



# Willingness to pay for Beach Ecosystem Services: The case study of three Colombian beaches

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## ABSTRACT

Throughout the scientific literature, beaches have been regarded as very valuable ecosystems for the tourism industry; however, these ecosystems provide multiple direct and indirect benefits beyond tourism. This paper accounts for the results from a Willingness to Pay (WTP) study using data from 425 respondents at three beaches in the Colombian Caribbean Region. Out of the respondents from the three beaches, over 70% expressed a positive WTP to maintain Beach Ecosystem Services (BES) beyond tourism purposes. At two beaches, the payment amount was 3.40 US\$/month, while at the third beach the payment amount was 6.80 US\$/month. Beach environmental quality seemed to be an important aspect regarding the payment amount. It is highlighted that WTP in beaches did not depend on economic variables such as income or employment, whereas variables related to perception had a determining impact. WTP for BES was defined by interest in environmental issues and concerns about ecosystem services loss. The results offered hereto could provide support to decision makers through quantitative information on social preferences regarding beach improvement projects policies, if several reflections are considered.

## 1. Introduction

### 1.1. Marine and coastal ecosystem services

The Ecosystem services approach has emerged as a core requirement for the ecosystem-based management of the marine space (Nahuelhual et al., 2017). It's estimated that the world's coastal biomes provide about two thirds of ecosystem services in the planet (MEA, 2005; TEEB, 2012). However, coastal areas have been altered by human activities, which notably affects ecosystem services flow (Santana-Cordero et al., 2016). Humans have been attracted to coastal areas for nearly 40% of the global population lives within 100 km of the shoreline nowadays (Martínez et al., 2007), and the impact of human activities has been intense (Mendoza-González et al., 2012).

Coastal and marine ecosystems provide a range of goods and services that promote human well-being (Castaño-Izasa et al., 2015). Marine ecosystems provide a variety of ecological functions, which produce multiple social and economic benefits (Remoundou et al., 2009). These benefits include goods such as food and materials, as well as services like waste regulation, climate regulation, coastal protection and opportunities for recreation (Schuhmann and Mahon, 2015).

Within the marine ecosystems, there is evidence that ecosystem services are provided by different coastal ecosystems: seagrass, beaches, reefs, sandy soft bottoms, wetlands, coastal lagoons (Martin et al., 2016; Mtwana Nordlunda et al., 2017; Elif and Kikuchi, 2017; Barbier, 2017; Tamayo et al., 2018).

Particularly, sandy beach ecosystems are highly pressured as a part of coastal ecosystems and regarded as ecosystems that generate benefits widely related to recreation, scenic beauty and tourism (Birdir et al., 2013; Zhang et al., 2015; Blignaut et al., 2016; Anfuso et al., 2017; Peng and Oleson, 2017). Beaches provide multiple ecosystem services, which bring about welfare for society and are essential for human usage of sandy coasts. This is because beaches are trophically coupled to marine systems, and they also physically and biologically interact with coastal dunes (Defeo et al., 2009), which means that Sandy beach systems are an important part of the global land-sea interface (Beck et al., 2017). This characteristic brings on the providing of a wide range of ecosystem services as follows: supporting services such as sediment storage and transport; regulation services such as wave dissipation and its associated buffering against extreme events, services directly related with food supplying, like nursery areas for young fishes, and cultural services as scenic vistas and recreational opportunities (NRC, 2007; Martínez

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et al., 2007; Defeo et al., 2009; Nelsen, 2012; Ekow, 2015). Considering the above, when talking about the quality and impacts on sandy beaches and their BES as a highly dynamic ecosystem, the possible affectation of adjacent habitats is included, both by physical sources and ecological impacts; this is the case for seagrasses, reefs, wetlands and coastal lagoons perceived use and value to beachgoers and beach residents within a beach-related dynamics context.

### 1.2. Willingness to pay for Beach Ecosystem Services (BES)

To understand the importance of Beach Ecosystem Services (BES) and the way in which these may be affected, there have been several studies aimed at identifying the way in which beachgoers value these ecosystems. This is the instance of studies related to Willingness to Pay (WTP), since they allow the identification of environmental preferences (Matthews et al., 2017), and are commonly used in coastal environmental programs (Risén et al., 2017). Studies such as those by Beharry-Borg and Scarpa (2010), Peng and Oleson (2017), Hess and Beharry-Borg (2011) have identified WTP in connection to the maintenance of water quality. Other studies such as those by Shivlani et al. (2003), Chang and Joon (2017), Matthews et al. (2017) have inquired about WTP for beach restoration, and Risén et al. (2017) have done so on beach algae removal. Additionally, willingness to pay for tourism services has been widely analyzed (Birdir et al., 2013; Zhang et al., 2015; Bignaut et al., 2016; Peng and Oleson, 2017; Prayaga, 2017).

