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Recycling Challenges: An Alternative for Connecting with Communities in Bahía de Caráquez, Manabí

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Abstract: The research on recycling challenges in the province of Manabí had as its main objective to analyze the current situation of recycling and the barriers that the province of Manabí faces for its effective implementation. It was carried out in various cantons of Manabí, using a mixed methodological approach that combined qualitative and quantitative techniques. Surveys were conducted with 50 people and semi-structured interviews with local authorities and waste management officials. The materials used included a structured questionnaire with 14 questions, designed to assess participants' knowledge recycling, attitudes and practices. The findings revealed that 98% of respondents supported recycling, although significant barriers were identified, such as lack of information, which 74% of participants considered a major obstacle. In addition, 94% of respondents agreed on the need to implement more educational programs on recycling, indicating a strong desire to improve the situation in the province. The research concludes that, despite the high level of environmental awareness in the region, it is necessary to overcome systemic barriers and strengthen collaboration between key actors. The implementation of educational programs and policies that improve the conditions of recyclers and recycling infrastructure was recommended. These efforts are much needed to move towards a more formalized and sustainable recycling system in Manabí, thus contributing to the environmental sustainability of the province and the well-being of its inhabitants, promoting a cleaner and healthier future.

Keywords: *Recycling, Sustainability, Education, Environmental, waste Management.*

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I. INTRODUCTION

The province of Manabí is one of the largest provinces in Ecuador, with 22 cantons, all of which are part of Ecuador's tourist destinations. They showcase the natural beauty of its beaches, reefs, waterfalls, lagoons, and other attractions to the world, filling you with peace and harmony when you visit them.(Goraymi, 2024)

According to Goraymi, Manabí is one of the largest provinces in Ecuador, comprised of 22 cantons, many of which are among the country's main tourist destinations. They are known for their impressive natural beauty, including beaches, reefs, waterfalls, lagoons, and other attractions that offer peace and serenity to visitors.

Human-generated waste has always existed. As an environmental problem, it is a current global phenomenon. The attitude toward environmental care is a global concept that adapts to the needs of society, and it is important to implement solid waste management.(Sumarriva et al., 2023)

According to Sumarriva, human-generated waste has always existed, but currently represents a global environmental problem. In this regard, the author points out that environmental protection is a universal concept that adapts to the needs of society, making it crucial to implement proper solid waste management.

The poor management of urban solid waste has become a serious pollution problem that affects the quality of air, water, and soil, with a negative impact on living beings: plants, animals, and humans. Therefore, it is of great importance to implement environmental education strategies from the earliest years of schooling in educational systems.(Zamora et al., 2023)

According to Zamora, the improper management of urban solid waste has become a serious pollution problem that harms the quality of air, water, and soil, with negative effects on all living beings, including plants, animals, and humans. For this reason, the authors emphasize the importance of implementing environmental education strategies from the earliest levels of education to address this issue.

"It is important that authorities provide training based on the topics covered, as it will contribute to improving the current situation in the sector, given its theoretical and practical foundation."(Zambrano et al., 2020a)

According to Zambrano and others, it is essential for authorities to implement training programs based on the topics being researched, as these will contribute to improving the current situation in the sector, thanks to their theoretical and practical foundation.

Recycling is one of the best ways to reduce the environmental impact generated by the "use and throw away" culture that has prevailed to this day. Several strategies have been implemented globally to reduce pollution: proper waste management, the reduction of single-use products, and the reintegration of raw materials into the value chain have all succeeded in reducing the environmental impact through the collaboration of various stakeholders.(Chavolla, 2023)

The author believes that recycling is one of the best solutions to mitigate the environmental impact resulting from the "throwaway" culture that has dominated until now. Various strategies have been implemented globally to reduce pollution, such as proper waste management, the reduction of single-use products, and the reincorporation of raw materials into the value chain, which has reduced the environmental impact thanks to the collaboration of multiple stakeholders.

Authors such as,(White, 2023)It expresses that the consumption of natural resources is constantly growing as the human population increases, which translates into an excessive increase in the generation of urban solid waste. Thisconsiders that the consumption of natural resources continues to increase steadily due to the growth of the human population, which in turn generates an excessive increase in the production of urban solid waste.

