



Environmental Perception of Solid Waste Management in the Hurtado Balneary, Colombia

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Abstract Environmental perception serves as a powerful tool for identifying community needs and potential within their surroundings. This study assessed tourists' environmental perception regarding solid waste and its impact on the Hurtado Balneary, located in Valledupar, Colombia. The investigation delved into the environmental attitudes and behaviors of 769 balneary users by employing a combination of observation, photographic documentation, and a comprehensive 21-question online survey. The findings are 98.8% of participants acknowledged the adverse effects of solid waste on the environment, with 98% demonstrating a willingness to participate in waste management efforts. Furthermore, 42.13% exhibited limited awareness regarding waste management practices, reflecting a concerning lack of public interest and commitment (41.61%). Statistically

significant disparities ($p > 0.05$) emerged 59% of waste items were not appropriately disposed of in designated receptacles. Reasons for this included a lack of a sense of belonging (50.2%) and inadequate environmental education (45.6%). Ninety-six percent expressed the need for river conservation signage, while 59.8% did not undertake any form of environmental training. The study's implications extend beyond the Hurtado Balneary, potentially informing solid waste management strategies in other aquatic environments. This investigation aligns with three Sustainable Development Goals: SDG 12, emphasizing responsible consumption and production; SDG 13, addressing climate action; and SDG 15, advocating for life on land and below water.

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1 Introduction

The tourism sector's substantial financial contribution of \$8.9 trillion, which represents about 10.3% of the global gross domestic product in 2019 (World Travel and Tourism Council, 2019; Chen et al., 2021), has a twofold impact. While tourism brings economic benefits to local economies, it also imposes considerable stress on the environment (Cheng & Zhang, 2017). This strain has led to a rise in ecological damage and pollution in tourist destinations. Unfortunately, a significant number of tourists exhibit limited restraint, environmental awareness, and self-discipline, resulting in behaviors that can be deemed uncivilized (Wang et al., 2018, 2019; Zhang et al., 2011). Such conduct contributes to ecological issues in these areas, thereby posing challenges to their overall ecological health (Sisneros-Kidd *et al.*, 2021), compelling nations to seek more efficient strategies for managing tourism (Larijani, 2010; Miller et al., 2015; Rodríguez-Rodríguez, 2012).

The Hurtado Balneario, situated in Valledupar, Colombia, serves as a prime example of this situation. Acting as a major attraction in a municipality of 532,956 inhabitants within the Cesar department, the area is subdivided into 25 territorial divisions, 102 villages, 204 neighborhoods, and 15 settlements (Valledupar, 2020). The balneario grapples with planned disruptions in environmental quality, largely attributed to the surge of tourists (Brown et al., 2010; Valledupar, 2020). The upsurge in unsustainable tourism practices and informal trade has triggered negative environmental consequences, evident through the accumulation of waste in riverbeds and riparian zones. This disruption alters landscapes and impacts water quality indicators such as dissolved oxygen, pH levels, organic matter concentration, and suspended solids, particularly in sections of the river frequented by tourists (Valledupar, 2020).

Rivers play a crucial role in activities such as aquaculture, irrigation, recreation, electricity generation, and public water supply (Khatri & Tyagi, 2015). The escalating global demand for river water amplifies water extraction, leading to a decline in

available water volume. Simultaneously, these rivers receive waste from human activities, causing changes in both water quantity and quality. These alterations disrupt communities, users, aquatic ecosystems, vegetation, and riverside fauna. The pollution of rivers has negative repercussions on human health, access to quality water for economic and recreational uses, and the well-being of aquatic biodiversity. Given the high human traffic in these areas, strategic planning for spaces, facilities, and tourist activities becomes imperative to protect the environment and sustain the allure of natural resources for future generations (Castro et al., 2014; Wolf et al., 2019).

This underscores the importance of sensitizing both visitors and those responsible for managing the Hurtado Balneario. Consequently, the exploration of environmental education initiatives becomes crucial, often spearheaded by higher education institutions involved in raising awareness. Environmental education proves to be a powerful tool in addressing environmental impacts, aiming to foster ecological and environmental safeguards (Palmer, 2002). By influencing perceptions and actions, environmental education encourages individuals to adopt responsible behaviors (McClelland, 1973), making it indispensable for advancing sustainable development (Michelsen & Fischer, 2017). Recognizing intrinsic motivations within human behavior is pivotal in mitigating anthropogenic environmental effects (Otto et al., 2014; Porras Del Vecchio, 2022), given the transient nature of extrinsic incentives (De Young, 2000).

The interaction between environmental education and perception is closely tied to individual and societal dynamics (Portz et al., 2020). This understanding underscores the role of individual perceptions as a catalyst for environmental education, shaping behaviors within social contexts. Additionally, the evolution of media provides novel avenues for reshaping human environmental attitudes (Silva et al., 2016), necessitating reflection on social practices in situations marked by environmental degradation.

Considering this, the evaluation of environmental perception among visitors to the Hurtado Balneario takes on a pivotal role, offering insights into how individuals perceive and respond to environmental challenges. The study's goal was to assess tourists' environmental perception concerning solid waste and its impact on the Hurtado Balneario and Guatapurí River

in Valledupar, Colombia. Utilizing observations, photographic records, and an online questionnaire, the study engaged 769 users, probing their perceptions and behaviors toward waste disposal. Through analyzing their conceptions, actions, and behaviors, the study aims to provide insights to inform strategies for solid waste management.

Neckel et al. (2020), Chung et al. (2023), and García et al. (2023) state that recommendations for the use of ecological spas include reinforcement of education and environmental awareness, with actions aimed at the correct disposal of waste generated by tourists on the premises of Balneario Hurtado. This study becomes relevant on a global scale by reinforcing the need to study environmental preservation in ecological spas intended for tourism practices, which highlight conservation, together with public use, capable of mitigating environmental impacts on the Hurtado Balneario simultaneously.

The innovation of this study lies in the comprehensive approach to tourists' environmental perception regarding solid waste and its impact on the Hurtado Balneario, in Valledupar, Colombia. Furthermore, this study's connection to three Sustainable Development

Goals (SDGs)—SDG 12 (responsible consumption and production), SDG 13 (climate action), and SDG 15 (life on land and below water)—expands not only its reach but also its relevance, positioning it as a replicable model in other tourist destinations (Hsieh et al., 2023; Ortiz-De-Montellano et al., 2023). This methodological approach and the results obtained in this study contribute to the development of effective strategies on a global scale aimed at managing waste generated by tourists during visits to such areas.

2 Materials and Methods

In the context of the Hurtado Balneario and the Guatapurí River, situated within Valledupar, Colombia, with a population of 532,956 residents, the area faces environmental challenges stemming from tourism and waste management practices (Valledupar, 2020). This region occupies 4493 km², constituting 18.8% of the Cesar department's total extension. The municipality encompasses 102 villages, 204 neighborhoods, and 15 settlements (Valledupar, 2020). The Hurtado Balneario (Fig. 1), a natural water reserve critical to

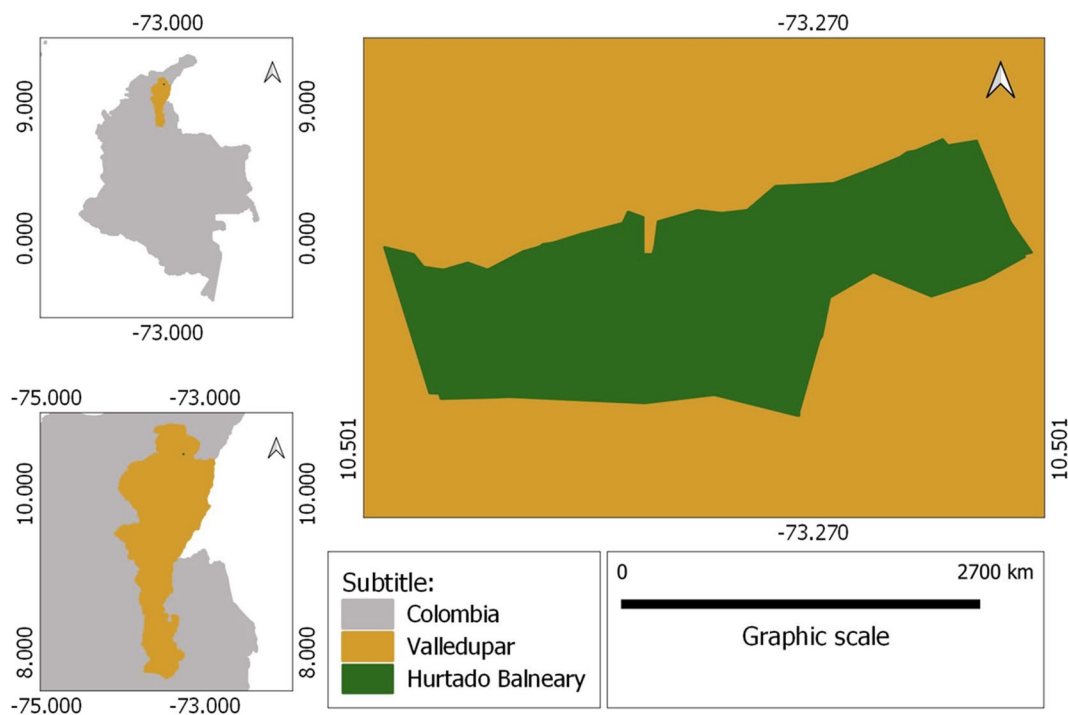


Fig. 1 Location of Hurtado Balneario in Colombia

the balneary, experiences significant water contamination (Quintero-Corrales et al., 2021). The Hurtado Balneary, a recreational space, witnesses a surge in visitors during weekends, resulting in soil and water impacts and an influx of organic and inorganic waste, including food remnants, packaging, and various disposables. However, the management of waste collection spaces remains problematic.

This challenge is amplified during peak visitor periods, exacerbated by a lack of dedicated personnel to monitor behavior. Current waste collection is primarily performed by on-site staff, who hastily collect visible waste shortly after its generation. Unfortunately, this approach fails to address waste that eventually finds its way into the river, becomes embedded in the ground, or is dispersed by wind, leading to environmental degradation. Moreover, no comprehensive assessment of local species and the impacts of continuous human presence and waste on them has been conducted.

Emphasize the necessity for more stringent regulations, surpassing existing norms, through the implementation of proven standards and indicators for managing solid and liquid waste, along with compensatory measures to mitigate adverse impacts. The present state of the Hurtado Balneary serves as an example of conventional management, where visitors habitually leave various forms of waste near the river and recreational areas. Despite the presence of waste bins, these facilities are often underused, as visitors frequently opt to dispose of waste directly on the ground or into the river currents. Notably, compliance with Resolution 2184 of 2019 (MADS, 2019), which mandates color-coded waste separation at its source to promote national waste segregation, is lacking.

