

SHORT ARTICLE

User perception of coastal risks. A practical case study on the beaches of Mayapo (Colombian Caribbean)*La percepción de los usuarios sobre los riesgos costeros. Un estudio de caso práctico en las playas de Mayapo (Caribe colombiano)*DOI: <https://doi.org/10.26640/22159045.2023.619>

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Alcides Rafael Daza-Daza¹**CITATION:****Daza Daza, A. R. (2023).** User perception of coastal risks. A practical case study on the beaches of Mayapo (Colombian Caribbean). *CIOH Sci. Bull.*, 42(2): 45-54. Online ISSN 2215-9045. DOI: <https://doi.org/10.26640/22159045.2023.619>**ABSTRACT**

Tourist beaches are sensitive and complex ecosystems that are constantly subjected to pressures derived from anthropic activities. The presence of natural phenomena increases coastal risks. The research was documentary and descriptive. The object of the study focused on assessing the perception that users have about the existing coastal risks on the beaches of Mayapo, in the department of La Guajira, Colombia. Among the results, it was found that the most frequent threat to the area of the beach comes from floods that occur in the rainy seasons, characterized by strong winds and large waves. It is concluded that the beach area currently suffers flood threats that lead to a reduction in the size of the coastal strip and damage to the present infrastructure, affecting the environmental, economic and sociocultural sustainability of the coastal territory.

KEYWORDS: Coastal risks, perception, tourist beaches, natural phenomena, La Guajira.**RESUMEN**

Las playas turísticas son ecosistemas sensibles y complejos que constantemente están sometidas a presiones derivadas de las actividades antrópicas. La presencia de fenómenos naturales incrementa los riesgos costeros. La presente investigación fue de tipo documental y descriptiva. El objeto del estudio se enfocó en valorar la percepción que tienen los usuarios sobre los riesgos costeros existentes en las playas de Mayapo, departamento de La Guajira. Entre los resultados se encontró que la amenaza más frecuente en la zona de playa procede de las inundaciones que se presentan en las temporadas de lluvias, caracterizadas por fuertes vientos y olas de gran tamaño. Se concluye que actualmente la zona de playa presenta amenazas de inundación que generan reducción de la franja costera y daños sobre la infraestructura presente, afectando la sostenibilidad ambiental, económica y sociocultural del territorio costero.

PALABRAS CLAVES: riesgos costeros, percepción, playas turísticas, fenómenos naturales, La Guajira.¹ Orcid: 0000-0003-1110-1520. Universidad de La Guajira. Email: adaza@uniguajira.edu.co

INTRODUCTION

The impacts of anthropic activities on marine and coastal ecosystems, along with the absence of a harmonious relationship between human actions and their environment, have affected the natural dynamics of these ecosystems. This has reached a point where the ecosystem services they provide have been jeopardized. Additionally, the presence of natural phenomena associated with the effects of climate change increases the coastal risks that the population may face in these territories (Ferrari, 2011). The risk factor in these natural spaces is represented by the possibility of environmental, social, and economic losses. The occurrence of disasters requires the historical construction of the past and the present in order to understand the changes that have occurred in the coastal territory (Ojeda-Rosero & López-Vásquez, 2017).

For this reason, it is understandable that the threats present in marine and coastal areas alert the population to the potential damages they may cause to a territory. In this regard, the probability of occurrence and the damages caused are fundamental conditions for assessing the level of risk that may arise in a coastal area (Galán-Gaitán & Jiménez-Miranda, 2018). Similarly, beach ecosystems are not immune to the emergence of socio-environmental problems caused by anthropic activities and natural phenomena resulting from climate change (Cantarero, De la

Fuente, & Bellido, 2023). In this sense, tourist beaches are considered a space that is sensitive to damages caused by anthropic activities and natural disasters (Daza-Daza, Castellanos-Martínez, & Jiménez-Royeth, 2020).

Regarding coastal management, the perception that users may have of their environment provides vital information to understand the relationships between different actors (Villares, Roca, & Oroval, 2015). Additionally, it makes it possible to determine the position and knowledge of residents about the phenomena and impacts that have occurred in the coastal area over the years (Roca, Villares, Oroval, & Ortega, 2014). Therefore, this work is oriented towards assessing the perception that users have about the existing coastal risks to the beaches of Mayapo, in the department of La Guajira, Colombia.

STUDY AREA

The district of Mayapo belongs to the municipality of Manaure, located in the department of La Guajira. It borders the Caribbean Sea to the north, the community of Garciamana to the south, the communities of Capichiraure and El Chorro to the southwest, and the community of Popoya to the west (Chaux, Márquez, Acero, & Gómez, 2018) (Fig. 1). The tourist beaches of Mayapo are located 30 minutes by land from Riohacha, the capital of the department of La Guajira.

