Recreational parameters as an assessment tool for beach quality

Camilo-Mateo Botero†, Cristina Pereira‡, Giorgio Anfuso∞, Omar Cervantes@, Allan T. Williams§, Enzo Pranzini+, Carlos P. Silva#

† Grupo Joaquín Aaron Manjarres, Universidad Sergio Arboleda, Calle 18 No. 14-18, Santa Marta, Colombia.
playascol@yahoo.com,
camilo.botero@usa.edu.co

@ Facultad de Ciencias Marinas (FACIMAR),Universidad de Colima. Carretera Manzanillo-Barra de Navidad Km 19.5.Colonia El Naranjo, 28860 Manzanillo, México
omar_cervantes@ucol.mx

e-GEO, Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa, 1069-061 Lisboa, Portugal
cpsilva@fcsh.unl.pt

‡ Grupo de Investigación en Sistemas Costeros, Playascol Corporation, Calle 19 N0. 8-44, Santa Marta, Colombia
grupo.sistemas.costeros@gmail.com
cpereira@playascorp.com

+ Built Environment, Swansea Metropolitan University, Swansea, Wales SA1 6ED, UK
allan.williams@virgin.net

∞ Departamento de Ciencias de la Tierra, Facultad Ciencias del Mar y Ambientales, Universidad de Cádiz, Polígono Río San Pedro s/n, 11510 Puerto Real, Spain
giorgio.anfuso@uca.es

+ Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Borgo Albizi 28, 50122 Florence, Italy
enzo.pranzini@unifi.it

www.cerf-jcr.org

www.JCRonline.org

ABSTRACT

Botero, C., Pereira, C., Anfuso, A., Cervantes, O., Williams, A.T., Pranzini, E., Silva, C.P. 2014. Recreational parameters as an assessment tool for beach *In:* Green, A.N. and Cooper, J.A.G. (eds.), *Proceedings 13th International Coastal Symposium* (Durban, South Africa), *Journal of Coastal Research*, Special Issue No. 70, pp. 556-562 ISSN 0749-0208.

Beach quality can be understood according to uses established for this coastal system, the most common being tourism, fishing and conservation. This is especially true with regards to tourism, where quality is frequently measured with respect to two major areas: environmental and recreational. In 2002, an environmental quality index for tourist beaches was developed in Colombia, called ICAPTU (Índice de Calidad Ambiental en Playas Turísticas). ICAPTU had four indicators and eleven parameters, mainly focused in environmental aspects. In 2010, a research project started with the objective of updating ICAPTU with a more comprehensive scope, dividing environmental quality into three indicators: sanitary, eco-systemic and recreational. This research paper presents the progress on the design of five parameters considered in the newer version of ICAPTU, all related to recreational issues: a. Coastal Scenery, focused on an assessment tool tested in Europe, USA and Australia; b. Safety and security, measured from risk perception and real risk; c. Urbanization, related to ecosystem resilience to infrastructure on the shore; d. Zoning, understood as a spatial organization of beach activities; e. Environmental behaviour, assessed from a test focused on common attitudes of tourists when they visit the beach. These five parameters were used on-field techniques as a method for acquiring information. Several instruments were designed based on surveys, checklists and interpretation sheets. Every tool was applied and tested on Colombian beaches located in four Departments: La Guajira, Magdalena, Atlántico and Bolivar. Geospatial technologies are also explored as resources for improving the evaluation of beach environmental quality. Finally, this work concluded that beach quality can be assessed by recreational parameters, scientifically designed, supporting decision making of coastal zone management.

ADDITIONAL INDEX WORDS: *Integrated coastal zone management, sustainable tourism, coastal systems, Caribbean, Colombia.*

INTRODUCTION

Tourism is the world's biggest industry with an average growth of 9% per annum since 1985 (Klein *et al*., 2004). In 2011, global tourism employed 6-7% of the global workforce and was *circa* 5% of the worldwide gross domestic product (GDP; UNWTO, 2011). In 2011 South America recorded a great increase (+9 percent), continuing to lead growth in the region for the second consecutive year. In Colombia, tourism currently represents one of the most important activities with 1.692.822 international tourism arrivals in 2012 and more than U$12,000 million generated (PROEXPORT - Ministerio de Comercio, Industria y Turismo, 2012). In this sense, beaches are considered as a major player in this market and worth billions of tourist dollars (Houston, 2008).

Such interest in exploiting the characteristics of national beaches, is consistent with the great dependency that Caribbean coastal zones have on tourist activities, as they generate a considerable proportion of national incomes (Beharry-Borg and Scarpa, 2010; Gavio *et al*., 2010). However sustainability of the beaches as natural systems is considered a limiting factor on the economic activities (Nelson and Botteril, 2002). As a coastal feature, beach quality is determined by both, the quality of the environment and the quality of the tourist experience (Duvat,

DOI: 10.2112/SI70-094.1 received 30 November 2012; accepted 21 February 2013. © Coastal Education & Research Foundation 2014

Electronic copy available at: http://ssrn.com/abstract=2551338

2011). Concerning the Caribbean coast of Colombia, Botero *et al.* (2013 a and b) have carried out studies concerning the interest of beach users and conclusions highlighted the pertinence of assessing beach quality from an integrated approach. Such is the case of the ICAPTU project (in English "Index of Environmental Quality in Tourist Beaches"), whose context has hosted the present investigation aiming at characterizing different aspects related to environmental and recreational perceptions from tourist beaches.