The research employed a survey method to collect data on attitudes, beliefs, behaviors, and values. This included semi-structured questionnaires, photographic records, and observations, engaging 769 balneary visitors between May and July 2023 via an online platform. The survey aimed to understand participants' perceptions of solid waste, water, and their habits influencing these aspects, as well as their comprehension of the balneary.

Quantitative and qualitative data were collected. The study analyzed quantitative data using Microsoft Excel to generate percentages and graphs, while qualitative data from questionnaires and observations were subjected to thematic analysis to identify

patterns and themes. Moreover, Pearson's chi-square test was employed to analyze the statistical significance of differences in response distributions between groups.

The research delved into the analysis of perception in the Hurtado Balneary, adopting a methodological framework proposed by Hurtado (2012), incorporating criteria examined by other researchers (Benez et al., 2010; Hernández-Solorzano, 2018; Valera, 2002). The study's methodology culminated in a detailed analysis of perceptions and behaviors related to solid waste, informing strategies for waste management and environmental conservation.

This study underscores the need for enhanced waste management practices and environmental education in the Hurtado Balneary to mitigate the detrimental effects of tourism and waste on the ecosystem. By utilizing a multi-faceted research approach, encompassing qualitative and quantitative methods, the study provides valuable insights into the perceptions and behaviors of balneary visitors. This approach paves the way for informed decision-making and the development of sustainable strategies, ultimately contributing to the preservation of natural resources and aligning with global sustainability goals.

3 Results and Discussion

3.1 Diagnosis of the Situation of Organic and Inorganic Solid Waste of the Hurtado Balneary on the Banks of the Guatapurí River

The Hurtado Balneary is experiencing a lack of proper waste management, particularly along the banks of the Guatapurí River. Various types of solid waste, including glass bottles, plastic containers, disposable items, plastic bags, straws, dry branches, and food scraps, are being improperly discarded at this location (Fig. 2). It is crucial that this waste is disposed of correctly and collected regularly to prevent its accumulation and potential migration to the riverbed through wind action.

Figure 2 illustrates the concerning environmental situation at the Hurtado Balneary, highlighting the inappropriate disposal of solid waste. Plastic, glass bottles, plastic bags, and face masks are the most observed waste categories in this area. This can be



Fig. 2 Photograph taken at the Hurtado Balneary, Colombia, showing various garbage strewn along the shore

attributed to the excessive consumption of alcohol, soft drinks, and disposable products used by leisure visitors, leading to a significant quantity of waste composed of these materials. These results are from the study conducted by Chapelle and Gouin (2015), which suggests that tourist destinations produce a diverse range of waste materials, primarily including organic waste, cardboard, paper, glass, tin, plastic, and packaging. Similarities were also found in Dias Filho et al. (2011) study conducted at Boa Viagem beach in Pernambuco, Brazil, where plastic waste was prevalent. The waste composition at the Hurtado Balneary resembles that of Nairobi, as noted by Karanja (2005), who emphasized the abundance of plastic bags of different sizes and colors. Karanja (2005) also observed an increase in food packaging, bottling, and the use of cans by the local population.

The increase in non-biodegradable substances is thought to be driven by the global expansion of the economy (Karanja, 2005). Solid waste is not only growing in volume but is also undergoing compositional changes, with plastics emerging as the predominant component. Lopes and Cornelian (2017) identified residents as the main contributors to environmental issues on Peruíbe beach in São Paulo, Brazil. Proper management of solid waste is crucial to address environmental pollution that impacts the soil, river water, landscape, and terrestrial and aquatic ecosystems. Additionally, it can lead to the proliferation of vectors such as flies, mosquitoes, rodents, and diseases. ASEO DEL NORTE S.A E.S.P, CORPOC-ESAR, and leaders of the mayor's office are expected

to have the authority to address these problems. If inspections are being conducted by these organizations, these issues should be identified and resolved promptly.

3.2 Socioeconomic Characteristics of Respondents in the Study Area

The demographic characteristics of the respondents revealed that a larger proportion of women (64%) participated in the survey compared to men (36%). The results obtained from the profile of the interviewees, in which the majority are female, are by the National Population and Housing Census carried out in 2018, where a total of 49,395,678 people were projected for the year 2019, representing 48.8% of men and 51.2% of women (DANE, 2018).

The sample is represented mostly by local visitors (86%), while the percentage of tourists was 11% and traders only 3%. Although the sample is somewhat varied in terms of age, older people are often an exception (those 50 and over make up only 18% of the sample). About 53% of those surveyed were between the ages of 25 and 50, with the second largest group being those under 25 (29%).

3.3 Level of Knowledge, Behaviors, and Perceptions of the Users of the Hurtado Balneary Regarding Organic and Inorganic Solid Waste

An attitude is a conceptual framework that reflects an individual's preferences or aversions toward an object or concept. Attitudes can also be perceived as a learned predisposition to assess things from a specific perspective. These assessments typically fall on a spectrum between favorable and unfavorable, occasionally encompassing a sense of uncertainty (neutrality). The amalgamation of knowledge and attitudes holds substantial sway in shaping people's conduct, choices, and judgments. In the context of solid waste, positive attitudes can substantially enhance waste management practices, while negative attitudes can impede effective waste management strategies.

It is important to note that attitudes are not static; they possess a dynamic nature. The same factors that contribute to the formation of attitudes can also pave the way for attitude transformation. In examining attitudes, one must consider the socio-economic traits of

the respondents and their inclinations towards managing solid waste.

3.4 Level of Knowledge Regarding the Difference Between Solid Waste

The waste classification process consists of separating them into different components. The waste can be sorted manually on the site and collected through steel collection programs, or it can be separated automatically in installations that recycle materials or employ mechanical biological treatment systems. The volume of solid waste that must be disposed of is reduced through classification, which reduces expenses and the burden of waste disposal. The classification of waste also improves the recycling of various resources. The results for this variable are shown in Fig. 3A, which shows that the majority of those surveyed (more than 95%) know what they are inorganic. There was a significant statistical difference at

the level of significance at 5%, p -value = 0.145. To inorganic solid waste (93%), there was little statistical difference at the level of significance at 5%, p -value = 0.056. This means that the type of user and the knowledge regarding solid waste are dependent.

The results of Fig. 3A show that almost 100% of the respondents answered that they know what organic and inorganic solid waste are, indicating that there will be no difficulties in the proper separation of waste. Most of these materials can be recycled through different processes carried out by recycling and composting plants.

3.5 Knowledge Regarding the Problem of Contamination of the Guatapurí River

Figure 3 B and D provides insights into the surveyed participants' awareness of the Guatapurí River contamination issue. In terms of waste disposal, 28.6% (220) acknowledged that waste ends up in the sea,

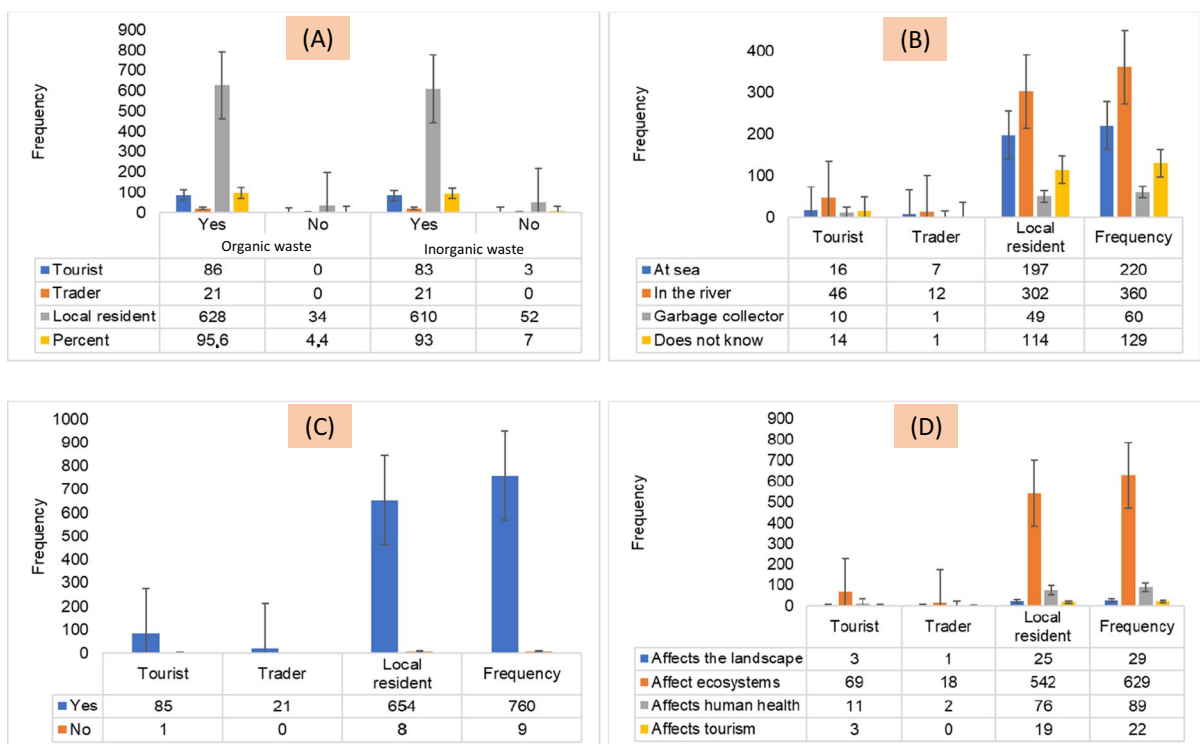


Fig. 3 **A** Knowledge of balneary users about the difference between solid waste (Do you know what solid waste is?); respondents' level of knowledge regarding the problem of contamination of the Guatapurí River: **B** What do you think is the fate of the solid waste that is thrown into the river?; **C** Do you

think that solid waste pollution affects the environment?; and **D** What impacts do you think are generated by the solid waste that is thrown into the river? The vertical bars represent the standard error of 769 answers

while 46.8% (360) believed it to be in the river; other respondents were unsure (Fig. 3B). There was a statistically significant difference with a p -value of 0.325. When considering the environmental impact, a substantial 98.8% (760) recognized that solid waste contamination adversely affects the environment (Fig. 3C), with a significant p -value of 0.523. Examining the consequences of waste dumped into the river, 81.8% (629) indicated that it harms ecosystems (Fig. 3D), accompanied by a significant p -value of 0.248. These findings underline the interdependence between user type and knowledge of solid waste disposal.

3.6 Perception of Visitors About the Causes of Contamination by Solid Waste

The problems of aptitudes and perceptions of the visitors to the balneario about the causes of pollution in the study area influence the littering behavior of

people. To gauge respondents' views regarding their knowledge of the causes of pollution, they were asked questions about environmental problems that result from improper waste disposal, among other things. Figure 4 A and D show the possible causes of the impacts generated by solid waste.

According to the results shown in Fig. 4 A, laziness was the main reason for not placing solid waste in the cans, followed by the fact that there are few in the Hurtado Balneario. There was no statistically significant difference at the 5% significance level, p -value = 0.005. This means that the type of user and his perceptions of the cause of the contamination are independent.