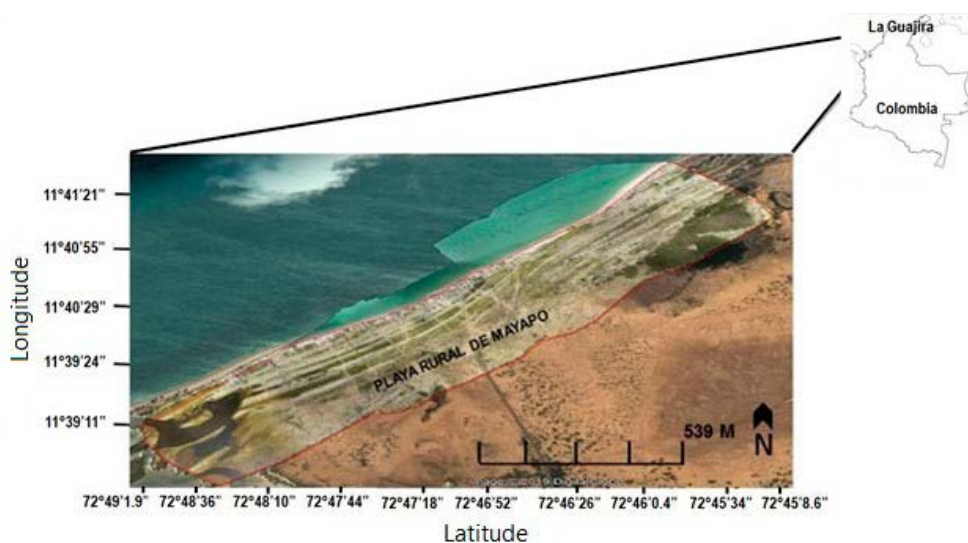


Figure 1. Location of the study area (Taken from: Daza-Daza *et al.*, 2020)

The department of La Guajira is characterized by average temperatures around 28.3°C, with scarce precipitation, mainly concentrated in September and October, when there is an average of 150 mm/month (Fig. 2). This characterizes it as a semi-arid to arid climate. The area is highly influenced by the Northeast Trade Winds, which reach average sustained speeds of 9 m/s at a height of 10 m above ground (Ideam, 2014; González & Barney, 2019; CIOH, 2020).

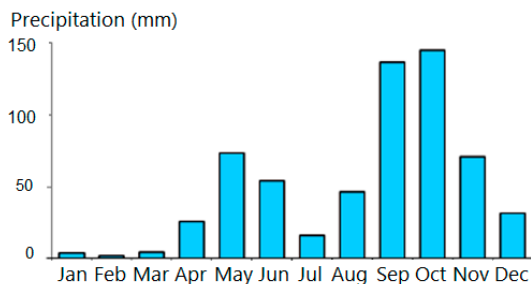


Figure 2. Precipitation in Riohacha, La Guajira (Source: Ideam, 2014)

METHODOLOGY

According to Yáñez-Arancibia and Day (2010), the coastal zone is considered a broad ecoregion with intense physical, biological, and socio-economic interactions, where there is a dynamic exchange of materials and energy between the continent, freshwater, the atmosphere, and the adjacent sea. Regarding coastal risks, Alonso, Vides, and Londoño (2001) define them as the probability of dangerous events occurring in coastal areas and the possible negative consequences that may result from these events.

Threats and vulnerability in coastal areas have been addressed by different authors. González (1990) defines a threat as the probability of the occurrence of a phenomenon to a certain magnitude at which damage can be caused. Vulnerability is defined by Blaikie, Cannon, Davis, and Wisner (1996) as the characteristic of a person or group based on their ability to anticipate, survive, resist, and recover from the impact of a natural threat. According to Alonso *et al.* (2001), threats refer to events or natural phenomena that can cause damage or endanger coastal areas, and vulnerability encompasses the susceptibility of coastal areas to suffering damage or losing resources as a result of dangerous events.

