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Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Baseline

Killing the goose with the golden eggs: Litter effects on scenic quality of the Caribbean coast of Colombia

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ARTICLE INFO

Keywords:

Typology
Scenery
Litter
Management
Colombia

ABSTRACT

137 coastal sites located along the Caribbean coast of Colombia were surveyed to determine scenic quality, litter content, and typology. Scenic evaluation categorized sites into five classes. 26 appeared in Class I; 18 in Class II; 19 in Class III; 30 in class IV; and 44 in Class V. Beach type was categorized into urban (31), resort (18), rural (46), village (32) and remote (10). Litter gave 17 sites an “A” grade (excellent); 34 sites a “B” grade; 53 sites a “C” grade and 33 locations a “D” grade (poor). Almost all sites surveyed have a low scenic quality and also significant litter content. Currently, litter directly produces aesthetic problems along the study area, and improvements are necessary to favor coastal scenic quality. Stakeholders should make a significant effort to improve the scenic human parameters along the study area, litter removal and prevention being the most important.

“Nature is the goose that lays her natural and economic golden eggs (e.g. coasts), but litter is choking both the scenic aesthetics and habitat quality... killing the goose”

Coasts are the most dynamic and valued geomorphological features of earth (Nordstrom, 2000; Pilkey and Cooper, 2014). These areas are home to a vast diversity of living organisms, and they are in constant change due to a large variety of natural and anthropogenic processes. Over the last years, there has been a continuous overdevelopment of this area due to an unbridled pursuit of further benefits. The above has led to an increase in environmental impacts due to processes that include among others: litter, a ubiquitous problem on all world coasts (Williams et al., 2013; Bergmann and Gutow, 2015; Kiessling et al., 2017).

Litter is a problem that affects coastal areas and also the sea floor at all depths. Its impact is of global significance, and has been recognized as a serious pollutant problem for around 57 years (Tudor and Williams, 2001; Ryan, 2015). However, it has only gained a real recognition during the past few years.

Litter consists of items with an anthropogenic origin composed of processed solid or manufactured material that gets into coastal areas due to different sources and is transported by winds, waves, currents and rivers (Coe and Rogers, 1997; Slavin et al., 2012; Williams et al., 2013, 2016).

Litter raises health, environmental, economic and aesthetic problems mainly associated with:

- Poor waste management practices.
- Absence and the insufficiency of adequate infrastructure for collection and treatment.
- Erratic human behaviors and activities.
- Weak and fuzzy understanding on the part of the public of the potential consequences of their actions.

Part of the lure of coastal scenic quality is the human image of a perfect area. For many tourists, this may be an idealized perception of a general amalgam of palms, white sand washed by clear blue waters, overlooked by forested mountains with cascading streams and exotic flowers and fruits, under an optimal weather and above all, perfectly clean beaches (Hudson, 1986; Rangel-Buitrago et al., 2013).

The denominated “Sun, Sand, and Sea tourism” (3S) - Coastal tourism - is founded on a particular resource conjunction along the interface between sea and land. The 3S activity offers amenities, such as water, beaches, cleanliness, scenic beauty, good weather conditions, biodiversity, cultural and historical heritage, healthy food and, under “ideal” conditions an adequate infrastructure. Within the overall tourism sector, the 3S market is by far the most significant in terms of

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visitor numbers and income generated in the last decade (UNTWO, 2016).

Among tourist destinations, coasts are probably the prime factor favored for guest preferences (Honey and Krantz, 2007; Houston, 2013). For example, Caribbean beaches are one of the world's leading tourist destinations. Secluded from the bustle of busy cities of the world, the Caribbean region is known as one of the world's favorites vacation destinations. Currently, with as many as 42 million residents and 28 nations, the Caribbean region per se can be considered as one of the world's most dynamic economies.

Tourism business - especially 3S tourism - occupies one of the largest sectors of the global economy. Tourism's contribution to a Gross Domestic Product can range from 2% for small-scale tourism countries where tourism weighting can be significant, to > 20% in countries where tourism is well developed (Becker, 2013). This industry generates one in twelve jobs globally, and between 35 and 40% of the world's export services (UNTWO, 2016).

The money that can be made, or indeed lost, from 3S tourism and related industries, is enormous. Since 1990, international tourism receipts have grown by 365%, moving from 271 to 1260 Billion US\$ (UNTWO, 2016). Despite there being no exact data on coastal tourism alone, the 3S industry is considered to be one of the largest-growing forms of travel in the last three decades, and all 10 of the world's top destinations in 2016 were coastal countries.

Tourism represents one of the most important economic activities in South American countries especially in Colombia which occupies 5th place in the region with 0.23% of total world arrivals and an increase of almost 300,000 international visitors during the past five years (MinCIT, 2016; Rangel-Buitrago et al., 2017). The above suggests that the development capacity of the Colombian 3S market appears to be almost limitless. The tourist industries rapid growth meant an increase of approximately US\$ 250–500 million per year for the Colombian GDP (Rangel-Buitrago et al., 2015). The GDP relating to tourism activities (> US\$ 5000 million in the balance of payments for travel/transportation) is now the third-highest source of foreign exchange after oil and coal, exceeding exports of coffee, and others products (ANATO, 2015).