ICAPTU - Index of Environmental Quality in Tourist Beaches

Within a research program held in Colombia since 2010, the ICAPTU has been designed to work as a technical instrument that summarizes the criteria for assessing beach quality. The original model designed in 2002 had four indicators and eleven parameters, which mainly focused on environmental aspects (Botero, 2002). In 2010, a research project started with the main objective of updating the ICAPTU index by enlarging its scope, dividing environmental quality aspects into three indicators: sanitary, eco-systemic and recreational.

In a recent development of the ICAPTU project, all its thirty parameters underwent a calibration process within the newer ICAPTU index, many of which related to recreational issues. This paper focuses on five of the most novel parameters, supported in several scientific documents: i) Coastal Scenery, focused on beach user perception of landscapes (Ergin *et al*., 2004 and 2006); ii) Safety and security, aimed at understanding relationships between beach user risk perception and real risk due to environmental beach conditions (Scott, et. al. 2007, 2009), anthropogenic hazards or human-made hazards (Espejel et.al. 2007); iii) Urbanization, related to type and proportion of buildings and public works in the coastall zone and ecosystem resilience to human intervention (Leatherman, 1989, De Santiago, et. al. 2013; Roig-Munar, F.X. 2013; iv) Zoning, concerning the spatial organization of beach activities (Zielinski and Botero, 2012, Yepes, 2002, 2004) ; v) Environmental behaviour, related to tourists attitudes when users visit the beach (Dovidio, J.F et. al. 2003, Wolch and Zhang, 2004,Cervantes et. al. 2008).

Geospatial Techniques for Beach Quality

Geospatial Techniques, refers to all available means for generating, organizing, storing, and analysing spatial information, which may include advances in geodesy, photogrammetry, geophysics, computer science, statistics, remote sensing and geographic information systems (GIS) (Klemas, 2011; Bishop, *et al*., 2012). Remote sensing in particular has been largely applied to the study of coastal systems, ranging from observation of chemical (suspended sediments, chlorophyll) and hydrological parameters, through to ocean processes affecting the seashore, as well as detecting changes of land use/cover, landscape, or ecosystems (Klemas, 2011). Within the coastal zone, the most popular application of remote sensing and GIS at the beach scale, is perhaps the evolution of erosion problems, usually addressed through the use of satellite and video imagery (Pranzini and Wetzel, 2007; Brignone, *et al*., 2012).

There are several sensors available for retrieving data, which differ from platform (aircraft, satellite), mode (active and passive), application (imagers, profilers) and wavelength range detection (Klemas, 2009). Remotely sensed data are now going beyond bare-earth representation and consider the effects of human interventions projected on anthropogenic structures, vegetation canopies and short-term changes in terrain (Mitasova, *et al*., 2012). Further elements on tourist beaches can also be studied with this instrument, such as the presence of human facilities and civil structures concerning zoning and urbanization, landscape and landform features that characterize coastal scenery and rip currents or near shore morphology associated to safety/security issues (Mitasova, *et al*., 2012; Barrett and Houser, 2012). In this context, geospatial techniques figure as an asset that may contributes to the calibration process of the recreational parameters within ICAPTU.

METHODS

Recreational parameters referred to in this document may be considered as immeasurable concepts usually conceived for characterizing a beach as a tourist destination. However, these concepts need to be translated into beach quality units susceptible of being aggregated into the mathematical expression of the indicators that compose an index. Therefore, the methods considered in this research are framed on the methodology designed for calibrating the recreational parameters of ICAPTU. Given the lack of measuring instruments and reference measurements, calibration of the recreational parameters considers five common stages (see figure 1).