Recycling is the best way to help the environment. Man has become the cause of daily pollution in our environment. Without realizing it, we have been killing our nature more and more. It's time we became more aware and did our part to recover the environment.(Carrasco, 2019)

Carrasco maintains that recycling is the best way to contribute to environmental protection, as humans have become the primary cause of daily pollution. Without realizing it, we have been deteriorating our natural environment, so it is urgent to raise awareness and contribute to the recovery of our environment.

According to Ruiz and others, recycling is a process whose objective is to transform waste into new products, after having gone through various selection processes and defines it as:*"Recycling is a process that aims to convert waste into new products after undergoing several selection processes."*(Ruiz et al., 2023)

Triana and Hernández assert that household recycling is a key factor that directly influences the adoption of responsible consumption practices and has a significant impact on solid waste management policies, arguing that: "Household recycling is one of the factors that directly influences the adoption of responsible consumption practices and directly affects solid waste management policies."*(Triana & Hernández, 2023)*

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On the other hand, Bolaños highlights that solid waste represents a concern and an environmental problem of social interest, and has currently become one of the key issues for environmental sustainability on the planet: "Solid waste constitutes a concern and an environmental problem that is of social interest and is currently one of the fundamental issues for the environmental sustainability of planet Earth."(Bolaños, 2019)

Although criteria by, Sánchez and Pazmiño explain that the recycling culture is understood as the process of observation and analysis of statistical data on recycling programs, with the objective of generating awareness about the change of habits and the social benefits that are derived from these programs. The recycling culture is understood as the process of observation and analysis of statistical information on recycling programs and the possibility of these for generating awareness regarding the change of habits and social benefits obtained.(Sánchez & Pazmiño, 2022)

The Sucre Extension of the Eloy Alfaro de Manabí 8 Lay University (ULEAM) through the outreach department and the project entitled: Circular economy an alternative for the sustainable development of the communities of the Sucre-San Vicente cantons through its leader, engineer Miguel Alberto Romero Zambrano with its members, supervising teachers and students involved in the outreach activity seek a transformation at the social and community level both urban and rural to strengthen entrepreneurship in the region. The objective is to analyze the current recycling situation and the barriers faced by entrepreneurs and communities in the Sucre and San Vicente cantons for the effective implementation of circular economy strategies to achieve the objectives proposed in the outreach project with society.

II. METHODOLOGY

The research on the challenges of recycling in the province of Manabí was structured in several methodological phases, combining qualitative and quantitative approaches to gain a comprehensive understanding of the recycling situation in the region. The methodology applied in this study is described in detail below.

- *Theoretical Foundation:*

The work began with a comprehensive review of the scientific and technical literature related to recycling, urban solid waste management, and environmental sustainability, with special attention to the local contexts of Manabí and Ecuador. This theoretical framework allowed for contextualizing the challenges of recycling in the province, highlighting both global issues and the characteristics and specificities of the region, such as the increasing consumption of natural resources, the impact of the "throwaway" culture, and the importance of implementing sustainable practices.

- *Quantitative Approach: Collecting Quantitative Data:*

A data collection instrument was designed in the form of a structured survey, targeting a sample of 50 households and businesses in various cantons of Manabí. Participants were randomly selected, ensuring a representative sample of the population in terms of geographic location and type of economic activity. The surveys included 14 questions: Knowledge and attitude toward recycling: Level of knowledge about recycling practices and willingness to implement them; recycling practices identified as the types of waste recycled, frequency, and methods used; and Perceptions of the benefits of recycling, given by the evaluation of the environmental, social, and economic impact of recycling, both at the individual and community levels. A was also carried out statistical analysis the collected data were analyzed using the statistical software SPSS v. 25. The analysis included the descriptive method to determine the profile of the people and companies involved in recycling activities in the region.

- *Qualitative Approach was Applied a Semi-Structured Interview:*

In order to gain a deeper understanding of perceptions and practices surrounding recycling in Manabí, a semi-structured interview was conducted with local authorities responsible for waste management. The interview focused on the following aspects:

- Perceived challenges in implementing recycling programs, both at the individual and institutional levels.
- Factors that facilitate the adoption of recycling practices in the region, including public policies, education, and community collaboration.
- Perceptions about the social and economic impact of recycling, especially in relation to job and income creation in informal sectors, such as recyclers.

