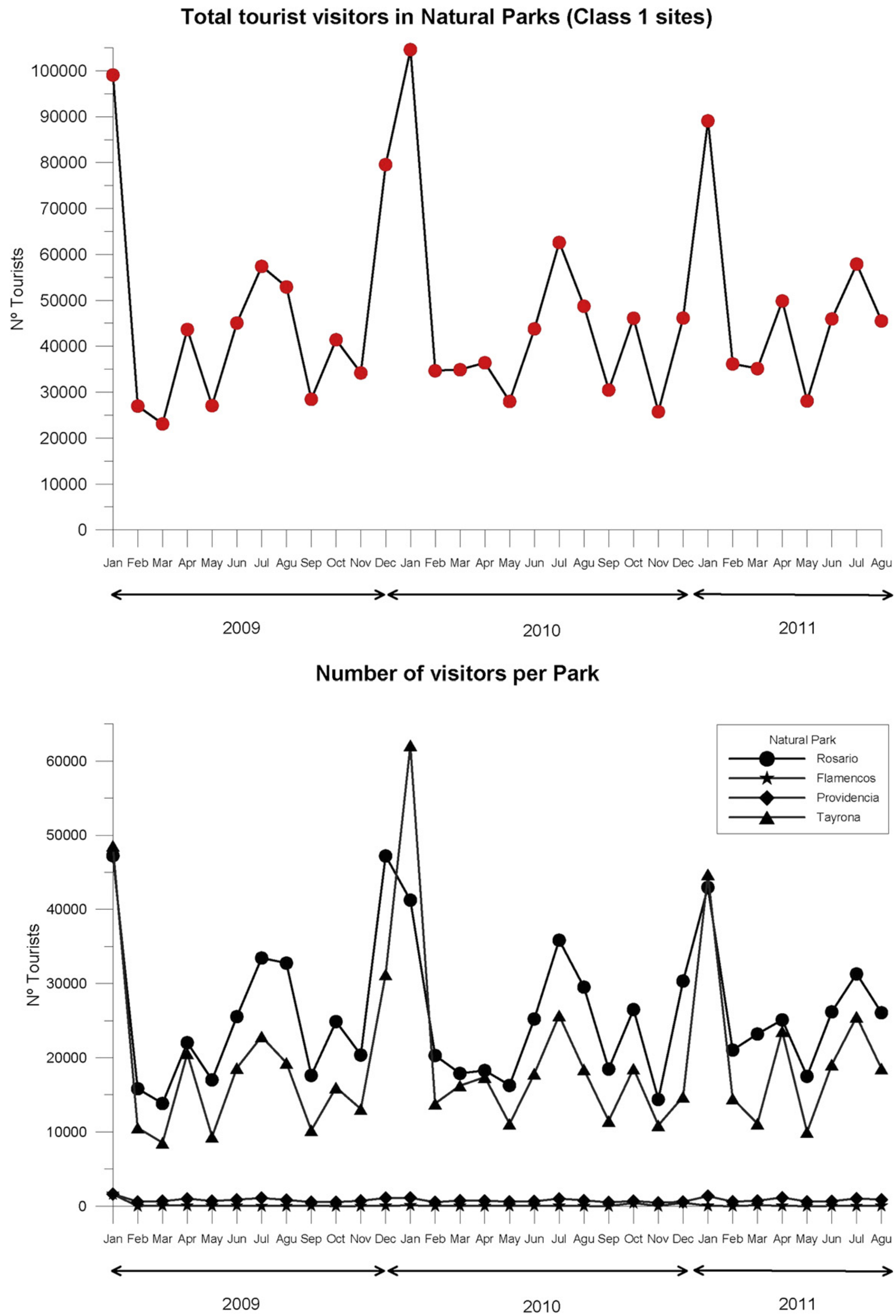

Fig. 10. Total amount (a) and specific data (b) of national and international visitors to coastal natural Parks.

or indirectly – related to weather characteristics that, in the Caribbean littoral, greatly differ from Europe.