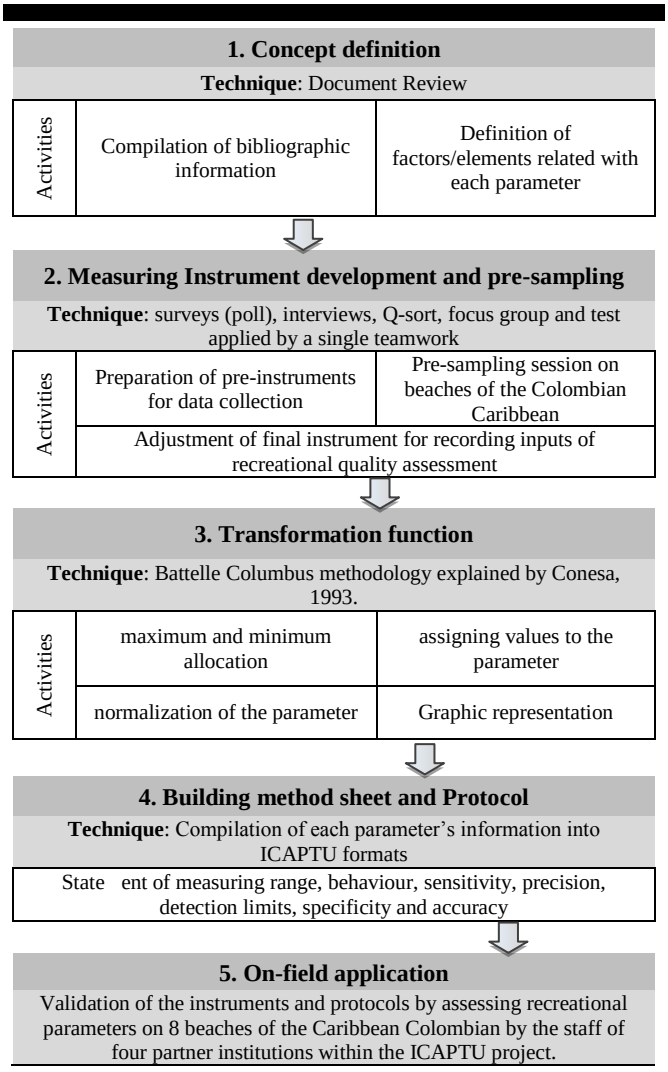

Figure 1. General methodology considered for the calibration process of recreational parameters within the ICAPTU project.

Electronic copy available at: http://ssrn.com/abstract=2551338

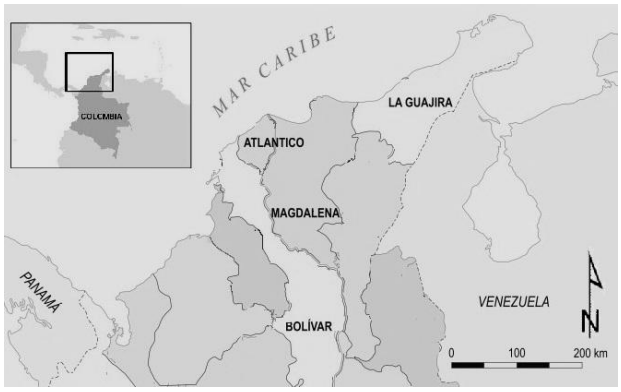

Figure 2. Study area, adapted from IGAC (2013). Visited beaches of Caribbean Colombian departments: Riohacha (La Guajira), El Rodadero and Bahia Concha (Magdalena), Puerto Velero, Caño Dulce and Salgar (Atlantico) and Boca Grande (Bolivar).

The results described here, focuses on the exercise developed for building up the instrument for measuring each recreational parameter. During the process, different tools were applied and tested in the Caribbean Coast of Colombia, specifically at beaches located in four departments: La Guajira, Magdalena, Atlántico and Bolivar (see figure 2).

Regarding the specific methods used for each parameter, construction of the measuring instrument for *coastal scenery* focuses on adapting the assessment process of Rangel *et al*. (2013), which applied the methodology of Ergin *et al*. (2004 and 2006), based on the scoring of 26 elements, both natural (physical features of the beach) and human (those introduced to the landscape through anthropogenic activities). Such parameters were determined by interviewing more than 1,000 beach users in various European countries and the USA about their preferences and priorities concerning coastal scenery. Considering this background, the present research applied the idea of assessing coastal scenery according to the preferences of beach users in the study area.

After identifying all characteristic elements of the coastal landscape in the zone, these were then organized on a checklist that was used on a survey applied to four beaches of different municipalities of the Colombian Caribbean. Each element is composed of five categories characterizing the landscape element and beach users were asked to rank them on a 1 to 5 scale, from "no importance" to "great relevance". The non-clustered ordinal data obtained from this pre-sampling sessions were brought under a frequency analysis to identify users' preferences. Categories with value of 1 represent the lowest recreational quality and a value of 5 is the highest.

Measurement instrument designs for the, *safety and security* parameter, were based on the definition of real and perceived risk of beach users. Concerning real risk it was designed as a tool for collecting information about the threats affecting the investigated coastal areas. This pre-instrument was a structured interview addressed to the staff responsible for security issues on beaches, such as, policemen, members of civil protection, Red Cross, lifeguards, doctors and nurses on duty at medical centres close to the investigated beaches.

Hence, the pre-instrument allowed drafting a measurement instrument to assess real risk on tourist beaches. This instruments figures as a quantitative matrix motivated by the methodology for risk assessment at the workplace proposed by the Colombia Technical Guide No. 45, which was adapted to the beach context. The methodology incorporated variables such as the level of impairment (e.g. the relationship between hazards, its consequences and preventive action), the exposure level (user contact with the hazard), the level of probability (likelihood of occurrence of a hazardous event) and consequence (results in terms of injury or illness) and the risk level (combination of probability and consequence). Levels above the variables are combined to yield a score that indicated which risk level (low, moderate, high or extreme), describes an evaluated beach and the resulting equivalent level of safety/security.

For designing the measuring instrument of the *urbanization* parameter, the "focus group" technique was used, as described by Hurtado (2010). After an active literature review of scientific articles and technical documents related to the term "waterfront" and "beach urbanization" (Leatherman, 1989, De Santiago, et. al. 2013 and Roig-Munar, F.X. 2013), a set of impacts associated with the presence of civil structures on the beach according to two dimensions: landscape and environment, were identified. These impacts where organized on a matrix to determine the degree of 'affectation' according to the methodology of Conesa (2003) and Gomez–Orea (2007), for environmental impact assessments.