In the context of tourist beaches, the term “user” is defined as a person who uses or enjoys the beaches as a tourist or recreational destination. This includes not only tourists who visit the beach temporarily but also local residents who use it regularly (EPA, 2023). In this sense, according to Sauver, Roca, and Villares (2022), some types of users that can be found in the beach area are:

- **Local Residents:** Beaches are frequented by residents living near the beaches, who visit them to sunbathe, swim, exercise, or relax.
- **Tourists:** Beaches are popular destinations, so tourists are frequent users. Tourists visit the beaches for holidays, to explore the natural environment, and participate in water activities.
- **Families:** Beaches are attractive for families looking to spend quality time together, engaging in activities like building sandcastles, playing in the water, and recreational activities.
- **Athletes:** Beaches are also used by sports enthusiasts engaging in activities such as surfing, beach volleyball, swimming, scuba diving, etc. These users make use of the natural conditions of beaches to enjoy their favorite sports
- **Nature Lovers:** Many people visit beaches to appreciate their natural beauty and marine life. They might be interested in bird watching, exploring protected areas near the beaches, and enjoying the natural surroundings.
- **Service and Amenity Users:** People visiting the beaches to take advantage of services and amenities like restaurants, bars, beach equipment rental, loungers, umbrellas, etc.

This research was documentary and descriptive according to the classification presented by Tamayo (2001). Secondary information sources were used to understand the history of natural phenomena that have impacted the coasts of Mayapo. Additionally, direct field observation was implemented to identify evidence validating the current risks to which beach users are exposed. Subsequently, the zone was described to characterize the problems in the beach sector, and guided interviews were conducted with residents to understand their perception of existing risks (Daza-Daza *et al.*, 2020). To achieve this and following the criteria of the United States Agency for International Development (USAID, 1991), the qualitative assessment matrix in Table 1 was implemented.

Table 1. Variables considered for qualitative risk assessment (Modified from: USAID, 1991)

Variable	Description
Water conditions	The visual quality of the water was assessed, including the presence of contaminants, transparency, odor, and the presence of algae or other organisms harmful to health.
Presence of warning signs	It was checked whether there were visible signs or indicators warning about possible dangers, such as strong currents, presence of sharks, rocky areas, or presence of dangerous marine life.
Terrain conditions	The condition of the terrain was assessed, including the presence of undulations, slopes, or unstable areas that pose risks to users.
Presence of emergency services	The availability and proximity of emergency services that might be needed such as lifeguards, rescue equipment, and access to medical services were verified.
Evaluation of human activity	The number of people present on the beach was observed, as well as how they interact with the environment, and whether they follow the established safety rules.

Semi-structured interviews were conducted using intentional sampling (Otzen & Manterola, 2022), with the criteria of selecting individuals of legal age who have a longer period of residence in the beach area, and who possess extensive knowledge of the threats present in the area (Fig. 3). During the execution of the field activities, a total of 20 residents meeting these criteria were identified.

The fieldwork was supported by tenth-semester students of the Environmental Engineering Program at the Universidad de La Guajira - Fonseca Campus, during the course of the subject Emphasis III - Assessment and Management of Natural and Anthropic Risks in Marine Coastal Areas 2022-II (Fig. 4). Microsoft Excel for Windows, version 2016, was used to tabulate the information.



Figure 3. Conducting interviews in the study area



Figure 4. Field observation activities

Finally, to determine the perception of local residents about the threats, the following questions were formulated:

- Have you experienced any natural threats in the area of Mayapo beach?
- What has been your reaction after the occurrence of a natural threat?
- What measures have been taken to mitigate and/or prevent the threats in Mayapo beaches?
- Have you received information from any authority about what to do in the event of a natural threat?
- Do the beaches of Mayapo have any plan or measures to be implemented in the event of a natural threat?
- What is your opinion on the use of native vegetation as a strategy to mitigate natural threats in the beach area?

RESULTS AND DISCUSSION

Background of natural phenomena that have impacted the coasts of Mayapo

The La Guajira Peninsula and the islands of San Andrés and Providencia are the areas in Colombia with the highest risk to the threat of storms coming from the East (Ortiz-Royero, 2007). In the 1980s and 1990s, the department of La Guajira was affected by the outer edges of around 25 hurricanes in the Caribbean Sea (Corpoguajira & Invemar, 2012). The report of threatening marine meteorological events for the department of La Guajira in the period 1966-2016 obtained from the DESINVENTAR database also showed that the most frequent threat is flooding, followed by strong gusts of winds (Invemar & Gobernación de La Guajira, 2018).

Currently, according to comments from local residents, natural threats continue to occur in the beach area. These threats include tidal surges, stream overflow, and torrential rains, which have caused severe flooding and changes in sand transport dynamics (coastal erosion), leading to the destruction of coastal infrastructure (thatched palapas, public bathrooms, kitchens, and supporting walls) and deterioration of mangrove ecosystems.