The reasons why solid waste is thrown on the ground are the lack of ownership and the lack of environmental education (Fig. 4 B). There was a significant statistical difference at the level of significance at 5%, p -value = 0.393. This means that the type of user and the perception as to the cause of contamination

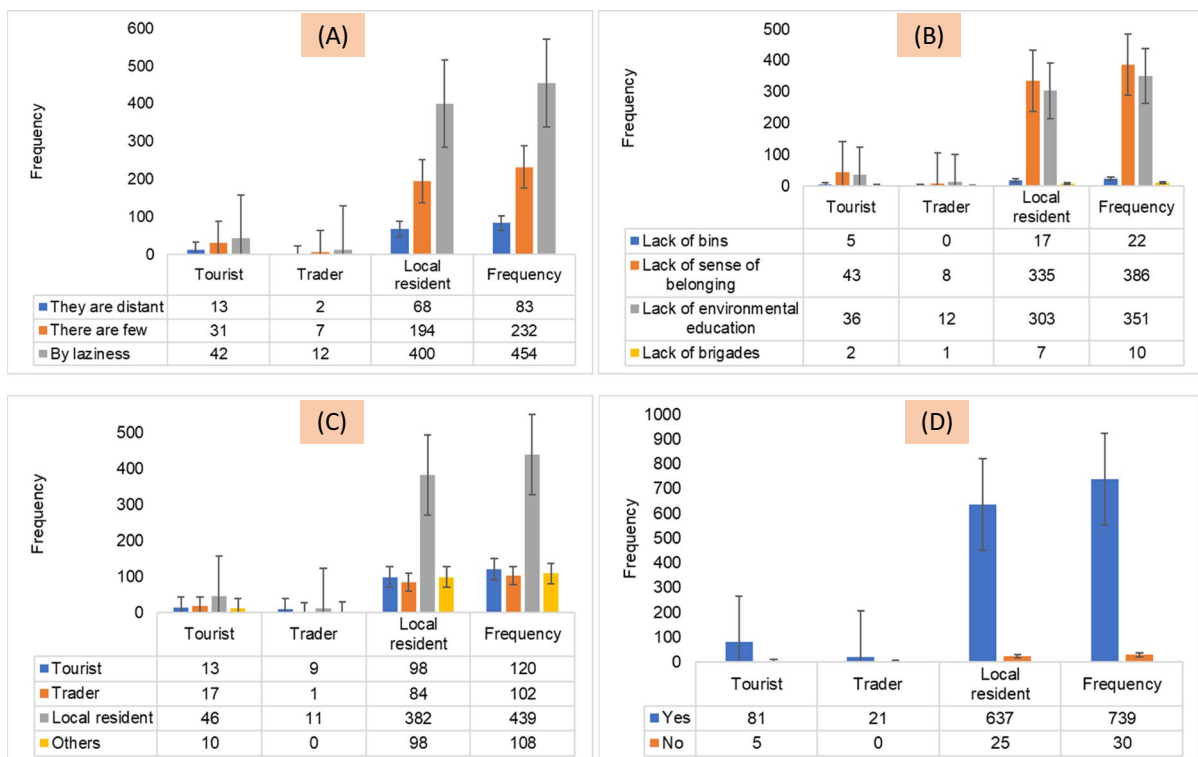


Fig. 4 Perceptions of the respondents regarding the causes of contamination by solid waste in the Hurtado Balneario (769 responses): **A** Why do you think they don't use the bins located in the balneario to deposit waste?; **B** Why do you think peo-

ple throw solid waste on the ground?; **C** What do you think is the cause of the contamination of the Guatapuri river by solid waste?; **D** Do you think that signage is needed for the conservation of the river?

by solid waste in the balneary are dependent. Figure 4 C shows that most of the respondents consider that the residents are the main responsible for the contamination of the Hurtado Balneary. There was a significant statistical difference at the level of significance at 5%, p -value = 0.983. This means that the type of user and their perceptions of the main causes of solid waste contamination are dependent.

Figure 4 D most of the users affirmed that signaling is needed for the conservation of the river. There was a significant statistical difference at the level of significance at 5%, p -value = 0.423. This means that the type of user and the perception regarding the need for signaling for the conservation of the Guatapurí River are dependent.

Given the above, the accumulation of solid waste inside and outside the bins was the most relevant environmental impact observed by the researcher, followed by the absence of bins. The Hurtado Balneary lacks a basic infrastructure to maintain cleanliness, which makes even the collaboration of users concerning the conservation of the site impossible. The absence of adequate bins for the selective disposal (in colors, black, white, and green) of the waste contributes negatively to the occurrence of accumulation of solid waste in the extension of the balneary. Similar results were found by Silva and Souza (2013) in Praia do Farol, in Pará, Brazil, where 56.6% of those surveyed pointed to the excess of “garbage” as one of the most significant environmental impacts in the area. In a study conducted by Santana-Neto et al. (2011) at Porto da Barra beach, Bahia, Brazil, it was observed that 84.3% of tourists also considered the inappropriate disposal of solid waste in the vicinity as a recurring environmental impact. For Farias (2014) and Rozelee et al. (2015), this situation is worrying, because the accumulation of solid waste not only affects the landscape but also interferes with the quality of human life, in aquatic and terrestrial ecosystems.

According to Rezende et al. (2009) and Tripto et al. (2013), the frequent occurrence of environmental degradation may be related to the lack of environmental education, which must educate people about the importance of the rational use of natural resources since it can affect the way, they perceive and are related to the environment. Changes in human behavior are one of the key steps in solving environmental problems. Therefore, environmental education must be seen not only to protect the environment but also as a tool that can maintain

a harmonious relationship between man and nature, depending on the attitudes of everyone within this system. In this context, Silva et al. (2016) and Wang et al. (2022) argues that it is necessary to establish actions that prioritize human well-being, the preservation of natural resources used as tourist attractions, and the sustainable use of these places.

A culture of consistent untidiness has been fostered by a combination of indolence and disregard. Neglect has led individuals to casually discard waste without considering the repercussions of their actions. A substantial portion of the population remains unaware of or underestimates the adverse consequences of littering on the environment. This arises from the notion that individual actions have minimal societal impact. Consequently, the sight of individuals disposing of items like wrappers and cigarette butts in public areas is all too familiar. A prevailing belief among many is that others will assume the responsibility of tidying up after them, leading to a scenario where the duty of waste cleanup frequently falls upon local authorities and taxpayers (Makhtar et al., 2021).

3.7 Behaviors Regarding User Waste Disposal

Figure 5 A shows the behavior of the users of the balneary regarding the disposal of waste, only 2.2% of the users of the balneary do not adequately dispose of the waste they generate. There was a statistically significant difference at the level of significance at 5%, p -value = 0.180. This means that the type of user and perception regarding the destination of solid waste are dependent.

If I could verify that the conscious act made, the proper disposal of solid waste by the users of the Hurtado Balneary shown in Fig. 5 A is not in line with the reality that is present in the place, given that the environmental impact was more perceived as inappropriate generation and disposal of solid waste. Hence, Evison and Read (2001) emphasize that human behavior presents a significant impediment to the effective execution of solid waste management strategies, necessitating a shift through environmental education. It is logical to assert that the limited understanding exhibited by survey participants regarding waste management methods and their unfavorable dispositions constitute major catalysts for waste issues (Yousefi et al., 2019). Notably, the absence of adequate receptacle installations was

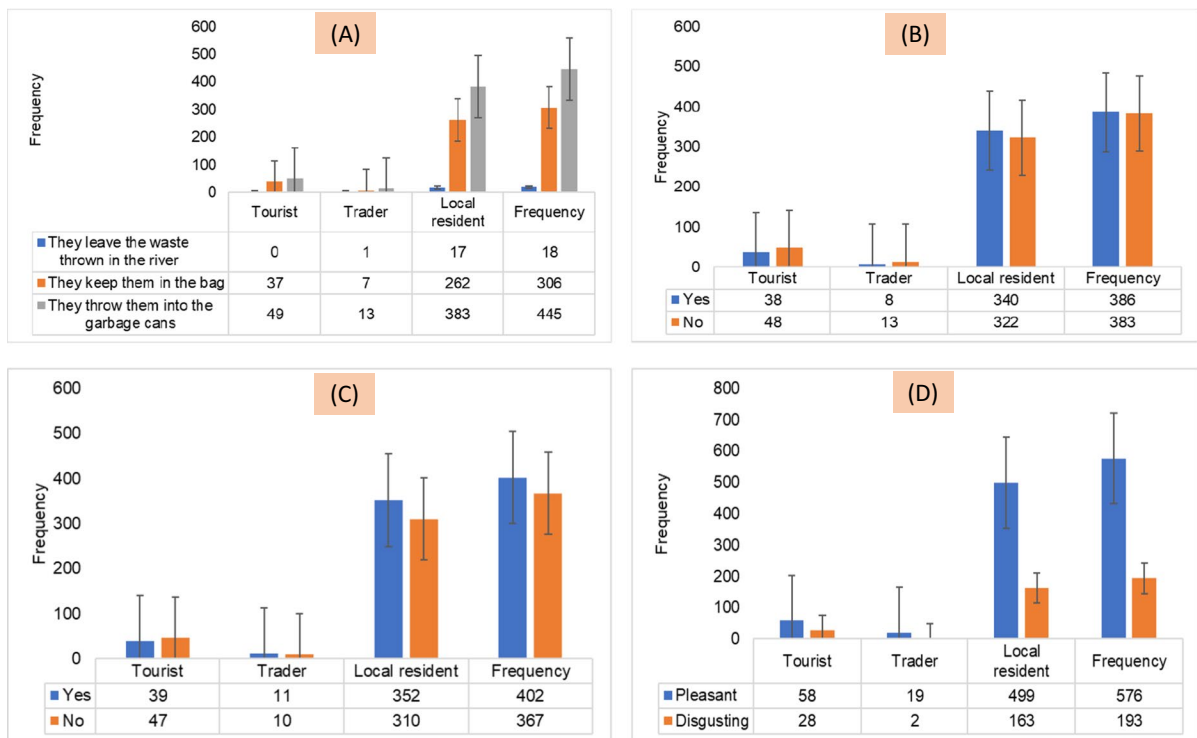


Fig. 5 Behavior of the users of the balneary regarding the disposal of their waste (A What do you do with the solid waste that you generate at the balneary?). Perceptions about the conditions of the Hurtado Balneary (769 responses): B Are there

adequate conditions in the Hurtado Balneary to comply with the care of the environment?; C Do you think the balneary is sustainable over time?; and D How do you perceive the moment of enjoying the balneary?

also highlighted by the survey participants as a factor contributing to waste challenges (depicted in Fig. 4 B).

Sichaaza’s comprehensive study (2009) delved into public attitudes towards solid waste management, unearthing three key themes: a dearth of knowledge concerning waste reduction, classification, and composting; insufficient presence of educational and awareness initiatives; and an overall pessimistic outlook towards waste management practices. This phenomenon was observed throughout public spaces in Lusaka, the capital of Zambia, where a lack of awareness and negative attitudes towards responsible waste handling led to observable adverse outcomes. The prevalence of negative attitudes was traced back to inadequate education and issues intertwined with waste management practices.