A diverse group of experts (environmental engineers, architects and civil engineers) where gathered at each of the four beaches evaluated (Riohacha, Bahia Concha, Puerto Velero and Bocagrande), each beach representing a different urbanization typology. Discussion sessions were held concerning the presence/absence, relevance and improvements of every impact registered on the matrix. When visiting every beach, experts were asked to score the impacts according to the 11 evaluation criteria established by: nature, intensity, extent, moment, persistence, reversibility, synergy, accumulation, effect, periodicity and recoverability (Conesa, 2003, Gomez–Orea, 2007).

The methodology used for the development of the *zoning* parameter was based on the document "Basic Guide for Certification of Tourist Beaches", proposed by Zielinski and Botero (2012). This document presented the use of checklists for assessing the status of tourist beaches in an easy, quick and accurate manner.

Initially elements or factors were identified which characterize an organized beach, according to a comprehensive literature review along with field visits. This preliminary list was then evaluated by experts of the Ibero-American Network of Beach Management and Certification (PROPLAYAS, from its Spanish acronym). Using the Q-Sort technique, zoning factors were organized from the "most" to the "least important". As a result, it produced a checklist of the zoning factors including different aspects and the relative importance of each one was established by the expert group.

The design of a tool for assessing the, *environmental attitude* of beach users took into account reliable instruments developed by other researchers and these were then adapted to the characteristics of tourist beaches (Mamat and Mokhtar, 2012). Initially five existing instruments for measuring environmental attitudes were chosen for creating a new one focused on the beach environment:

- New Ecological Paradigm (Dunlap *et al*., 2000)
- New Environmental Paradigm (Dunlap and Van Liere, 1978 - Adapted by Kim and Weiler, 2012)
- Scale of attitudes toward environmental issues (Moreno *et al*., 2005)
- Test of environmental attitudes (Mamat and Mokhtar 2012)
- Measurement of environmental attitudes based on behaviour (Kaiser, 2007)

Table 1. Coastal landscape elements considered for evaluating coastal scenery on the Caribbean Littoral of Colombia.

Physical Elements	Human Elements
Cliff height	Litter
Beach face width	Sewage
Sand colour	Soil use
Rocky shore width	Built environment
Valley	Beach Users' Density
Skyline landform	Recreational Equipment
Coastal landscape features (arches, caves, waterfalls, island, reefs, etc.)	Folklore
Vistas	Floating Surfaces (boat, vessels...)
Water colour	Facilities
Vegetation cover	
Waves	

Categorization of coastal landscape elements Example:

Beach face with				
Category A	Category B	Category C	CategoryD	CategoryE
< 15 m	**15-30 m**	**31-45 m**	**46-60 m**	**> 60 m**
Weighting factor:	Weighting factor:	Weighting factor:	Weighting factor:	Weighting factor:
0.08	**0.2**	**0.2**	**0.12**	**0.4**

The items of each instrument were grouped, based on the classification made by Kim and Weiler (2012), which gathered their items into five variables according to their synergy. The variables used included the importance of resource protection, user support to management measures, negative and positive impacts perception (Cervantes, et. al. 2008) and feelings of concern over certain habits and behaviour.

RESULTS AND DISCUSSION

Coastal Scenery

Over 450 beach users were asked for their perception on the beaches of Riohacha, Puerto Velero, Bocagrande and El Rodadero. Table 1 registers the final list of physical and human elements considered on the surveys applied during the pre-sampling sessions. Out of the data collected and analyzed, a weighting factor may be defined for each category within each element as represented in the example in Table 1. The final instrument measures recreational quality (according to coastal scenery) by identifying from a checklist the category of the landscape elements present on the beach and calculating the average value of their weighting factor.

As research is ongoing, some of these elements are currently under review because of underlying inconsistencies between field data with previous work related with coastal scenery, such as, the case of natural elements, e.g. cliff height, rocky shore width, valley and waves. As previously observed by Botero *et al*. (2013 a and b), beach users at the Colombian Caribbean were not particularly interested in landscape but in having fun and enjoying sunshine and bathing, as recorded in many Mediterranean destinations. In this sense, natural elements of great scenic relevance, as highlighted in previous studies (Ergin *et al*., 2004 and 2006), were not selected by beach users during the survey exercise and/or had a small score during data analysis.

Concerning beach width, it represented an important parameter and users preferred wide beaches, favoured sand colour being white, later grey, and the less attractive one being black sediments, which differ from previous studies where black sediments on Pacific islands are considered exotic because of its volcanic origin and "grey mouse" is less appreciated (Pranzini *et al*. 2010). Further contrast, with respect to results obtained by Ergin *et al*. (2004 and 2006), was evidenced by the importance given to human parameters such as recreational infrastructures and activities, etc. Such results, are also probably linked to the fact that questionnaire surveys were carried out on urban beaches essentially frequented by local users, that were not used to visiting different beach types (natural ones) and, for this reason, their "ideal" beach, is the one they were used to and essentially chosen because of its proximity (Botero *et al*., 2003 b).