Research conducted by Rangel and Anfuso (2012), demonstrates that historical records of beach ecosystems in the municipality of Manaure show an accretion of beaches of 33.7 m in 32 years, equivalent to rates of +1 m/year. It is necessary to clarify that while it is true that natural phenomena such as hurricanes have not directly hit the shores of the Mayapo district, La Guajira, due to its geographical position, is the second most likely zone in Colombia to be affected by the outer edges of hurricanes. This is because in the Caribbean, hurricanes move from East to Northwest (Corpoguajira & Invemar, 2012).

Perception of residents about the natural threats present in the area

Based on the responses obtained from the interviews, in general terms, the most frequent threat in the beach area corresponds to floods that occur during the rainy seasons, characterized by strong winds and large waves. These cause damage to existing infrastructure (destruction of thatched palapas, restaurants, and hotel buildings), economic losses due to the inability to offer products to tourists (crafts, food sales), and a reduction in the beach area due to sediment transport. Likewise, there was evidence of the concern of local residents regarding the periodicity of natural phenomena, as they expressed that "if flood threats occurred regularly, Mayapo would cease to exist."

When assessing the residents' perception of their responsiveness to threats, it was found that after natural events, the local community engages in recovery activities such as salvaging wood from palapas and other useful items. They emphatically stated that they carry out these actions independently, without receiving support from any state institution.

Regarding the question "What measures have been taken to mitigate and/or prevent the threats in the beaches of Mayapo?" It was found that, to mitigate the effects of floods, the local community has extracted sand from the beach itself to build protective barriers (Fig. 5a) and used wheelbarrows to transport beach sand (Fig. 5b) and fill flooded access roads, thus ensuring the entry of tourists with their vehicles. This action may be potentially exacerbating the problem due to the loss of sediment in the beach area.



Figure 5. Management actions by the local population **(a)**, and items used for transporting sand **(b)**

Regarding the awareness of local residents about the existence of any risk management plan, it is apparent that there is no such management tool. Additionally, they stated that institutional presence is low, as institutional actors are only present during vacation seasons.

The perception of local residents regarding the importance of conserving mangrove ecosystems and their use as a mitigation measure against flood threats, revealed that they believe having mangroves on the coastal zone does not prevent the floods that occur. One reason given is that the strong currents in the area would sweep away mangrove species. In this regard, some considered that groins could be a good course of action. It is crucial to note that according to some local residents, back in the days when the beaches were untouched and there was no road, the Mayapo area was blanketed with mangroves and boasted an extensive stretch of beach. However, with the construction of the road, tourism made its way to the area, prompting locals to clear mangroves, construct palapas, and establish access roads.

In this sense, it is clear how the impacts resulting from natural phenomena and anthropic activities have affected not only tourism, but

also the scenic quality of the beach ecosystems. Regarding this, the study on the perception of beach landscapes in the Colombian Caribbean conducted by Botero, Anfuso, Williams, and Palacios (2013) found that users who visit rural beaches prefer them for their clean sand, clear waters, natural vegetation, and morphological characteristics such as cliffs, rocky platforms, caves, arches, and dunes.

Anthropic activities, and the associated effects and risks in the beaches of Mayapo

During the study, anthropic activities were identified, and their effects can have a negative impact on tourism, the health of coastal ecosystems, and the protection of the coastline. Among these activities is the extraction of sand and seashells (Fig. 6a), used to fill in flooded roads, with the main effect being the reduction of the width of the beach (Fig. 6b). The accumulation of solid waste from restaurants, hotels, and hostels (Fig. 6c) leads to the contamination of mangrove ecosystems and areas with stagnant water (Fig. 6d), becoming breeding grounds for vectors.

Manual raking of the sand and constant foot traffic from tourists and residents affect the

natural regeneration processes of mangrove propagules (Fig. 6e) and hinder their natural growth. Meanwhile, the transit of motorcycles and vehicles (Fig. 6f) causes soil compaction and loss of vegetative cover. All of this is in addition to the absence of environmental authorities and disaster risk management institutions.

Based on the above, Pérez (2021) suggests that anthropic activities in coastal areas can increase risks in beach areas. He states that the activities with the greatest impact are: increased tourism, material extraction, domestic waste, and poorly planned tourism.