3.8 Perception of Visitors Regarding the Conditions of the Hurtado Balneary

Figure 5 B and D show the results of the perceptions of visitors to the Hurtado Balneary regarding their conditions. It is interesting to observe the results presented in Figure 5 B and C, for the differences in the percentages of the responses of the participants to the question about the conditions of the balneary if they comply or not with care for the environment and sustainability a the long of the time. There was a significant statistical difference at the level of significance at 5%, p -value = 0.242. This means that the type of user and the perceptions about the conditions of the Hurtado Balneary are dependent (Fig. 5 B). There was a significant statistical difference at

the level of significance at 5%, p -value = 0.879. This means that the type of user and the perception regarding the sustainability of the balneary are dependent (Fig. 5 C). The percentage of participants who believe they have sustainability and conditions is 52.3% and 50.2%, while 47.7% and 49.8% believe they do not have sustainability and care conditions in the Hurtado Balneary, respectively. Sixty-five percent perceive the balneary as pleasant while 35% consider that it is not (Fig. 5 D). There was a significant statistical difference at the level of significance at 5%, p -value = 0.069. This means that the type of user and the perception of the spa environment are dependent.

Quintero-Corrales et al. (2021) showed that tourists and residents meet their physiological needs in the river, which increases the possibility of spreading some infectious diseases. Additionally, the study carried out by Martínez-García et al. (2022) revealed that the lower Guatapurí River habitat proves to be a little diverse with a lower score concerning the Hurtado Balneary area and that this low score is mainly due to tourist activity.

SDG target 6.2 necessitates the collective efforts of various stakeholders to ensure universal access to suitable drinking water, equitable sanitation, and hygiene practices, while also eradicating open defecation by 2030 (Moro et al., 2022). Given that the Sustainable Development Goals (SDGs) encompass three fundamental dimensions—environmental, economic, and social sustainability—the responses of the participants were dissected to reveal their implications across these dimensions, which collectively form the foundational pillars of the SDGs (Moro et al., 2022).

Examining environmental sustainability, the scrutiny of responses, as depicted in Fig. 5 B and D, a collection of photographs captured by the researcher. These visuals exposed unsuitable behaviors in waste disposal, contributing to environmental degradation and the contamination of the Guatapurí River. Consequently, these actions have instigated the deterioration and depletion of biodiversity. Transitioning to economic sustainability, users' attitudes toward waste disposal carry the potential to escalate collection expenses for the Valledupar municipality. In terms of social sustainability, these behaviors can introduce environmental contamination—spanning air, soil, and water bodies—culminating in public health predicaments. A direct consequence of the improper disposal of waste is the onset of illnesses, impacting public

health and potentially carrying socioeconomic ramifications for both the local populace and any individuals encountering the tainted surroundings.

The water right is not expressed in the Political Constitution of Colombia, however, to the extent that all human beings are guaranteed the enjoyment of their human rights since they are universal, indivisible, and interdependent, linked to each other, belonging to the community; denotes the construction that the water right is interrelated with other rights such as to life, to the dignity of the human person, to adequate food, to health, and the environment, for which reason it needs constitutional recognition, to be True, an authentic fundamental right. For this reason, there is an intense international impulse to support the right to water for its universal recognition, whose understanding is shared by Albuquerque and Roaf (2012), who express the thought when they affirm that this right must be provided for in national Constitutions, emphasizing that the most developed legal frameworks are found in countries that explicitly recognize the rights to water and sanitation. Since national constitutions define the roles and responsibilities of all, this recognition emphasizes the national commitment to the rights of all and ensures their incorporation into national law. In addition, the recognition provides an essential reference point for policymakers, government ministries, judicial bodies, and civil society, all to influence policy, set norms, and hold political actors accountable (Table 1).

3.9 Level of Knowledge of Respondents Regarding the Use of Solid Waste

The level of knowledge of the Hurtado Balneary users is presented in Fig. 6 A, B, and C. The option to sell (264) and make didactic material (262) were the ones that presented the highest frequency regarding the use of inorganic waste while the majority of those surveyed (573) said that organic waste can be composted. There was a significant statistical difference at the level of significance at 5%, p -value = 0.65 and 0.446. This means that the type of user and his knowledge about the use of inorganic and organic solid waste, respectively, are dependent. When asked about their knowledge of the 4R policy, 83.7% (647) of the respondents said they were aware (Fig. 6A). There was a significant statistical difference at the level of significance

Table 1 Categories, indicators, questions, and variables of perception analysis in the Hurtado balneario. Source: Indicators and variables used to test hypotheses

Categories	Variables	Indicators	Questions
Environmental perception	Users	Knowledge about the difference between solid waste and the pollution problem. Origin/cause of contamination.	Do you know what organic solid waste is? Do you know what inorganic solid waste is? What do you think is the fate of the solid waste that is thrown into the river? What impacts do you think are generated by the solid waste that is thrown into the river? Do you think that solid waste pollution affects the environment? Why do you think they don't use the bins located in the balneario to deposit waste? Why do you think people throw solid waste on the ground? What do you think is the cause of the contamination of the Guatapuri River by solid waste? Do you think that signage is needed for the conservation of the river?
Environmental behavior	Users	Solid waste disposal. Perception of balneario conditions. Knowledge before the use of solid waste.	What do you do with the solid waste that you generate at the balneario? Are there adequate conditions in the Hurtado Balneario to comply with the care of the environment? Do you think the balneario is sustainable over time? How do you perceive the moment of enjoying the balneario? Do you know how inorganic solid waste (paper, cardboard, metal, plastic, glass) can be used? Do you know what can be done with organic solid waste? Do you know the policy of the four Rs (reduce, reuse, recycle and recover) solid waste?
Social perception	Users	Knowledge about environmental insecurity Mitigation	Are you aware of the dangers we run if we neglect the environment (water and soil pollution, death of fauna and flora)? Have you participated in any environmental training aimed at raising awareness about the efficient use of solid waste? Would you be willing to collaborate with good management and final disposal of solid waste?
Perception of environmental risk	Users	Services and quality of life	Do you consider that ASEO DEL NORTE S.A E.S.P. adequately manages the solid waste from the balneario? Is CORPOCESAR committed to caring for the water of the Guatapuri River?

Source: Adapted from Benez et al. (2010), Valera (2002), and Hernández-Solorzano (2018)

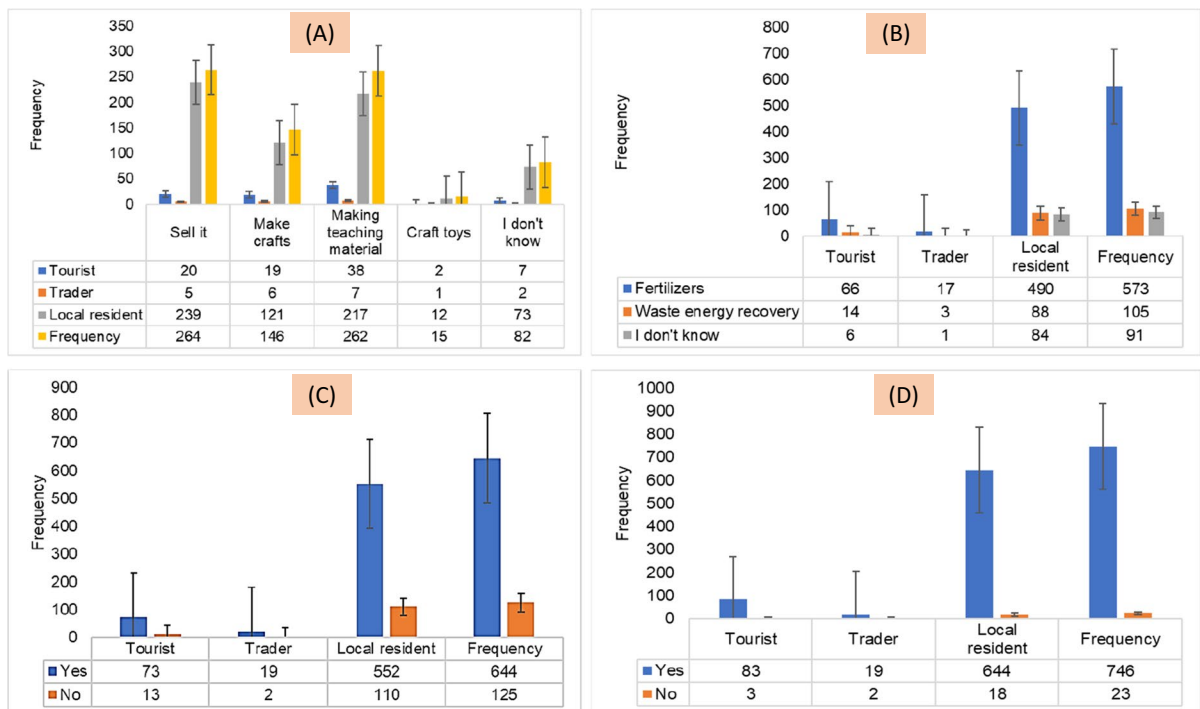


Fig. 6 Knowledge of the users of the Hurtado Balneario regarding the possibilities of using organic and inorganic solid waste: **A** Do you know how inorganic solid waste (paper, cardboard, metal, plastic, glass) can be used?; **B** Do you know what can be done with organic solid waste?; **C** Do you know

the policy of the four Rs (reduce, reuse, recycle and recover) solid waste?; Knowledge of the users of the Hurtado balneario about the dangers of not caring for the environment: **D** Are you aware of the dangers we run if we neglect the environment (water and soil pollution, death of fauna and flora)?

at 5%, p -value = 0.65. This means that the type of user and the knowledge regarding the 4 RS policy are dependent.

These results point to the need for environmental education in the Valledupar community to generate knowledge and awareness to efficiently manage solid waste, not only in the Hurtado Balneario but also in the municipality. In this sense, Madrid León (2012) in his study presented a comprehensive solid waste management plan for the central market of the Canton of Esmeraldas, in Ecuador, where he discusses the importance of raising awareness about the separation of solid waste for future purposes. However, the separation of waste does not make sense if there is no method of treatment and use for each waste. Arbolada Montaña (2009) presented in his dissertation a plan for the integral management of solid waste in the Gorgona National Park in Cauca, Colombia. He mentioned that visitors should be made aware of the solid waste generated in the park since the park produces more waste per capita than the national average.

Ramdas and Mohamed (2017) assessed visitor and resident perceptions of the impacts of tourism on water quality in the Redang and Perhentian Islands in Malaysia, using 469 questionnaires. The results showed that there is a high level of agreement for both visitors and residents regarding the water quality of both islands affected by tourism. The authors' suggestions were to establish the carrying capacity and incorporate environmental education in the sustainable management of tourism to broaden the perception of visitors. The beaches of the island of San Andrés in Colombia had high levels of contamination by solid waste, due to human activities, mainly by tourists and residents, and inadequate waste disposal (Portz *et al.*, 2020).