Safety and Security

Security is one of the fundamental attributes to measure the quality of a tourist destination, because it represents one of the aspects that tourists consider when making their choice. With the information gathered at four beaches in the study area (Riohacha, Puerto Velero, Bocagrande and El Rodadero), a classification of the identified hazards was made according to the damage they cause. These hazards were included in 6 groups: natural, environmental, physical, biological, social and institutional (see table 2).

Short and Holgan (1994), Scott, *et al*. (2007, 2009) and Espejel *et al*. (2007) argued that environmental characteristics are important in preventing accidents on beaches because these aquatic environments are variable and continuously evolving (Abraldes and Rubio, 2005). These environments present four major factors that can determine the degree of peril on a beach: the beach morphology, equipment and infrastructure, rescue and first aid service and circumstantial aspects. Therefore, this paper has defined a safe beach as the one that provides conditions for the protection of life and physical integrity of users through the following services: a) rescue and first aid, b) emergency care at sea and land, and c) surveillance and monitoring personal protection to safeguard users from common crime and criminal acts, this being an important issue along many areas of Colombia. All these services are achieved through joint work among lifeguards, health and police officers, and relief agencies.

Table 2. Hazard classification of beaches from interviews on the Caribbean coast of Colombia.

Natural	Environmental	Social
· Natural disasters · Precipitations · Floods · Rip currents · Waves · Landslides · Coastal erosion · Beach topography Reefs, bedrock, cliffs	· Microbiological pollution of water · Microbiological pollution of sand · Modification of sediment dynamics · Litter and hazard waste · Atmospheric emissions from vehicles · Sewer presence	· Criminal activities · Reckless behaviour · Harassment of street vendors · Ignorance of regulations · Lack of hygiene in food handling · Increased carrying capacity

Biological	Physical	
· Invasive species · Marine animals Presence of birds and domestic animals.	· Solar radiation · Very high temperature · Water turbidity	· Noise (intermittent or continuous) · Insufficient lighting on the beach

Institutional		
· Police absence or insufficient beach patrol of authority. · Absence of first aid services	· Lack of safety measures and risk management · Informal provision of tourist services · Absence of emergency and rescue services	· Invasion of public space · Absence of lifeguards · Lack of nearby medical centres

Urbanization

Urbanization is defined as, the effect of construction of coastal civil structures, which produces a negative or positive contrast with the landscape and ecosystem functionality when satisfying human need for leisure. The following typologies of urbanization were also categorised from undisturbed natural beaches, natural or minimally altered beaches, moderately artificial beaches, artificial beaches, to very artificial beaches. Another progress on the calibration process of this parameter refers to identification of the impacts or effects associated to the urbanization on the beach (see table 3).

Urban development in coastal zones seeks for the development of tourism by incrementing foreign investments, job creation and the presence of transnational companies (Talesnik and Gutierrez, 2002). A high density of buildings can currently be recorded along several coastal areas of France, Italy and Spain, where the built up area exceeds 45% (EEA, 2006). In the same way, Breen and Rigby (1996) argued that such pressure produces important changes in land use by means of construction of shops, cafes and restaurants (Talesnik and Gutierrez, 2002). They observed others kinds of recreational buildings, such as, aquariums, amusement parks and yacht marinas as well as buildings for cultural purposes (e.g. theatres, concert halls and cinemas; Benseny, 2008).

Zoning

As a pre-instrument for the zoning parameter, a checklist was designed for gathering all relevant factors defining this parameter, distributed in their respective typologies (see table 4). The maximum quality is then observed when the beach presents all of these factors and the minimum occurs when there is none. The Zoning parameter is necessary for evaluating the environmental quality of a tourist beach, in terms of its ability to satisfy the human needs for leisure and recreation. Therefore in order to facilitate the management of beach space, a strategic plan is required concerning beach zoning and the organization of local stakeholders, such as, beach users, peddlers, life-guards, fishermen, etc. Such kinds of studies were carried out in Spain over a decade ago, whilst in Colombia the topic has been developed only in the past few years (Yepes *et al*., 2002, 2004; Botero, 2008, Herrera, 2010).

The most known antecedent is a study titled "Beaches: models, types and suggestion for its management", in which two types of spatial arrangement for Spanish beaches were proposed, e.g. lateral and cross-section zoning (MOP, 1970). This study clearly explained the proper way for the establishment of different areas in a beach, according to the main types of usage, which include a variety of activities ranging from recreational and sports to economic or contemplative (Botero, 2013a). Therefore, the zoning parameter encompasses the spatial arrangement of physical elements and services to reduce the negative interactions amongst them.

Table 3. Effects associated with the presence of buildings and structures on the beach within two dimensions.

Environment	· Solid waste generation · Atmospheric emissions · Discharges · Migration of species (disturbance)	· Habitats (changes and fragmentation) · Changing sediment dynamics · Microclimatic variations · Modified waves · Noise pollution · Soil sealing
Landscape	· Visual intrusion · Changes in natural morphology	· Human concentration · Employment generation · Loss of vegetation cover

Table 4. Zoning Factors defined for measuring recreational quality at the Caribbean coast of Colombian.