- *Data Analysis and Interpretation:*

The qualitative data obtained through interviews were analyzed by experts from Uleam, which facilitated the identification of patterns and recurring themes. Based on this analysis, an interpretation of perceptions and attitudes toward recycling in Manabí was developed, highlighting both the strengths and weaknesses of current waste management systems. The quantitative results were combined with the qualitative findings to provide a comprehensive view of the challenges facing recycling in the region. Factors such as the lack of infrastructure, limited environmental education, and the economic limitations of informal recyclers were identified as key barriers to the success of recycling programs.

III. KEY FINDINGS

The following analysis was conducted of the interview with engineer José Alejandro Cedeño Alcívar, an environmental professional from the San Vicente Gad (National Development and Development Group) in the province of Manabí, Ecuador.

- *What do You Consider to be the Main Challenges Local Authorities Face in Implementing Recycling Programs in the Province of Manabí?*

Based on my experience as an environmental engineer in Manabí, I believe the main challenges lie in the lack of adequate infrastructure, such as collection centers and

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recycling plants, as well as the limited allocation of financial resources. Furthermore, at the community level, there persists a cultural resistance to recycling, influenced by a lack of environmental education and limited awareness of the benefits of proper waste management. These factors, along with the lack of clear policies and effective waste management mechanisms, hinder the successful implementation of recycling programs.

➢ *What Factors Facilitate the Adoption of Recycling Practices in the Region?*

The adoption of recycling practices in Manabí is favored by the implementation of environmental education programs in schools and communities, as well as by the growing collaboration between local governments, private companies, and non-governmental organizations. Public policies that promote recycling incentives and the creation of community awareness spaces also play a key role. Furthermore, the existence of organized groups of recyclers and their willingness to participate in a formalized system contributes to the adoption of these practices.

➢ *In your Opinion, How does Environmental Education Influence the Adoption of Recycling Practices?*

Environmental education is a fundamental pillar for promoting recycling. Through educational programs in schools and community campaigns, people are raised awareness about the importance of reducing, reusing, and recycling. In Manabí, I have seen how initiatives led by teachers and environmental organizations have progressively changed the community's perception of waste, transforming it from a problem into an opportunity. This shift in mentality is essential for recycling to be more widely adopted.

➢ *How do you Perceive the Collaboration Between Local Authorities and the Community in Relation to Recycling Programs?*

Collaboration between local authorities and the community in Manabí is key to the success of recycling programs. However, there is still a long way to go to strengthen this relationship. In general, I have observed that when authorities provide resources, information, and support, communities respond positively. Furthermore, initiatives involving community leaders and recycler groups generate greater cohesion and collective commitment. The challenge lies in maintaining this active collaboration over the long term.

➢ *From your Perspective, What is the Social and Economic Impact of Recycling n Manabí, Especially in Terms of Employment and Income for Informal Recyclers?*

Recycling has a significant social and economic impact in Manabí. For informal recyclers, it represents a source of income and an employment opportunity, although often under precarious conditions. Formalizing this activity could improve their working conditions and guarantee them access to social benefits. Recycling also promotes the development of small businesses related to the recovery and sale of recyclable materials, contributing to the local economy.

➢ *What Actions or Policies are Being Implemented to Improve the Working Conditions of Informal Recyclers and their Integration into a more Formal and Sustainable Recycling System?*

In Manabí, some actions being carried out include the creation of recycling cooperatives and training in waste management techniques. Additionally, policies are being developed to ensure their integration into formal recycling systems, providing them with access to resources such as personal protective equipment and adequate workspaces. These initiatives seek not only to improve their working conditions but also to recognize their role as key players in waste management.

- *Survey Results*

A detailed analysis of the surveys was also conducted. The surveys consisted of 14 questions, addressed to 50 people in the province of Manabí, and were tabulated using the statistical software SPSS V.25, highlighting the most relevant. A profile analysis of the respondents is presented below.