The environmental problem caused by the increase in solid waste is partly due to the lack of education and environmental responsibility to classify it as the source and reuse it as raw material for new products (Uba *et al.*, 2023). Integrated solid waste management contributes to the sustainable conservation of

natural resources. In the five semesters that the La Salle University Corporation developed the program, it saved more than 18 million pesos in cleaning costs and reduced the amount of waste for disposal in sanitary landfills. Other benefits include the production of compost and the sale of recycled materials (Castrillón Quintana and Puerta Echeverri, 2004).

3.10 Level of Knowledge of the Respondents About the Insecurity Regarding the Contamination of Water, Soil, and Affections of the Ecosystems of the Hurtado Balneario

The results obtained on the level of knowledge of the users of the Hurtado Balneario regarding the sanitary insecurity that solid waste can generate are presented: 97% of the users of the Hurtado Balneario know the risks of contamination by solid waste. There was a significant statistical difference at the level of significance at 5%, p -value = 0.189. This means that the type of user and the knowledge regarding insecurity and the risks of contamination by solid waste are dependent.

The results shown in Fig. 6 D are like those of Martínez-García and Zequeira-Cuervo (2018) who observed that the impacts caused by anthropic activity in the Hurtado Balneario were tourism, recreation, mismanagement of solid waste of this activity, the degradation of the riparian forest, the alteration of the banks, and urbanization. The riverside forest of the Hurtado Balneario, which presents the worst quality, is of poor quality since it presents extreme degradation. The riparian forest downstream of the Hurtado Balneario has received less impact, but compared to the riparian forest upstream, it shows a significant loss of floristic biodiversity and considerable degradation. Martínez-García and Zequeira-Cuervo (2018) have attributed the lack of environmental education and infrastructure to the poor disposal of solid waste in the Hurtado Balneario, these materials are dumped into rivers by wind action or by the bathers themselves. These are then carried away by the wind, but a certain amount of it precipitates, allowing organic matter to decompose in the water and facilitating the formation of sludge that can favor the presence of some species of macroinvertebrates and other disease-carrying vectors that adapt to these conditions (Silva et al., 2021). Additionally, solid waste production contributes to negative economic and social as well as environmental effects because it reduces the tourism potential,

contaminates the environment with pathogenic microorganisms, and costs public organizations money to clean up the natural environment. This money could be better used for other purposes (Moore, 2008). Since the negative environmental impacts generated by activities such as tourism and commerce have progressively increased waste, accompanied by poor management, which may be prone to depositing both in the Guatapurí river bed and the riparian areas and may negatively alter the physicochemical characteristics such as organic matter, solids in suspension, dissolved oxygen, pH, among others, of the areas of the Guatapurí river that are used by bathers in the Hurtado Balneario (Martínez-García et al., 2022).

3.11 Level of Knowledge of Users Regarding the Efficient Use of Solid Waste

The results obtained on the level of knowledge of the users of the Hurtado Balneario regarding training for the efficient use of solid waste are presented in Fig. 7 A. 59.8% of the users of the Hurtado Balneario have not participated in environmental training and 40.2% said yes. There was a significant statistical difference at the level of significance at 5%, p -value = 0.603. This means that the type of user and the knowledge regarding the conscious use of solid waste are dependent.

This discovery carries significant weight as it underscores the imperative of initiating an environmental education initiative as the initial step. This educational program aims to heighten the community's consciousness and instill a sense of ownership (Hasan & Idris, 2014). The accurate identification and incorporation of these factors into solid waste management strategies are pivotal for fostering environmental consciousness. Such inclusion ensures the effectiveness of these initiatives, further underscoring the criticality of an interdisciplinary approach when tackling environmental issues, as demonstrated here—specifically, the realm of solid waste management within aquatic ecosystems (MADS, 2015).

3.12 Willingness to Collaborate with Good Management and Final Disposal of Solid Waste

When the respondents were asked about their willingness to participate in improving solid waste management services, the results obtained indicated that

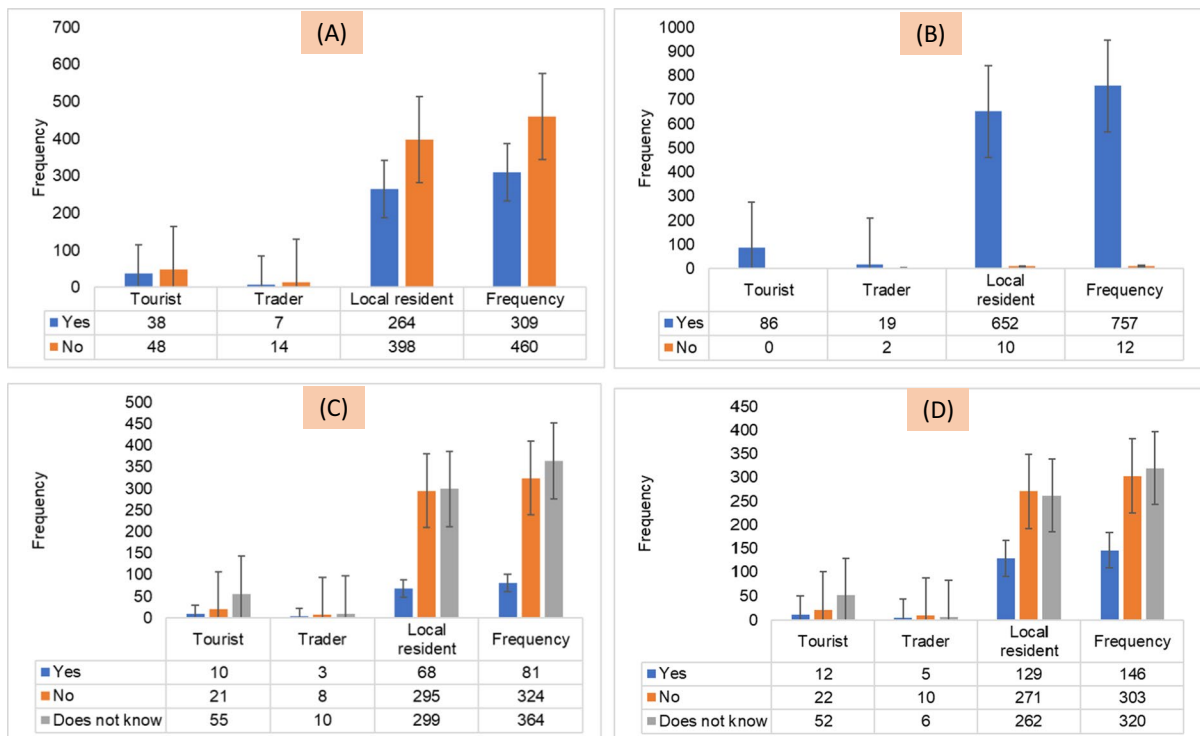


Fig. 7 Knowledge of the users of the Hurtado Balneario regarding training for the efficient use of solid waste: **A** Have you participated in any environmental training aimed at raising awareness about the efficient use of solid waste?; Willingness to collaborate with good management and final disposal of solid waste: **B** Would you be willing to collaborate with good management and final disposal of solid waste?; Percep-

tions about the solid waste collection services of the Hurtado Balneario and CORPOCESAR's commitment to the Guatapurí river: **C** Do you consider that ASEO DEL NORTE S.A E.S.P. adequately manages the solid waste from the balneario?; **D** Is CORPOCESAR committed to caring for the water of the Guatapurí River?

(98%) would be willing to collaborate with good management and final disposal of solid waste (Fig. 7 B). According to the results of Fig. 7 B, it was possible to verify that 98% of the respondents are willing to collaborate with the good management of solid waste from Hurtado Balneario. There was no statistically significant difference at the 5% significance level, p -value = 0.007. This means that the type of user and the willingness to collaborate with the proper management and final disposal of waste are independent.

Solid waste and its management, which is everyone's responsibility, cannot be attributed solely to the responsibility of local authorities. The protagonists that generate waste must be the same people responsible for its management, that is, everyone: society, public administrations, private initiatives, and even tourists. Gradually, from the moment in which the tourist experiences are shared collectively, inserting

the socio-environmental problems of the tourist destinations—which goes from the encouragement to the commitment and reciprocity with the conservation of the environment and the improvement of the quality of life of the local population—it is possible to affirm the existence of a new pattern of tourism, that is, the sustainable one (Silva et al., 2021).

If there are sustainable development indicators; sustainable tourism indicators; and the Comprehensive Solid Waste Management Policy in the country, which offers guidelines to be implemented, in short, a sufficient framework of information, there is no excuse for the local government of Valledupar to evade the responsibility of adequately managing the solid waste of the Hurtado Balneario and encourage new practices about the management of these materials in the local community. The fact is that there are problems: an increase in solid waste due to tourist

activity; the non-recycling of waste by the municipality since only pressed materials are classified and sold; the lack of selective collection; the inefficiency of the municipal plan for comprehensive management of solid waste; and the absence of the 4RS policy. However, solutions to these problems are possible through public policies and environmental education that includes tourists, residents, and businessmen of the city.

3.13 Perception of Visitors Regarding the Solid Waste Collection Services of the Balneario and CORPOCESAR's Commitment to the Guatapurí River

Figure 7 C and D show the results of the perceptions of visitors to the Hurtado Balneario regarding the provision of services and the government's commitment to the Guatapurí River. The perception of the respondents about waste management was also measured to verify the commitment to keep the balneario facilities clean by the institutions responsible for public sanitation; 364 (47.4%) said that ASEO DEL NORTE S.A. E.S.P. adequately manages the solid waste from the balneario while 324 (42.1%) did not know how to answer.

There was no statistically significant difference at the 5% significance level, p -value = 0.009. This means that the type of user and the perceptions regarding the cleanliness of the balneario are independent. 41.6% (320) said they do not know if CORPOCESAR is committed to caring for the water of the Guatapurí River, while 303 (39.4%) consider that it is not (Fig. 7 C and D). There was a significant statistical difference at the level of significance at 5%, p -value = 0.945. Since the p -value is greater than the significance level, the null hypothesis is not rejected. This means that the type of user and the perceptions regarding the commitment of the government of Cesar are dependent.

User perception of environmental issues can be a better basis for planning and management so that collaboration between stakeholders can be implemented. This is supported by Meppem (2000) and Tress and Tress (2003), who stated that dialogue sessions between managers and stakeholders are encouraged, supporting and sharing decisions.

Leff (1995) argues that sustainable development depends on ecosystem characteristics based on

biological resources, environmental services, and sociocultural and political ideologies. In terms of solid waste management, an effort should be made to provide environmental services instead of logistics services that move materials from the point of waste generation to final disposal. In addition, it is necessary to pay attention to responsible consumption, respecting the balance between human activity and its impact on nature, to promote sustainable development.