Beaches are an attractive resource because of their economic, recreational, aesthetic and cultural values (Williams et al., 2016), and are subject to constant pressure by human activities. This is the case of the beaches from the department of Atlántico in the Colombian Caribbean region, where there are several issues related to water contamination (Gómez and Salcedo, 2016), sand quality (Torres-Bejarano et al., 2016) and the beaches' litter (Rangel-Buitrago et al., 2017). There are few studies related to WTP in coastal ecosystems from the Colombian Caribbean region. Those of Cardoso and Benhin (2011) and Castaño-Izasa et al. (2015) stand out, which analyze WTP for coastal protection, nonetheless, another BES are not regarded. Therefore, the objective of this paper consists on identifying the WTP for BES maintenance by visitors at three beaches from the Colombian Caribbean region. The foregoing to consolidate strategies for these ecosystems' quality maintenance, which is fundamental for decision making in the Colombian Caribbean Region (Botero et al., 2014).

### 1.3. Study area

The Department of Atlántico is located in Colombia's northern region. The region has a coastal area extension of about 64.5 km, which represents 4% of the Colombian Caribbean coast (Torres Bejarano et al., 2014). The delimited coastal area is included within the Magdalena River Coastal Environmental Unit<sup>1</sup> (INVEMAR, 2007). The research was carried out on three beaches in the northern area of the Atlántico department: Caño Dulce, Puerto Velero and Salgar (Fig. 1). Beaches of Puerto Velero and Caño Dulce are located in the municipality of Tubará, which outstands by its huge beach extension (about 16 km and a mean temperature of 27 °C). Salgar's beach is located in the municipality of Puerto Colombia, which is part of Barranquilla's metropolitan area (Atlántico's Capital City) and has a mean temperature of 27.8 °C.

These beaches are constituted by the accumulation of fluvio-marine sediments. These are composed mainly of fine-to-medium-grained sands, from light gray to dark gray (INVEMAR, 2007). By its configuration in the form of a spike Puerto Velero, protects the coast from

strong waves; this is reflected in the little dynamism of its waters, which offers the tourist a space to rest and practice of nautical sports. Caño Dulce, on the other hand, has favorable conditions for sun and beach tourism, since it counts with a large area to perform this type activities (bathing, recreation, among others). Overall, Tubará's beaches have sound natural conditions (Díaz-Solano et al., 2013). On the other hand, Salgar has more infrastructure for overall tourism, however, its environmental conditions are significantly lower than other beaches' (García, 2013). Nevertheless, the three beaches are regarded as one of the main touristic destinations of the department of Atlántico.

The selection of these beaches was due to their environmental characteristics, and their destination for touristic usage mainly by visitors from the neighboring city of Barranquilla. Likewise, the differences in the planning of each beach was considered, with Puerto Velero being a beach of high national interest for the installation of an international marina on its southern end, whereas Salgar has been prioritized from the local scope and Caño Dulce has not been included in public policies neither at national, regional nor local scopes.

## 2. Methodology

### 2.1. On-field beach characterization

A baseline describing the study area was obtained directly at the field by using a technique called Beach Technical Inspection (Botero and Di Tomassi, 2015), considering the scarce scientific and official information on the three beaches studied. This technique assesses eight categories of the beach from an integral and integrated approach: Generalities (e.g. type, access), Beach Uses and Activities, Environmental Features, Pollution, Services and Facilities, Risk Management, Information, Marine Spatial Use, and Beach Users Density and Capacity.

### 2.2. Contingent valuation method and willingness to pay for BES

Based on previous WTP studies (Roca et al., 2008; Marín et al., 2009; Ariza et al., 2012), a survey was designed to identify willingness to pay by the visitors of the three beaches selected (Appendix 1). As a common structure for contingent valuation studies questionnaires (Carson, 2000; Martín-López et al., 2007; Sanjurjo and Islas, 2007; UNEP, 2010; Enriquez-Acevedo, 2012), three sections were designed for the research at hand: firstly, beachgoer's socioeconomic information with classic questions such as visitors' origin, gender, age, educational level, occupation and monthly income; it also included a question about respondents' interest in ecology and environmental issues. Secondly came BES Context including beach uses, perception about BES and their environmental problems; and finally, there were WTP-related questions, with specifications regarding the range of payment, and the maximum amount to pay.

Regarding the BES context, specific questions were asked about the usage of beaches, such as the number of monthly visits to the beach, main activities carried out on the beaches, as well as the beachgoer's satisfaction when visiting the beaches. A hypothetical scenario regarding beach quality change was proposed and inquired about through the question: *if local authorities should inform you that the beach's quality has depleted, would you change your visit frequency to the beach or not?*

Based on the Millennium Ecosystem Assessment (2005), a description of ecosystem services categories and examples of each category were presented to respondents (Table 1). According to this context it was asked about: (i) the importance of each BES category (ii) the respondents' interest in BES maintenance, and (iii) the importance of beaches' environmental problems. To categorize the Importance of BES (Provision, Regulation, Supporting, Cultural) high, medium and low values were proposed, as for the importance of environmental beach problems. Maintenance of BES for the future generations was a question with different categories from not interested to very interested.

The question asked about WTP was the following: *Would you be*

<sup>1</sup> The Coastal Environmental Units are coastal zone areas defined geographically for their management and contain ecosystems with similar conditions and connectivity in terms of structural and functional aspects (Decree 1120/2013, Ministerio de Medio Ambiente y Desarrollo Sostenible de la Republica de Colombia).

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