Coastal development has always actively connected with natural resource exploitation, among which is scenery, and above all, scenic quality. A coastal area in optimal conditions can mean millions of dollars profit for any zone (Clark, 1996; Rangel-Buitrago et al., 2016). Beach degradation related to litter issues produces a rejective reaction in beach users due to the feeling of unhealthy conditions and poor beach aesthetic value, among other aspects. As a result, the presence of litter is a strong reason to leave a beach or not to visit (Ryan et al., 2013).

The loss of tourism and recreational potential of a beach are very real impacts related to litter (Nelson et al., 2000; Tudor and Williams, 2001). A coastal area that relies heavily on tourism for its livelihood can have its income severely depleted by this problem. In fact, authors such as, Windom (1992), Debrot et al. (1999) and Do Sul and Costa (2007), suggested that, in some cases, the greatest impact associated with litter is not to organisms, but to the economic loss associated with the reduction of amenities in a beach.

According to the World Health Organisation (WHO), the adverse effect of aesthetic problems on the amenity value of coastal environments can produce:

- Loss of tourist days.
- Resultant damage to leisure/tourism infrastructure.
- Damage to commercial activities dependent on tourism.
- Damage to the positive image of a site.

The above effects have been experienced worldwide. For example, during 1987 the exacerbated amounts of litter found in New Jersey and Long Island produced a beach use prohibition with an estimated economic loss between 37 and 121 million user days at the beach and

between US\$ 1.3×10^9 and US\$ 5.4×10^9 in tourism-related expenditure (Valle-Levinson and Swanson, 1991).

These issues are manifest also in developing regions such as the Caribbean states, including Colombia, where natural resources may be limited and economic development now is largely dependent upon coastal tourism. To be competitive economically, If Colombia wants to increase coastal tourist numbers, it is important to know coastal tourist preferences. Five parameters are of the greatest importance to coastal visitors: i) water quality, ii) safety, iii) facilities, iv) scenery and v) no litter (Williams, 2011).

Litter along the Caribbean coast of Colombia produces deterioration of scenic quality, health hazards for humans and wildlife, substantial financial investments for 'cleanups', and currently a severe threat to the growing and productive '3S' industry. Any management plan must take cognizance of the current tourism model together with the increasing problem of beach litter; therefore litter's characteristics, impacts, and trends are deemed indispensable for effective coastal management.

In this paper 137 coastal sites, were assessed and rated according to **Scenic Quality** (Ergin et al., 2004), **Litter Grading** (EA/NALG, 2000) and **Typology** (Micallef and Williams, 2003). The goal is to analyze these three interrelated variables as indicators from a pollution management perspective opening new opportunities for the development of coastal tourism in natural areas and landscape quality improvement of current tourist-developed areas. Results presented in this work are useful to coastal managers, who need accurate coastal, landscape inventories based on ascertained facts to adopt sound management decisions.

The Caribbean coast of Colombia is a developing region divided into eight Departments including 28 Coastal Municipalities with 4,175,876 inhabitants (Fig. 1). This population (8.5% of the total national) is mainly concentrated in four commercial and tourist cities: Barranquilla, Cartagena, Santa Marta and Riohacha (DANE, 2016).

The study area includes 137 coastal sites distributed along a 2733 km coastline oriented NE-SW with some sectors oriented E-W that has generated an alternation of medium - long linear segments with Zeta curved bays (Fig. 1; Table 1). It is a complex region where tectonic processes have defined the actual topography with landscape units that include terrigenous sandy beaches, sand spits, rocky coasts, coastal plains and coastal lagoons, dunes and mangrove swamps.

Sand from rivers are the major sediment component of local beaches and availability is partially controlled by seasonal wave regimens. The supply of coarse terrigenous sediments to the Colombian Caribbean beaches comes mainly from four large rivers (Atrato, Sinú, Magdalena, and Rancheria - Fig. 1) and numerous small distributaries, which drain the Andean region. At Colombian islands (e.g., the San Andres Islands) and along some specific coastline sectors, abundant calcareous materials on the coast and shallow marine platform are provided by sub-aerial and marine erosion of Plio-Pleistocene to recent coral-reefs terraces and living reefs. A lesser percentage of sediment comes from erosion of granitic rock shore segments, outcropping along the entire coastline.

The study area lies in a semi-arid tropical environment with mean temperatures of < 28 °C and maximum precipitation values of 2500 mm yr⁻¹ making the coastal environment attractive for tourism development (Rangel-Buitrago et al., 2013). Seasonal variations show two rain periods (April–May and October–November) and two dry periods (December–March and July–September).

Tides are mixed semi-diurnal, with maximum amplitudes of 65 cm. The average significant wave height is 1.6 m and peak period average is 7 s. From November to July, the wave system along the study area is dominated by NE swells; for the remainder of the time waves from NW, WSW, and even SW occur. This seasonal variation of wave direction corresponds to a decrease in significant wave heights, with the lowest values occurring between August and October (≤ 1.5 m); whereas the highest energy conditions occur from November to July when wave heights can exceed 2 m (Rangel-Buitrago et al., 2015). Longshore sand

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