Spatial organization	**Regulations**	**Commercial organization**
· Green zones · Parking lot · Tourism services area · Public space binding site · Transition area · Users resting area · Users active area · Bathing area · Nautical sports area · Area for vessels transit · Vessel parking area · Promenade · Beach access · Signing and lighting Sports and recreational facilities	· Respect for beach public use · Absence of discharges · Solid waste management · Lifeguard service · Presence of trash cans Cleaning periodically · Non-cemented structures · Ornamentation with native plants Beach management	· Peddler identification · Forbidden animals at food courts · Clean sales sites · No disturbing advertising activities · Legality of goods · Hygiene and sanitation with products Access to potable water
	Beach users organization	
	· Carrying capacity · Beach information board · Code of conduct for all	· Tourist information points · Safety recommendations

Environmental Behaviour

In general, environmental attitudes are defined as, the provision or encouragement to perform an action that can help or affect the natural environment. These attitudes, condition people's habits and/or customs and are in turn associated with a number of cognitive, psychosocial and socio-demographic variables (Mamat and Mokhtar 2012b). Therefore, attitudes are the starting point for establishing environmentally responsible behaviour (Cervantes et. al, 2008; Dovidio, et. al. 2003). The evaluation of environmental attitudes has an extensive literature, especially on assessment of attitudes in schools, universities, and industries, which leave aside the relationship between communities and natural resources as scenarios for socio-economic development (Wolch and Zhang, 2004, Cervantes et. al. 2008).

Along with creation of a new test for environmental attitudes on tourist beaches, a list of 24 items was compiled that composed the new instrument. Within the instrument, items where organized by sections on: waste management, commitment to conservation concern for the community and responsible actions for the conservation of water, fauna and flora. Because several items were left out of the synergy of the proposed variables, they were gathered into an additional variable called "intention of intervention". On-field applications are being carried out on four beaches along the Northern Caribbean littoral of Colombia in Riohacha, El Rodadero, Salgar and Bocagrande. These pre-sampling sessions have contributed to improve the instrument by reorganizing items in order to fit into the proper variables. Further results on the validation of the text are also expected from field work currently in progress.

CONCLUDING REMARKS

According to the improvements achieved in the present study, beach quality can be assessed by the use of scientifically designed recreational parameters that produces a measurable appreciation of the coastal system. The applied methodology and results obtained

constitute important tools for decision makers, especially along the Northern Caribbean coast of Colombia, which is increasing in occupation and development. Detailed monitoring of this parameter would be a warning system for authorities and managers, orienting in this way the definition and implementation of appropriate management measures (Botero, 2013). Thus, improvements of beach quality evaluation by innovative technologies fulfils a rising need with the interest of an automatic monitoring process and optimizing the available funding; in that way, the ICAPTU initiative is getting closer to becoming an efficient tool for coastal zone management.

ACKNOWLEDGEMENT

Authors want to acknowledge institutions and researchers which are part of the project ICAPTU, especially students who support daily research activities in Santa Marta. Moreover acknowledge to the Iberoamerican Network of Beach Management and Certification – PROPLAYAS, which all authors are members. Finally, authors acknowledge the programme Expo-Master in Marine-Coastal Integrated Management, in which three authors participated as student, professors or supervisor.

LITERATURE CITED

Abraldes, J., Rubio, J. 2005. Factores de peligrosidad para la valoración del riesgo de accidentes en las playas. Departamento de Ciencias de la Actividad Física y del Deporte. Universidad Católica San Antonio de Murcia. UCAM. Revista Digital - Buenos Aires 91 - Diciembre de 2005.

Barrett, G. and Houser, C., 2012. Identifying Hotspots of Rip Current Activity Using Wavelet Analysis at Pensacola Beach, Florida. *Physical Geography*, 33, 32-49.

Beharry-Borg, N., & Scarpa, R., 2010. Valuing quality changes in Caribbean coastal waters for heterogeneous beach visitors. *Ecological Economics*, 69 (5), 1124-1139.

Benseny, G., 2008. La problemática ambiental en urbanizaciones turísticas litorales. *Aportes y Transferencias*, 12 (1), 105-125.

Benoit, G., and Comeau, A., 2005. In G. Benoit, and A. Comeau (Eds.), A sustainable future for the Mediterranean: The Blue Plan's environment and development outlook. London, UK: Earthscan.

Bishop, M. P., James, L. A., Shroder Jr, J. F. and Walsh, S. J., 2012. Geospatial technologies and digital geomorphological mapping: Concepts, issues and research. *Proceedings of the 41st Annual Binghamton Geomorphology Symposium* (South Carolina, Columbia), *Geomorphology* 137 (1), pp. 5-26.

Botero, C., 2002. Propuesta de un índice de calidad ambiental de playas turísticas. University of La Salle. Bogota, Colombia. Eng. Thesis, 108 p.

Botero, C., 2008. Proposal of management framework for tourist beaches based on integrated coastal management. Faro, Portugal: Erasmus mundus European joint master, Msc. thesis, 100 pp.

Botero, C., 2013. Evaluación de los esquemas de certificación de playas en América Latina y propuesta de un mecanismo para su homologación. Puerto Real, Spain: University of Cádiz, PhD thesis, 408 pp.