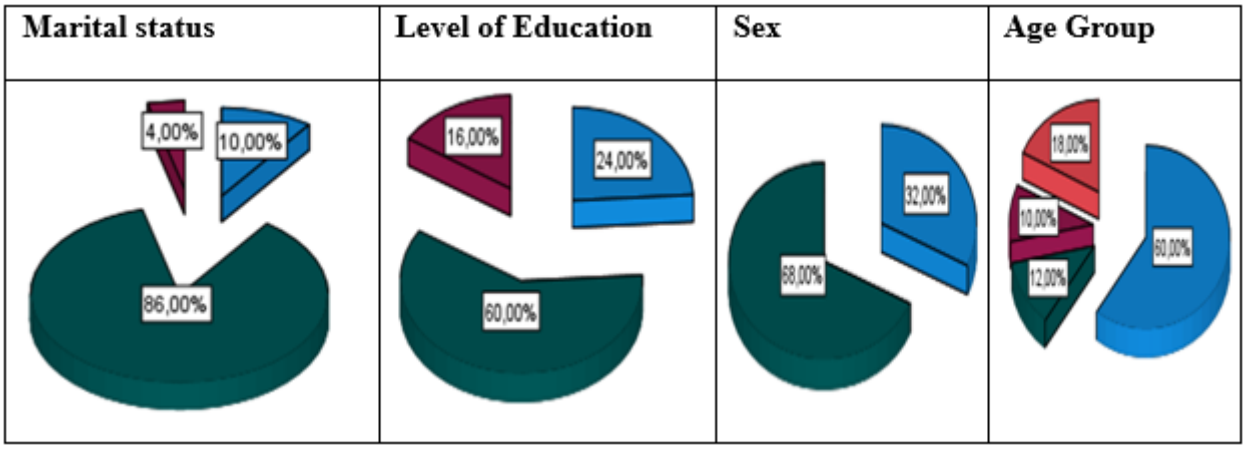

Fig 1 Respondent Profile
Elaboration: Own
Fountain: People of Manabí

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Marital status of the respondents indicates that: The 86% of respondents (43 people) were single, representing the majority of the sample. 10% (5 people) were married, and 4% (2 people) identified themselves as divorced. This indicates that the majority of survey participants were single, followed by a small percentage of married and divorced individuals.

Instead the nlevel of education reflected that: E60% of respondents (30 people) have completed post-secondary education, which constitutes the majority of the sample. 24% (12 people) have completed primary-secondary education, while 16% (8 people) have postgraduate studies. This suggests that the majority of survey participants have higher education (tertiary education), followed by a smaller percentage with postgraduate and primary-secondary education.

Overall, 84% of respondents have attained at least the third level of education. Regarding gender and68% of the respondents (34 people) were female, while 32% (16 people) were male. This indicates a greater female participation in the sample, with almost twice as many women as men. 100% of the respondents were classified into these two categories, which covers the entire sample.

According to the age range and60% of respondents (30 people) are between 18 and 24 years old, representing the majority of the sample. 18% (9 people) are 36 years old or older, while 12% (6 people) are between 25 and 30 years old, and 10% (5 people) are between 31 and 35 years old. This reflects a predominantly young population, with 72% of participants between 18 and 30 years old. The age distribution is balanced, with a smaller percentage of people in the older age ranges.

The question: Do you agree with recycling regularly in your home? It was observed that70% of respondents (35 people) agree with recycling regularly at home, while 28% (14 people) strongly agree. Only 2% (1 person) is neutral on the matter. This indicates strong support for recycling at home, with 98% of respondents either, agree, or strongly agree.

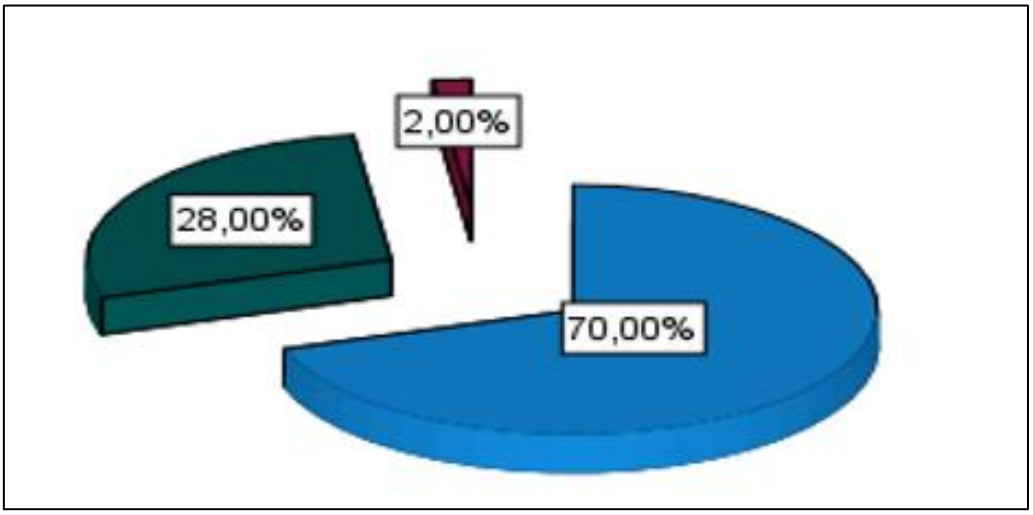

Fig 2 Recycling at the Household Level
Elaboration: Own
Fountain: People of Manabí