Hence, application of this classification, sometimes enhances some points (i.e. gives very positive scores to aspects that are quite common along the Caribbean littoral) and *vice versa*. In this sense, important rainfall and mild temperatures (with no seasonal variations) generally favour development of an abundant natural vegetation cover (high score at point 17, Table 2) which produces a great amount of vegetation debris (low score at point 18). During the rain periods (April–May and October–November), rain favours abundant river discharges of vegetation debris and sediments – that increase water turbidity and darken natural beach sediment. A further difference is that vegetation debris in Europe consists mainly of seaweed, which is probably associated with a perception of dirty/unattractive water/sand by beach users. In Colombia, vegetation debris is constituted mainly by terrestrial vegetation (palm trees, etc.); it seems that beach users along the Caribbean littoral are used to a great vegetation cover and a great amount of vegetation debris – that is associated with – and represents evidence of – a natural environment.

5.4. Considerations on beach users

Despite the international economic crisis that also affected tourism activities and the construction of coastal developments (Cooper & Mckenna, 2009), coastal tourism and occupation in Colombia has grown greatly during the last three years. Tourists are essentially interested in beach related activities and natural beach of great scenic beauty. As observed by Williams (2011) from studies carried out at several places in Europe, beach users are especially interested in 'safety, facilities, water quality, no litter and scenery'. On the other hand, it appears that local administrations are more often convinced that beach users are more interested in awards and a great variety exist throughout the world (McKenna, Williams, & Cooper, 2011). The most important award appears to be the Blue Flag, used in 48 countries worldwide, most located in Europe. Other countries that flag this award are Brazil, Canada, New Zeeland, South Africa and, in the Caribbean Sea, Jamaica, Puerto Rico, Dominican Republic, Bahamas and Colombia (since March 2012). In Latin America, other awards are observed in Peru, Mexico, Argentina, Uruguay, Cuba and Colombia (FEE, 2006). Each one of the mentioned countries has a different and specific award, generally based on the same principles of the Blue Flag. In detail, in Colombia two technical standards (e.g. NTS-TS-001-1 and NTS-TS-001–2) are especially used that regulate environmental parameters, define beach zoning, litter management, etc. Beach sites that want to obtain the mention of 'tourist quality place', established in 2006, have to fulfil the 100% of mentioned standards (Botero & Hurtado, 2009). Despite the above, beach awards are not known and beach users seem to be not very concerned about this issue. A pilot questionnaire relating to the above awards was tested and no beach user was aware of such an award. It appears that the award, which does not even have a symbol, is known only to a very few experts who work on such topics.

At the international level, the most striking finding of research in many diverse locations was the emphasis of beach users on cleanliness and not awards. Questionnaire surveys carried out on beach user preferences (50 beach aspects) in Wales, UK ($n = 2{,}345$, 98% locals); Hollywood beach, Florida, USA ($n = 83$, 76% locals); the Costa Dorada, Spain ($n = 157$, 95% locals); Malta ($n = 154$, 65% local and 34% northern European) and Turkey's Aegean coast ($n = 245$, 12% local and 88% northern European), showed that the above five previously mentioned parameters were of the greatest importance on beach choice (Williams, 2011). In the Mediterranean areas tourists come to the beach for swimming and sun, as virtually every beach user enters into the sea. In UK, because of the weather, bathers represent a minority; this being probably the reason why beach users give more importance to scenery.