Botero, C., Anfuso, G., Williams T. and Palacios, A., 2013 a. Perception of coastal scenery along the Caribbean littoral of Colombia. *Journal of Coastal Research*, Special Issue No. 65, pp. 1733-1738.

Botero, C., Anfuso, A., Williams, A.T., Zielinski, S., Silva, C.P., Cervantes, O., Silva, L. and Cabrera, J.A., 2013. Reasons for beach choice: European and Caribbean perspectives. *Journal of Coastal Research*, Special Issue No. 65, pp. 880-885.

Breen A. and Rigby, D., 1996. The new waterfront: a worldwide urban success story. McGraw-Hill. London: Thames and Hudson; New York. 224 pp.

Brignone, M., Schiaffino, C. F., Isla, F. I. and Ferrari, M., 2012. A system for beach video-monitoring: Beachkeeper plus. *Computers & Geosciences*, 49, 53-51.

Cervantes, O. and Espejel, I., Arellano, E., and Delhumeau, S., 2008. Users perception as a tool to improve urban beach planning and management. *Environmental Management.* 42,2, pp. 249-264.

Conesa, V., 2003. Guía Metodológica para la Evaluación del Impacto Ambiental. *Ediciones Mundi-Prensa*, Madrid. 3ª edición. 412 p.

De Santiago, I., Morichon, D., Abadie, S., Castelle, B., Liria, P. and Epelde, I., 2013. Video observation of the morphodynamics of nearshore sandbars on a partially engineered embayed beach. *Journal of Coastal Research*, Special Issue 65, 458-453.

Dovidio, J.F., Kawakami, K and Beach, K.R., 2003. Implicit and explicit attitudes: Examination of the relationship between measures of intergroup bias. In: Brown, R. and Gaertner, S. (eds.), Blackwell Handbook of Social Psycology: Intergroup processes. United Kingdom. Blackwell Publishing, pp. 175–197.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G. And Jones, R. E., 2000. New trends in measuring environmental attitudes: Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 55 (3), 425-442.

Duvat, V., 2011. Interest of quality-based policies for Integrated Coastal Zone Management implementation: Lessons learnt from a French case study. *Ocean & Coastal Management* 54 (2011), 831-843.

EEA. 2006. The changing face of Europe's coastal areas. In Breton F. and Meiner A. (Eds.), EEA report no. 6. Luxembourg Office for Official Publications of the European Communities.

Ergin, A., Karaesmen, E., Micallef, A., and Williams, A.T., 2004. A new methodology for evaluating coastal scenery: Fuzzy logic systems. *Area.* 36(4), 367-386

Ergin, A., Williams, A.T., and Micallef A., 2006. Coastal Scenery: Appreciation and Evaluation.. *Journal of Coastal Research*. 22(2), 958-964.

Espejel, I., Espinoza-Tenorio, A., Cervantes, O., Popoca, A., Mejìa, A., and Delhumeau. S,. 2007. Proposal for an integrated index for the planning of recreational beaches: use at seven mexican arid sites. *Journal of Coastal Research.* Special Issue 50, 47-51.

Gavio, B., Palmer-Cantillo, S., & Mancera, J. E., 2010. Historical analysis (2000–2005) of the coastal water quality in San Andrés Island, SeaFlower Biosphere Reserve, Caribbean Colombia. *Marine Pollution Bulletin*, 60 (7), 1018-1030.

Gómez-Orea, D., 2007. Evaluación ambiental estratégica. Un instrumento para Integrar el medio ambiente en la elaboración de planes y programas. Madrid Spain: Mundi-prensa, 360p.

Grünewald L., 1998. La Seguridad en la Actividad Turística". Secretaria de Turismo de la Nación, Universidad del Salvador y Cámara de Empresarios Hoteleros de Villa Gesell. 10pp.

Herrera, J., 2010. Modelo de gestión costera para playas turísticas del Caribe Colombiano. Aplicación en Playa Blanca, Magdalena, Colombia. Santa Marta, Colombia: University of Magdalena, Msc thesis, 174 p.

Houston, J. R., 2008. The economic value of beaches e a 2008 update. *Shore and Beach*, 76(3), 22-26.

Hurtado, J., 2010. Metodología de la investigación. 4 ª edicion. *Ciea-Sypal*. Caracas, Venezuela. 168 p.

IGAC-Instituto Geográfico Agustin Codazzi. 2013. Mapas Nacionales. Presidencia de la República. Available in: http://geoportal. igac.gov.co/ssigl2.0/visor/galeria.req?mapaId=22 on 20-11-2013.

Kaiser, F. G., Oerke, B. and Bogner, F. X., 2007. Behavior-based environmental attitude: development of an instrument for adolescents. *Journal of Environmental Psychology*, 27 (3), 242-251.

Kim, A. and Weiler, B., 2013. Visitors' attitude towards responsible fossil collecting behaviour: An environmental attitude-based segmentation approach. *Tourism Management*, 36 (2013), 602-612).

Klein, Y., J. Osleeb and Viola M., 2004. Tourism-generated earnings in the coastal zone: a regional analysis. *Journal of Coastal Research*, 20 (4), 1080–1088.