- *The Question: are You Familiar with the Recycling Rules and Procedures in Manabí?, the Following Answers:*

Forty-two percent of respondents (21 people) agree that they are familiar with recycling regulations and procedures in Manabí, and 30% (15 people) strongly agree. Twenty-two percent (11 people) are neutral on the matter. Only 4% (2 people) disagree, and 2% (1 person) strongly disagree. This indicates that the majority of respondents have some level of knowledge about recycling regulations in the region, with 72% in favour and a small percentage (6%) disagreeing.

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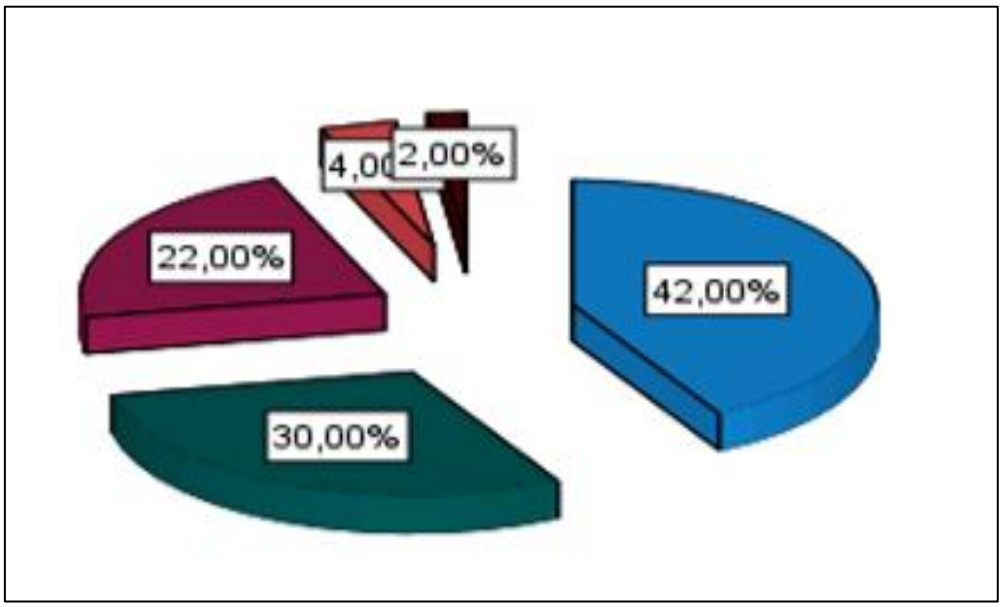

Fig 3 Familiarization with Recycling Standards and Procedures
Elaboration: Own
Fountain: People of Manabí

On the other hand, question 7: Do you think the community is sufficiently informed about the importance of recycling? They responded assertively, stating that:

Twenty-four percent of respondents (12 people) agree that the community is sufficiently informed about the importance of recycling, and 16% (8 people) strongly agree. Thirty-eight percent (19 people) are neutral on this issue, while 20% (10 people) disagree and 2% (1 person) strongly disagree. This indicates that while a significant portion of respondents agree with the level of recycling information in the community (40%), a considerable portion (38%) remain neutral, and 22% consider the community to be insufficiently informed.