No research on the above topics, has ever been carried out in Colombia or any other Caribbean country. Undoubtedly, the beauty and attractiveness of the Caribbean littoral is based on sand and water colour, presence of natural vegetation and scenery. Observations carried out during this study showed that beach users were mainly young or middle aged people that enjoy bathing – it is often a necessity due to the elevated temperatures. Despite the age of beach users and the fact that most are short-day visitors or residents, they can be clearly divided onto two categories: a) a larger segment preferring urban beaches and b) a smaller segment whose preferences are rural and remote beaches.

a) Urban

These are related to beach activities and local entertainments e.g. Taganga, Dpto of Magdalena, Cartagena, Dpto of Bolivar; examples in Europe are the Rimini littoral and Riccione, Italy or Ibiza, Spain. Unlike their European counterparts, beach facilities, which are often a necessity for families with children, are not common and water quality is usually low, the beach usually showing much evidence of litter and sewage. Beach users do not seem to be concerned about coastal structures, noise, facilities (usually there are little), or the 'carrying' capacity of beaches, e.g. Taganga or Cartagena (Fig. 9a and b) and the latter is quite often exceeded (Botero, Hurtado, González, Ojeda, & Díaz, 2008). They want ease of access, to bathe, listen to music and to have 'fun'.

b) Rural and remote

The other (smaller – but growing) category is represented by people that prefer isolated sites, usually located in natural protected areas which often show quite complicated access. These beach users are concerned about cleanliness, water colour and clarity, sand colour, natural vegetation cover and scenery. The above mentioned aspects are not taken into account in the award that is used in Colombia and a natural area will never be able to obtain the mention of 'quality tourist place' or the Blue flag. This category of beach users, interested in scenery, water colour and quality is reflected by the greater number of national and international visitors to natural protected areas (Fig. 10a – PROEXPORT – Ministerio de Comercio, Industria y Turismo, 2011). A clear bimodality may be seen, with a main peak in January and a second one in August, both linked to national tourists that travel during holidays. As can be seen the most visited area is Tayrona Park, which has class 1 beaches (Fig. 10b).

Lastly, considering previous assumptions, the observed dichotomy of beach users' types, and the fascinating attractiveness of many Colombian coastal sectors, it would be probably useful to create an award based on coastal scenery.

6. Conclusions

Colombian Caribbean littoral is a nascent popular destination for many national and international tourists attracted by rural and remote sites of great scenic beauty and/or urban sites because of their beach-related activities and local entertainments. Pleasant weather conditions recorded during much of the year favour an almost constant flow of tourists, with mean peaks observed in December and August, the capacity for tourism growth appearing to be almost limitless.

Along the investigated littoral, scenery is a very important component for beach tourism and drives the economy of many coastal areas. In order to recognise the potential for coastal tourism development in rural and remote areas and for scenic quality improvement of village and urban areas, a scenic assessment of 135 sites along the investigated coast was provided in this study. Investigated sites were divided into five classes, from Class 1 – including areas of high scenic values, to Class 5, including urban degraded areas with low scenic scores. Almost all Classes 1 and 2 sites are remote, rural and village areas with spectacular water and sand colour, exuberant vegetation, etc. They are usually located in Natural Parks and are especially abundant in La Guajira and Magdalena Departments where the mountainous relief gives rise to spectacular landscape characteristics enhanced by the presence of special geological features.

Sites categorised within Classes 3, 4 and 5 are observed along all the investigated departments and their low classification corresponds to a progressive decrease of both natural and (especially) human parameters. Lowest scores are recorded in urban beaches where litter and sewage evidences are frequently observed. At many sites, beach degradation was enhanced by erosion processes, which were counteracted by the construction of hard structures that further reduce the scenic value.

Since it is not possible to change natural characteristic, in many places related to adverse geological conditions, efforts must be done to change human parameters to improve the site score. This can be done at several places with different initiatives, as elimination of litter and sewage evidences by relating them to a source and taking appropriate measures, as well as the implementation of cleaning beach programs and management of residual waters. Further measures can be devoted to eliminate unnecessary coastal defence structures and increase beach width and colour carrying out nourishment projects with white/gold sands.

Concerning remote and rural areas, efforts must be carried out to maintain, protect and promote their natural beauty and scenic features by limiting and regulating current increasing coastal urbanisation menacing even natural protected areas.

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