Likewise, the UN body (2017) the Sustainable Development Goals (SDG) sets common goals on issues such as water, air, and soil, to achieve better current living conditions and ensure the life of future generations, respecting ecosystems. Specifically, regarding solid waste management, the Sustainable Development Goals include goal six, which aims to "guarantee access to water and its sustainable management and sanitation for all." The effective provision of public services is an opportunity for citizens to live and work in peace and contentment and to promote development. In particular, the proper management of solid waste can be a decisive factor in improving urban environmental conditions, positively affecting not only the environment but also all the economic actors involved in this activity.

The results of behaviors and perceptions of the users of the Hurtado Balneario indicated that tourist activities have negative impacts on the environmental attributes of the study area. This evidences that the implementation of more cans, awareness campaigns, and environmental education for the community that enjoys the balneario must be included in the solid waste management plan and thus contribute to the improvement of environmental conditions, reducing insecurity regarding dangers of the contamination of water, soil, and affectations of the ecosystems of the Hurtado Balneario.

4 Solid Waste Management Plan for the Hurtado Balneario, Guatapurí River in Valledupar, Department of Cesar, Colombia

The main problems diagnosed in the Hurtado Balneario through the observation and photographic record of the researcher and the answers obtained from the survey were that the bins located in the balneario are not used to deposit waste due to the lack of

bins and because of user laziness. Users throw solid waste on the ground for lack of a sense of belonging and environmental education. Signage is needed for the conservation of the Guatapurí River. That the company ASEO DEL NORTE S.A E.S.P. does not adequately manage the solid waste from the balneary, and that CORPOCESAR is not committed to caring for the water of the Guatapurí River. Faced with this scenario, there is a need for a solid waste management plan since the solid waste generated in the Hurtado Balneary increases local waste production, which generates financial and logistical pressures for the local government of Valledupar.

The average monthly cost per inhabitant is \$2250 for collection and transportation and \$860 for final disposal. Valledupar has a population of 532,956 people, which represents a monthly expense of \$1,657,493,160.00. This cost does not include cleanup activities, which are also expensive. The municipality has limited logistics of solid waste, containers, and garbage cans available in the Hurtado Balneary. Furthermore, the “Los Corazones” sanitary

landfill in Valledupar is grappling with spatial constraints. Competent waste management not only ensures the enduring viability of the surveyed region but also plays a pivotal role in upholding the allure of the destination. Benefits include income generation from the sale of recyclable materials, development of good community relations, odor reduction, landscape and sanitation improvements, and increased tourist satisfaction. It should be noted that before implementing a solid waste management program, regulations and strategies designed to promote greater use of waste and the formalization of recyclers must be considered. The possible actions for the main activities to be carried out in the Hurtado Balneary and the regulatory and planning instruments for waste management in Colombia are presented in Fig. 8.

Solid waste management services primarily encompass activities such as waste collection, transportation, and treatment. These services hold significant importance in maintaining the cleanliness of tourist regions, thus serving as a crucial component. Consequently, they also contribute to the sustenance

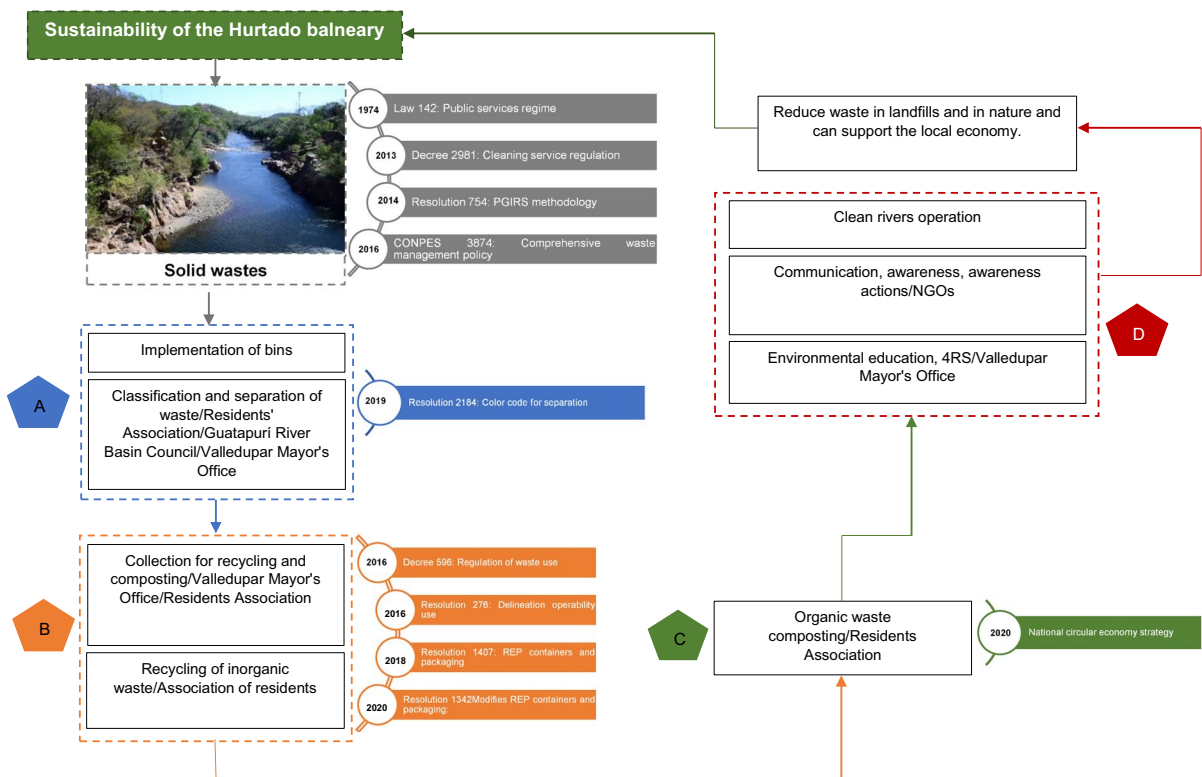


Fig. 8 General model proposed for the organic and inorganic solid waste management plan in the Hurtado Balneary

of economic and social dynamics within tourist destinations (Lakioti et al., 2017). The objective of this management plan is to recover, take advantage of, and value solid inorganic and organic waste. This operation requires a prior classification of waste at the Hurtado Balneario to separate recyclable fractions and organic waste, making it necessary to implement more cans. These may oversee the residents' association the Guatapurí River Basin Council and the Valledupar mayor's office (Fig. 8, point A). The latter will be responsible for financing and organizing solid waste management activities. The city mayor's office could collaborate with the collection companies and recyclers, additionally, control and monitor the system, as well as establish collection objectives for recycling and composting to be respected by the residents' association that will be the operator of the system (Fig. 8, point B).

Organic solid waste poses a challenge for municipal and local entities, as it escalates collection and treatment expenses. Additionally, it contributes to CO₂ emissions and leachate generation within landfills. Notably, proper source-based sorting could enable the recovery of this waste through composting. The primary aim of this technical approach is to mitigate an existing issue rather than generate composting-based revenue. The resultant compost could serve agricultural needs within Valledupar municipality (Fig. 8, point C). To execute this, a well-defined strategy called "Operation Clean Rivers" is suggested, targeting effective communication, awareness, and infrastructure for source-level waste segregation. In the context of the Hurtado Balneario, this role could be effectively played by non-governmental organizations (NGOs) for communication and awareness initiatives, along with local authorities such as the Valledupar mayor's office, which can facilitate an environmental education and 4Rs training program (reducing, reusing, recycling, recovering) (Fig. 8, point D). This holistic solution has the potential to augment the local collection of recyclable materials, consequently minimizing their presence in landfills and natural settings, while also bolstering the local economy.

River and garbage do not mix! Solid waste contamination can remain on the banks of the Guatapurí River for a long time, generating soil and water contamination, affecting aquatic and terrestrial ecosystems, proliferating disease-causing vectors, and putting human health at risk. The cleanliness of the

balneario should receive special attention from all the actors throughout the year. Communication and awareness campaigns with various slogans, signs, and awareness guidelines are needed for traders, residents, and tourists (Silva et al., 2021).

Ensuring the sustainability of pristine rivers necessitates key components such as active engagement, effective leadership, strategic planning, and prudent governance. Introducing awareness initiatives targeting visitors at Hurtado Balneario can assume a pivotal role in ensuring the pristine state of the region while facilitating the recuperation of recyclable materials and the composting of organic waste. The main objectives of the solutions proposed for the management of solid waste in the Hurtado Balneario are to improve the efficiency of waste management activities (proper disposal, collection, recycling, and cleaning); create new employment opportunities and support the economic sector (recyclers, composters, and agriculture); and minimize waste to landfill, thus reducing CO₂ emissions.

Nonetheless, the implementation of viable alternatives for the sustainable management of solid waste within the balneario necessitates a multi-faceted approach. Alongside this, it is imperative to develop a robust infrastructure for recycling inorganic solid waste, adopt source separation practices to curtail waste generation, and sustain an ongoing regimen of awareness and education targeting diverse waste contributors. The engagement of non-governmental organizations (NGOs) can further fortify the sustainable framework of the Hurtado Balneario.

Several recommendations can be proposed to enhance the solid waste management at the balneario. Elevating the effectiveness of solid waste management models can be achieved through the establishment of diverse initiatives such as training programs and awareness campaigns to bolster the technical and environmental expertise of municipal staff. Moreover, addressing the lack of professional knowledge and experience among local and national authorities as well as waste management personnel could be tackled through specialized training endeavors for decision-makers and other stakeholders (Patel, 2024). Such efforts could facilitate the exchange of best practices with international entities and countries (Patel, 2024).

Emphasizing public education and sensitizing residents while fostering comprehensive communication with all stakeholders is pivotal. By doing so,

active participation in the waste management process is ensured (Patel, 2024). Implementing waste sorting at the source, along with the segregation and separation of waste, holds the potential to significantly diminish waste generation and reduce associated costs in collection, transportation, and landfill management. This approach can contribute to a surplus of clean recyclable materials, subsequently fostering new economic avenues and employment prospects (Patel, 2024).

Enhancements are essential for augmenting the budget allocated to solid waste management activities within tourist destinations (Tsai et al., 2021). Primarily, fostering collaboration among all stakeholders within the waste management sector of tourist municipalities holds the potential to address numerous challenges by distributing financial responsibilities across various partners (Tran et al., 2002; Patel, 2024). This collaborative approach could alleviate the financial burden on the municipality (Tsai et al., 2021).

Integration of waste collectors is a pivotal facet in establishing a comprehensive and sustainable solid waste management framework in the Hurtado Balneario, particularly concerning material recovery operations. Exploring the integration of waste collectors within this framework aims to enhance waste recovery processes and ameliorate the working conditions of collectors.