Klemas, V., 2009. Sensors and Techniques for Observing Coastal Ecosystems. In: Yanf., X. (ed.), *Remote Sensing and Geospatial Technologies for Coastal Ecosystem Assessment and Management*. Berlin: Springer Heidelberg, pp. 17-44.

Klemas, V., 2011. Remote sensing techniques for studying coastal ecosystems: An overview. *Journal of Coastal Research*, 27 (1), 2-17.

Leatherman, S., 1989. National assessment of beach nourishment requirements associated with accelerated sea level rise. *In* Smith, J.B. and Tirpak D. A. (eds.), *The Potential Effects of Global Climate Change on the United States Appendix B: Sea Level Rise*. Washington, D.C.: U.S. EPA Office of Policy, Planning, and Evaluation Publication, EPA 230-05-89-057, 28p.

Mamat, M. and Kokhtar, F., 2012a. Developing hadhair environmental attitude test as instrument for Malaysian Environmental Attitude. *Proceedings of the 1st National Conference on Environmental-Behaviour Studies* (Shah Alam, Malaysia), *Procedia– Social and Behavioral Sciences*, 49, pp. 75-84.

Mamat, M. and Kokhtar, F., 2012b. Environmental attitude profile among Muslim students of environmental course in Malaysia. *ASEAN Conference on Environmental-Behaviour Studies (AcE-Bs)* (Kuching, Sarawak, Malaysia), *Procedia– Social and Behavioral Sciences*, 42, pp. 92-99.

Mitasova, H., Harmon, R., Weaver, K., Lyons, N. and Overton, M., 2012. Scientific visualization of landscapes and landforms. *Proceedings of the 41st Annual Binghamton Geomorphology Symposium* (South Carolina, Columbia), *Geomorphology* 137 (1), pp. 122-137.

Moreno, M., Corraliza, J. A. and Ruiz, J.P., 2005. Escala de actitudes ambientales hacia problemas específicos. *Psicothema*, 17, 412-418.

Nelson, C. and Botteril, N., 2002. Evaluating the contribution of beach quality awards to the local tourism industry in Wales - the Green Coast Award. *Journal of Ocean & Coastal Management*, 45, 157–170.

Pranzini, E., 2007. Remote sensing in beach erosion monitoring: from the origin, to OpTIMAL and further. *In*: Pranzini, E. and Wetzel, L. (ed.), *Beach erosion monitoring. Results from BEACHMED-e/OpTIMAL Project*. Florence, Nuova Grafica Flrorentina, pp. 49-50.

Pranzini, E., Simonetti, D., Vitale, G., 2010. Sand colour rating and chromatic compatibility of borrow sediments. *Journal of Coastal Research*, 26, 798-808.

PROEXPORT. 2012. Informe Turismo Extranjero en Colombia. Ministry of Trade, Industry and Tourism. Bogota, Colombia. 37 p.

Rangel, N., Correa, I., Anfuso, G., Ergin, A., and Williams, A.T., 2013. Assessing and managing scenery in the Caribbean coast of Columbia, *Journal of Tourism Management*. 35, 41-58.

Roig-Munar, F.X., Mir-Gual, M., Rodríguez-Perea, A., Pons, G.X., Martín-Prieto, J.A., Gelabert, B. and Blázquez, M., 2013. Beaches of Ibiza and Formentera (Balearic Islands): a classification based on their environmental features, tourism use and management. Journal of Coastal Research, SI 65, 1844- 1849.

Scott, T., Russell, P., Masselink, G., Wooler, A., and Short, A., 2007. Beach rescue statistics and their relation to nearshore morphology and hazards: a case study for southwest England. *Journal of Coastal Research*, SI 50. 1–6.

Scott, T., Russell, P., Masselink, G., Wooler, A., 2009. Rip current variability and hazard along a macro- tidal coast. *Journal of Coastal Research*, SI 56. 895 – 899.

Short, A., 1996. The role of wave height, period, slope, tide range and embaymentisation in beach classifications: a review. *Revista Chilena de Historia Natural*, 69, 586-604.

Talesnik, D. and Gutierrez, A., 2002. Transformaciones de frentes de agua: la forma urbana como producto estándar. EURE (Santiago), Santiago, v.28, n. 84, sept. 2002. Available in <http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0250716120020084000002&lng=es&nrm=iso 20/11/2013.

UNWTO - United Nations World Tourism Organization. 2011. Tourism highlights, 2011 edition.

Wolch, J. and Zhang, J., 2004. Beach recreation, cultural diversity and attitudes towards nature. *Journal of Leisure Research*. 36, 3, 414-443.

Yepes, V., 2002. Ordenación y gestión del territorio turístico. Las playas, *In* Blanquer, D. (ed.), *Ordenación y gestión del territorio turístico*. Valencia, Spain: Tirant lo Blanch press, pp. 549-579.

Yepes, V., Sánchez, I. and Cardona, A., 2004. Criterios de diseño de aparcamientos y accesos a las playas. *Equipamientos y servicios municipales*, 112, 40-44.

Zielinski, S and Botero, C., 2012. Guía básica para certificación de playas turísticas. Editorial Gente Nueva. Santa Marta, Colombia. 86 p. ISBN 978-958-8704-25-8 www.sistemascosteros.org.