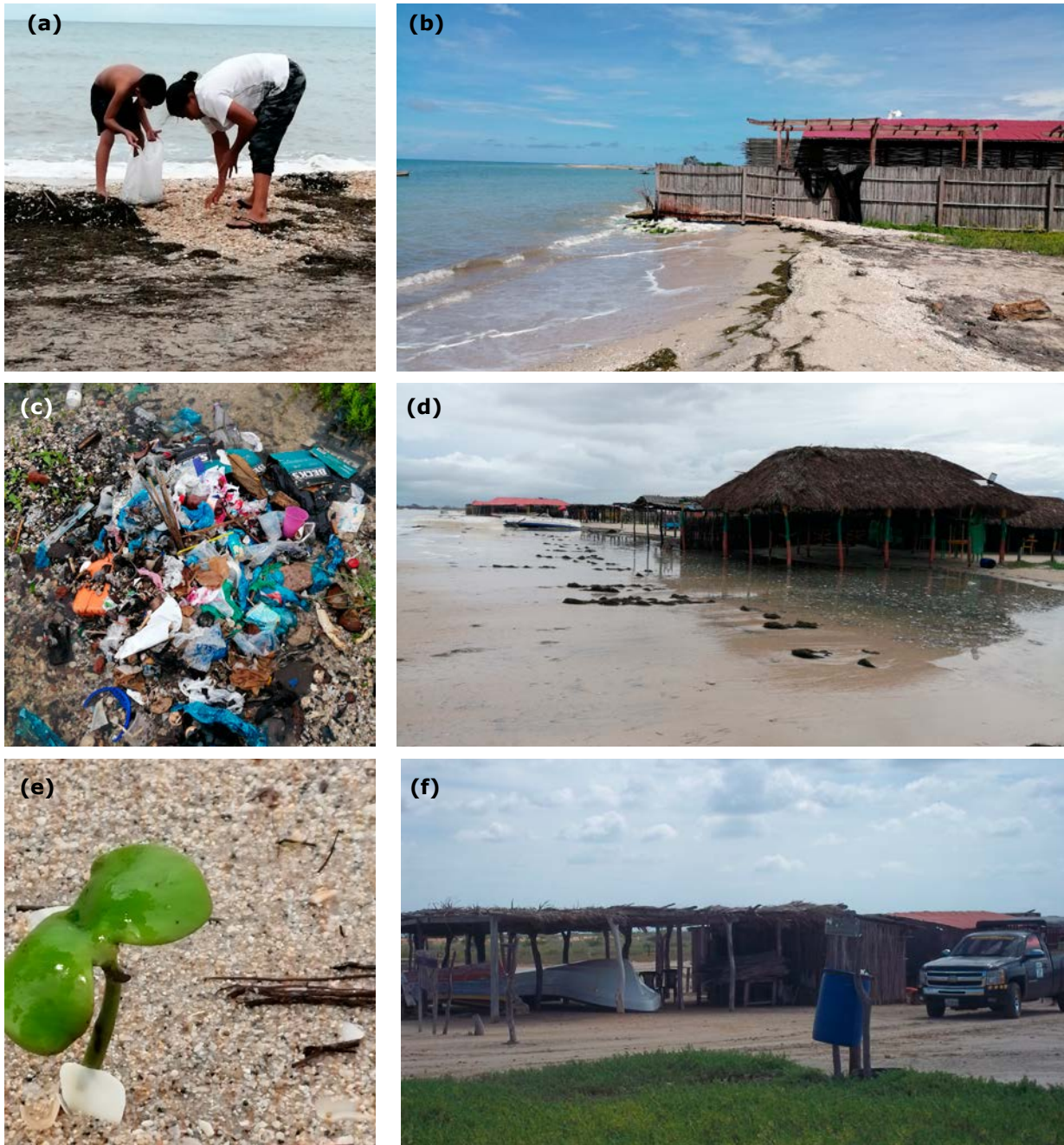


Figure 6. Anthropic activities and effects identified in the beach area. Extraction of seashells **(a)**, reduction of the coastal strip **(b)**, accumulation of solid waste **(c)**, flooding of infrastructure **(d)**, mangrove propagules **(e)**, and vehicle traffic **(f)**

CONCLUSIONS

The beaches of Mayapo currently pose risks to users, stemming from threatening marine meteorological events and anthropic activities that negatively impact the coastal ecosystem.

The extraction of sand from the beach by local residents, as a mitigation measure against flooding processes, can affect the stability of the coastline due to sediment loss. Additionally, the construction of containment walls with sandbags from the beach disrupts natural sedimentation processes, affecting the natural dynamics of the beaches and their ability to provide protection against extreme weather events.

The lack of a risk management tool for Mayapo beach has negative effects on its state and conservation. Moreover, institutional absence in the coastal area can lead to inappropriate use of the current ecosystems, jeopardizing their sustainability.

The negative perception among local residents regarding the effectiveness of mangroves as a mitigation measure demonstrates the need to create spaces for dialogue with the population to enhance understanding of disaster risk management. This includes knowledge about threats, reduction strategies, and response and recovery activities, which have no negative consequences for the ecosystems of Mayapo beach and its users.

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