The government should actively promote alliances and cultivate models for solid waste management in aquatic environments, centered on waste reduction, reuse, recycling, recovery, and composting (Andrade et al., 2019; Tsai et al., 2021). Moreover, the government's role should encompass bolstering both companies and communities through initiatives like pilot projects, financial support, training, technical assistance, information exchange, and continuous monitoring. For instance, the municipality can stimulate small-scale private composting endeavors by forming contracts to secure the product for a period of 3 to 5 years for application in municipal or private undertakings. Using regulations, rigorous enforcement, and the establishment of economic incentives, the government can stimulate improved waste management practices and facilitate market creation to ensure effective waste collection and recycling (Minn et al., 2010; Tsai et al., 2021). Educational initiatives, such as organizing conferences, seminars, and workshops, publishing training materials, showcasing case studies, and best practices, as well as

offering technical and financial aid, should also be a focal point (Keong, 2021).

The Department of Cesar's government is advised to adopt a dual-pronged approach, encompassing both "bottom-up" and "top-down" strategies. The "bottom-up" approach, crucially, entails the rejuvenation of the "Los Corazones" sanitary landfill in Valledupar. Conversely, the "top-down" strategy revolves around source waste minimization, valorization, and pre-treatment before disposal. While this approach demands more time and effort, its comprehensive impact is paramount (Keong, 2021).

5 Conclusion

The study delved into the multi-faceted impacts of tourist activities on the Hurtado Balneario's environment, shedding light on how tourist behaviors exacerbate not only the balneario's ecological challenges but also those of the Guatapurí River. Through a comprehensive investigation, it became evident that solid waste mismanagement prevails within the Hurtado Balneario, with improper waste disposal being a prominent concern.

The survey conducted as part of this study aimed to capture tourist perceptions, behaviors, and knowledge concerning environmental impact. The outcomes underscored tourists' belief in the substantial adverse effects of tourism-related activities, development, and infrastructure on the environment. This underscores the heightened awareness and concern among tourists about the ecological consequences of their actions.

The strategies recommended for the creation of a solid waste management plan for the Hurtado Balneario are rooted in addressing the problematic waste disposal practices that result in negative environmental and social outcomes. The study found a lack of awareness, ownership, and education among the local population regarding proper waste disposal. This deficiency leads to mismanaged organic and inorganic solid waste within the balneario, as observed both by the researcher's fieldwork and survey results.

Implementation of the proposed solid waste management plan, including awareness campaigns and environmental education for the Valledupar community, offers a promising avenue for enhancing the balneario's condition. Effective signage and user-friendly

waste bins are vital components. Installing warning signs in areas prone to uncivil behavior can also foster improved visitor conduct.

Infusing environmental education into the tourist experience can pave the way for positive action. Environmental education can foster a positive attitude toward the environment among tourists, making it a pivotal aspect of sustainable solid waste and tourism management. It is important to acknowledge that the research was limited to the perspectives of the interviewees rather than relying on purely scientific data or mathematical models. The study, conducted during peak tourist periods, experienced limitations inherent to cross-sectional research, which focused on weekend visitors facing heightened pollution and environmental disturbances.

The findings from this study are anticipated to extend beyond the Hurtado Balneario, offering insights for better solid waste management practices in similar aquatic settings. Future research could replicate this study to validate data applicability and compare outcomes in diverse tourist destinations. Moreover, this research aligns with Sustainable Development Goals 12, 13, and 15, reflecting its contribution to broader global sustainability objectives.

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Data Availability It does not apply to that specific section.

Declarations

Conflict of Interest The authors declare no competing interests.

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References

- Albuquerque, C., & Roaf, V. (2012). *Derechos hacia el final: buenas prácticas en la realización de los derechos del agua y al saneamiento*. ONGAWA. Disponible en: https://sr-water-sanitation.ohchr.org/pdfs/BookonGoodPractices_sp.pdf.
- Andrade, L. C. D., Rodrigues, L. R., Andrezza, R., & Camargo, F. A. D. O. (2019). Lago Guaíba: uma análise histórico-cultural da poluição hídrica em Porto Alegre, RS, Brasil. *Engenharia Sanitária e Ambiental*, 24, 229–237.
- Arboleda Montaña, N. (2009). *Programa de manejo integral de residuos sólidos en el parque nacional natural Gorgona*. Cauca Disponible en: <https://repositorio.utp.edu.co/server/api/core/bitstreams/771afae6-9de0-455b-9135-73a9fcc12666/content>
- Benez, Mara Cristina., Kauffer -Michel, Edith F., Álvarez-Gordillo, Guadalupe del Carmen. (2010). *Percepciones ambientales de la calidad del agua superficial en la microcuenca del río Fogótico*, Chiapas Frontera Norte, 22, núm. 43, enero-junio, pp. 129-158.
- Brown, T. J., Ham, S. H., & Hughes, M. (2010). Picking up litter: An application of theory-based communication to influence tourist behaviour in protected areas. *Journal of Sustainable Tourism*, 18(7), 879–900.
- Castrillón Quintana, O., & Puerta Echeverri, S. M. (2004). Impacto del manejo integral de los residuos sólidos en la corporación universitaria lasallista Revista Lasallista de Investigación, vol. 1, núm. 1, junio, 2004, pp. 15-21 Corporación Universitaria Lasallista Antioquia, Colombia. *Revista lasallista de Investigación*, 1(1), 15–21.
- Castro, R. B., Neaman, A., Reyes, F. V., & Elizalde, P. G. (2014). El conocimiento ambiental y el comportamiento proambiental de los estudiantes de la Enseñanza media, en la Región de Valparaíso (Chile). *Revista de Educacion*, 364, 66–92. <https://doi.org/10.4438/1988-592X-RE-2014-364-255>
- Chapelle, S., Gouin, S., 2015. *Observatoire des Multinationales*. Disponible en: <http://multinationales.org/Dechets-la-face-cachee-du-tourisme-de-masse-en-Tunisie>
- Chen, P., Zhao, Y., Zuo, D., & Kong, X. (2021). Tourism, water pollution, and waterway landscape changes in a traditional village in the Huizhou Region, China. *Land*, 10(8), 795.
- Cheng, W., & Zhang, Y. (2017). Research on the impact of tourism development on regional ecological environment and countermeasure based on big data. *Technology Bulletin*, 55, 464–470.
- Chung, L., Chao, C., Liao, M., Kao, C., & Lu, D. (2023). Effectiveness and appropriateness of core areas in an integrated protected area: A case study of Ecological Protected Areas in Yangmingshan National Park, Taiwan. *Environmental Science & Policy*, 145, 175–187. <https://doi.org/10.1016/j.envsci.2023.04.012>
- DANE. (2018). DEPARTAMENTO ADMINISTRATIVO NACIONAL DE ESTADÍSTICA. Censo Nacional de Población y Vivienda de 2018. Disponible en: <https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018/cuantos-somos>.
- De Young, R. (2000). New ways to promote proenvironmental behavior: Expanding and evaluating motives for

- environmentally responsible behavior. *Journal of social issues*, 56(3), 509–526.
- Dias Filho, M., Silva-Cavalcanti, J. S., Araujo, M. C. B., & Silva, A. C. M. (2011). Avaliação da percepção pública na contaminação por lixo marinho de acordo com o perfil do usuário: estudo de caso em uma praia urbana no Nordeste do Brasil. *Revista de Gestão Costeira Integrada-Journal of Integrated Coastal Zone Management*, 11(1), 49–55.
- Evison, T., & Read, A. D. (2001). Local Authority recycling and waste—awareness publicity/promotion. *Resources, Conservation and recycling*, 32(3–4), 275–291.
- Farias, S. C. G. (2014). Acúmulo de deposição de lixo em ambientes costeiros: a praia oceânica de Piratininga—nitrói—RJ. *Geo UERJ*, 2(25), 276–296.
- García, J. E. A., Ramallo-González, A. P., Bernardeau-Esteller, J., Enguix-Egea, Á. M., Martínez, J. V. Y., & Gómez, A. B. (2023). A combination of ICT solutions with socio-ecological and economic indicators to evaluate the governance and improve the management of Posidonia oceanica in the Sierra Helada Marine Natural Park. *Regional Studies in Marine Science*, 60, 102841. <https://doi.org/10.1016/j.rsma.2023.102841>
- Hasan, A., & Idris, O. (2014). Changes in the environmental perception, attitude and behavior of participants at the end of nature training projects. *Environmental Engineering and Management Journal*, 13, 419–428.
- Hernández-Solorzano, Sergio (2018). Análisis de la percepción en la contaminación de arroyos urbanos en la microcuenca el Riíto en Tonalá Chiapas, México. Tesis presentada para obtener el grado de Maestro en Gestión Integral del agua. Monterrey, N. L., México. 109.
- Hsieh, S., Lin, P., Lin, I., Beck, D. E., & Lin, C. (2023). Assessing the contribution of semiconductors to the sustainable development goals (SDGs) from 2017 to 2022. *Heliyon*, 9(11), e21306. <https://doi.org/10.1016/j.heliyon.2023.e21306>
- Hurtado, J. (2012). *The research project Holistic understanding of methodology and research* (Seventh ed.). Quiron and Sypal editions. Caracas.
- Karanja, A. (2005). *Solid waste management in Nairobi: Actors, investment arrangements and contribution to sustainable development*. PhD Dissertation. Institute of Social Studies, Netherlands Shaker Pub.: Maastricht, 240 pp.
- Keong, C. Y. (2021). *The United Nations environmental education initiatives: The green education failure and the way forward* (pp. 289–349). In Elsevier eBooks. <https://doi.org/10.1016/b978-0-12-822419-9.00006-0>
- Khatri, N., & Tyagi, S. (2015). Influences of natural and anthropogenic factors on surface and groundwater quality in rural and urban areas. *Frontiers in life science*, 8(1), 23–39. Ley 23 del 19 de diciembre de 1973, “Código de Recursos Naturales y de Protección al Medio Ambiente”, DO: 34.001.
- Lakioti, E. N., Moustakas, K., Komilis, D. P., Domopoulou, A. E., & Karayannis, V. G. (2017). Sustainable solid waste management: Socio-economic considerations. *Chemical Engineering Transactions*, 56, 661–666.
- Larijani, M. (2010). Assessment of environmental awareness among higher primary school teachers. *Journal of Human Ecology*, 31(2), 121–124.
- Leff, E. (1995). ¿De quién es la naturaleza? Sobre la reapropiación social de los recursos naturales. *En: Gaceta Ecológica*, 37, 28–35.
- Lopes, M. M., & Cornelian, A. R. (2017). A percepção ambiental de turistas, veranistas e moradores de Peruíbe/SP. *Revista Brasileira Multidisciplinar-ReBraM*, 20(1), 122–141.
- Madrid León, V. E. (2012). *Plan de Manejo Integral de Residuos Sólidos del Mercado Central del Cantón Esmeraldas* (Bachelor’s thesis, Escuela Superior Politécnica de Chimborazo). <http://dspace.epoch.edu.ec/handle/123456789/2008>
- MADS. (2015). Minambiente promueve programa que pretende revolucionar la educación ambiental en Colombia | Ministerio de Ambiente y Desarrollo Sostenible. <https://www.minambiente.gov.co/index.php/noticias-educacion-ambiental/1638-minambiente-promueve-programa-que-pretende-revolucionar-la-educacion-ambiental-en-colombia>.
- MADS. (2019). Ministerio de Ambiente y Desarrollo Sostenible. Resolución 2184 de 2019. “Por la cual se modifica la resolución 668 de 2016 sobre el uso racional de bolsas plásticas y se adoptan otras disposiciones”. <https://www.minambiente.gov.co/documento-entidad/resolucion-2184-de-2019>.
- Makhtar, S. Z., Amirah, A. S. N., Ab Wahab, M., Hassan, Z., & Hamid, S. (2021). Study of environmental awareness, practices and behaviours among UniMAP students. In *IOP Conference Series: Earth and Environmental Science* (646. 1, 012061 IOP Publishing).
- Martínez-García, N., Royero-Ibarra, A., Navarro-Sining, B. A., Torres-Cervera, K. P., Cahuana-Mojica, A., & Herrera-Martínez, J. R. (2022). Determinación de los índices BMWP/COL,(QBR),(IHF) e ICO en Valledupar, Colombia. *Revista Politécnica*, 18(35), 110–127.
- Martínez-García, N., & Zequeira-Cuervo, Á. A. (2018). *Evaluación del recurso hídrico del balneario Hurtado, río Guatapurí, determinada a través de macroinvertebrados acuáticos implementando índices biológicos y físicoquímicos*. Disponible en: <https://repository.usta.edu.co/handle/11634/13864>
- McClelland, D. C. (1973). Testing for competence rather than for “intelligence.”. *American Psychologist*, 28(1), 1.
- Meppem, T. (2000). The discursive community: Evolving institutional structures for planning sustainability. *Ecological Economics*, 34(1), 47–61.
- Michelsen, G., & Fischer, D. (2017). Sustainability and education 1. In M. von Hauff & C. Kuhnke (Eds.), *Sustainable Development Policy: A European Perspective* (pp. 135–158). <https://doi.org/10.4324/9781315269177>
- Miller, D., Merrilees, B., & Coghlan, A. (2015). Sustainable urban tourism: Understanding and developing visitor pro-environmental behaviours. *Journal of Sustainable Tourism*, 23(1), 26–46.
- Minn, Z., Srisontisuk, S., & Laohasiriwong, W. (2010). Promoting people’s participation in solid waste management in Myanmar. *Research Journal of Environmental Sciences*, 4(3), 209–222.
- Moore, C. J. (2008). Synthetic polymers in the marine environment: A rapidly increasing, long-term threat. *Environmental Research*, 108(2), 131–139.
- Moro, L. D., Maculan, L. S., Pivoto, D., Cardoso, G. T., Pinto, D., Adelodun, B., Bodah, B. W., Santosh, M., Bortoluzzi, M. G., & Branco, E. (2022). Geospatial analysis with Landsat series and Sentinel-3B OLCI satellites to assess changes in land use and water quality over time in Brazil. *Sustainability*, 14(15), 9733. <https://doi.org/10.3390/su14159733>
- Neckel, A., Da Silva, J. L., Saraiva, P. P., Kujawa, H. A., Araldi, J., & Paladini, E. P. (2020). Estimation of the

- economic value of urban parks in Brazil, the case of the City of Passo Fundo. *Journal of Cleaner Production*, 264, 121369. <https://doi.org/10.1016/j.jclepro.2020.121369>
- Ortiz-De-Montellano, C. G., Samani, P., & Van Der Meer, Y. (2023). How can the circular economy support the advancement of the Sustainable Development Goals (SDGs)? A comprehensive analysis. *Sustainable Production and Consumption*, 40, 352–362. <https://doi.org/10.1016/j.spc.2023.07.003>
- Otto, S., Kaiser, F. G., & Arnold, O. (2014). The critical challenge of climate change for psychology: Preventing rebound and promoting more individual irrationality. *European Psychologist*, 19(2), 96.
- Palmer, J. (2002). *Environmental education in the 21st century: Theory, practice, progress and promise*. Routledge.
- Patel, R. (2024). Securing development: Uneven geographies of coastal tourism development in El Salvador. *World Development*, 174, 106450. <https://doi.org/10.1016/j.worlddev.2023.106450>
- Porras del Vecchio, D. (2022). *Análisis integrado de percepciones para un plan de manejo del arroyo El Salao II en Barranquilla*. Corporación Universidad de la Costa.
- Portz, L., Manzolli, R. P., Herrera, G. V., Garcia, L. L., Villate, D. A., & do Sul, J. A. I. (2020). Marine litter arrived: Distribution and potential sources on an unpopulated atoll in the Seaflower Biosphere Reserve, Caribbean Sea. *Marine Pollution Bulletin*, 157, 111323.
- Quintero-Corrales, A., Fragoso-Castilla, P. J., & Olivieri, G. F. (2021). Calidad bacteriológica del agua de cuatro balnearios del municipio de Valledupar (Colombia). *Información Tecnológica*, 32(4), 31–38.
- Ramdas, M., & Mohamed, B. (2017). Perceptions of visitors and residents on impact of tourism activities towards quality of water in Redang and Perhentian Islands, Malaysia. *Asian Journal of Technical Vocational Education and Training*, 2, 1–7.
- Rezende, C. N. V., da Cunha, S. L., & Silveira, T. C. (2009). Percepção ambiental e a prática docente nas escolas do meio rural do município de Itapetinga-BA. *REMEA - Revista Eletrônica Do Mestrado Em Educação Ambiental*, 23, 1517–1256. <https://doi.org/10.14295/remea.v23i0.4573>
- Rodríguez-Rodríguez, D. (2012). Littering in protected areas: A conservation and management challenge—a case study from the Autonomous Region of Madrid, Spain. *Journal of Sustainable Tourism*, 20(7), 1011–1024.
- Rozelee, S., Rahman, S., & Omar, S. I. (2015). Tourists' perceptions on environmental impact attributes of Mabul Island and their relationship with education factor. *Environ Sci Tourism Environ Soc Manag Sci*, 15, 146–152.
- Santana-Neto, S. P., Silva, I. R., Cerqueira, M. B., & Tinoco, M. S. (2011). Socio-economic profile of beach users and awareness on marine pollution by litter: Porto da Barra beach, BA, Brazil. *Journal of Integrated and Coastal Management*, 11(2), 197–206.
- Silva, F. G. S. D., Silva Filho, F. P. D., Oliveira, D. S. D., Dias, H. D. S., & Silva, E. G. D. A. (2016). A Educação Ambiental como instrumento de gestão turística sustentável na Praia da Pedra do Sal, Parnaíba (Piauí). *Revista Brasileira de Gestão Ambiental e Sustentabilidade*, 3(5), 123–136.
- Silva, L., Lozano, L. P., Oliveira, M. L., Da Boit, K. M., Gonçalves, J. O., & Neckel, A. (2021). Identification of hazardous nanoparticles present in the Caribbean Sea for the allocation of future preservation projects. *Marine Pollution Bulletin*, 168, 112425. <https://doi.org/10.1016/j.marpolbul.2021.112425>
- Silva, T. S. N., & Souza, C. F. (2013). Percepção dos impactos do Turismo pelos moradores da Praia do Farol - Ilha de Cotijuba/PA. *Revista Brasileira De Gestão E Desenvolvimento Regional*, 9(1), 262–280. <https://doi.org/10.54399/rbgdr.v9i1.878>
- Sisneros-Kidd, A. M., D'Antonio, A., Monz, C., & Mitrovich, M. (2021). Improving understanding and management of the complex relationship between visitor motivations and spatial behaviors in parks and protected areas. *Journal of Environmental Management*, 280, 111841.
- Tran, K. C., Euan, J., & Isla, M. L. (2002). Public perception of development issues: Impact of water pollution on a small coastal community. *Ocean & Coastal Management*, 45(6–7), 405–420.
- Tress, B., & Tress, G. (2003). Scenario visualisation for participatory landscape planning—a study from Denmark. *Landscape and urban Planning*, 64(3), 161–178.
- Tripto, J., Assaraf, O., & Amit, M. (2013). Mapping what they know: Concept maps as an effective tool for assessing students' systems thinking. *American Journal of Operations Research*, 3, 245–258. <https://doi.org/10.4236/ajor.2013.31A022>
- Tsai, F. M., Bui, T., Tseng, M., Lim, M. K., & Tan, R. R. (2021). Sustainable solid-waste management in coastal and marine tourism cities in Vietnam: A hierarchical-level approach. *Resources, Conservation and Recycling*, 168, 105266. <https://doi.org/10.1016/j.resconrec.2020.105266>
- Uba, U. J., Efut, E. N., Bassey, O., Asuquo, E. E., & Uba, J. C. (2023). Sociodemographic factors and environmental workers' knowledge of the impact of awareness creation on sustainable disposal of solid wastes. *Heliyon*, 9(7), e18122. <https://doi.org/10.1016/j.heliyon.2023.e18122>
- Valera, S. (2002). Gestión ambiental e intervención psicosocial. *Psychosocial Intervention*, 11(3), 289–301.
- Valledupar. (2020). Valledupar en Orden 2020 – 2023" Plan de Desarrollo Municipio de Valledupar. Disponible en: <https://www.valledupar-cesar.gov.co/MiMunicipio/ProgramadeGobierno/PLAN%20DE%20DESARROLLO%20VALLEDUPAR%20EN%20ORDEN%202020%20-%202023.pdf>
- Wang, C., Zhang, J., Cao, J., Hu, H., & Yu, P. (2019). The influence of environmental background on tourists' environmentally responsible behaviour. *Journal of environmental management*, 231, 804–810.
- Wang, C., Zhang, J., Yu, P., & Hu, H. (2018). The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: The moderating role of environmental interpretations. *Journal of Cleaner Production*, 194, 425–434.
- Wang, J., Dai, J., Dewancker, B. J., Gao, W., Liu, Z., & Zhou, Y. (2022). Impact of situational environmental education on tourist behavior—A case study of water culture ecological park in China. *International Journal of Environmental Research and Public Health*, 19(18), 11388.
- Wolf, I. D., Croft, D. B., & Green, R. J. (2019). Nature conservation and nature-based tourism: A paradox? *Environments*, 6(9), 104.
- World Travel and Tourism Council: World, Transformed-January 2019. Disponible en: <https://wtcc.org/>
- Yousefi, S. R., Amiri, O., & Salavati-Niasari, M. (2019). Control sonochemical parameter to prepare pure

Zn_{0.35}Fe_{2.65}O₄ nanostructures and study their photocatalytic activity. *Ultrasonics Sonochemistry*, 58, 104619. <https://doi.org/10.1016/j.ultsonch.2019.104619>

Zhang, J., Zhang, H., Zhang, J., & Liu, F. (2011). Notice of Retraction: Review of studies on environmental impacts of tourism waste. In *In 2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)* (pp. 6369–6372). IEEE.

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