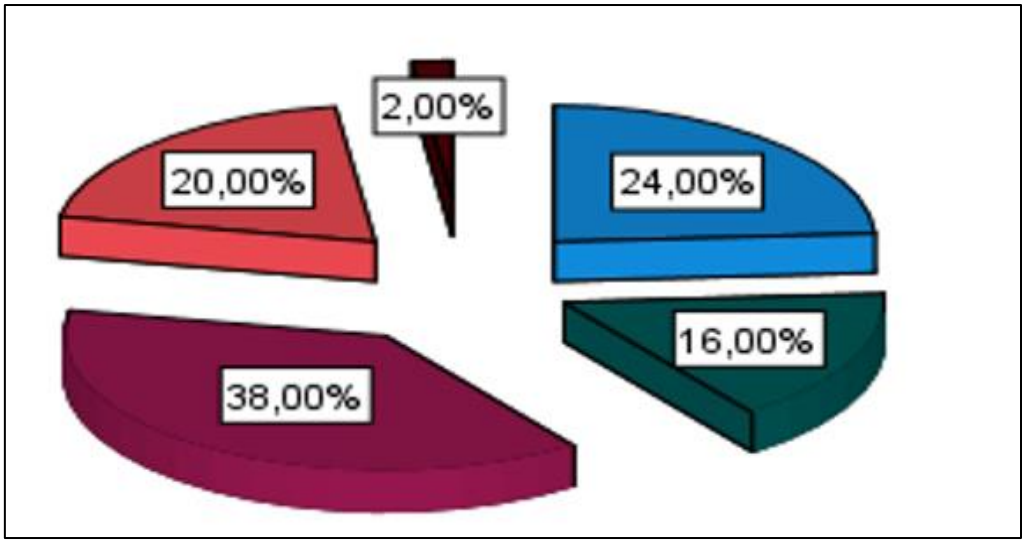

Fig 4 Community Commitment to Recycling
Elaboration: Own
Fountain: People of Manabí

Considering two questions: Do you think there are enough recyclable collection points in the province of Manabí? And are the collection points accessible to the province of Manabí? An impressive result was observed, as shown in Figure 5.

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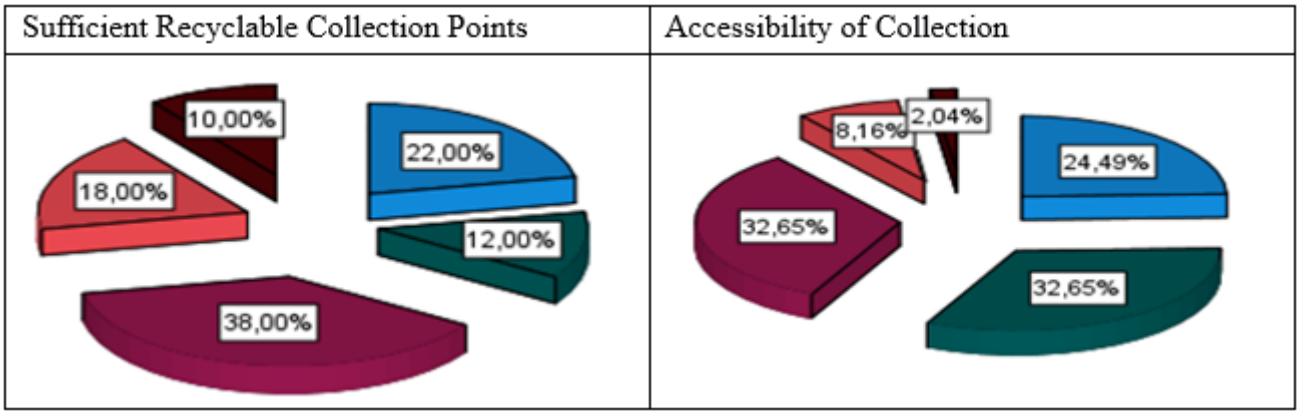

Fig 5 Considerations Regarding Collection Point and Accessibility
Preparation: Own
Source: People of Manabí

Twenty-two percent of respondents (11 people) agree that there are sufficient collection points, while 12% (6 people) strongly agree. Thirty-eight percent (19 people) remain neutral on this issue. However, 18% (9 people) disagree, and 10% (5 people) strongly disagree. This reflects a divided perception, with only 34% considering the collection points sufficient, while a significant 28% consider them insufficient, and 38% remain undecided.

Regarding the collection points, they are accessible for the province of Manabí and24.5% of respondents (12 people) agree that the collection points are accessible, while 32.7% (16 people) strongly agree, adding up to 57.1% positive responses. 32.7% (16 people) are neutral, while 8.2% (4 people) disagree, and 2.0% (1 person) strongly disagree. It is worth noting that there was one missing response (2%). Overall, more than half of respondents consider the collection points to be accessible, although a significant proportion remain neutral.

Three questions are correlated below, which denote a representative importance for the present study, so the questions are considered: Are you motivated to recycle by concern for the environment? Do obstacles such as a lack of information prevent you from recycling more frequently? Do you think more recycling education programs should be implemented in the province of Manabí? And the question: Would you participate in recycling workshops or programs if they were available in your province and community? Figure 6 shows the results.

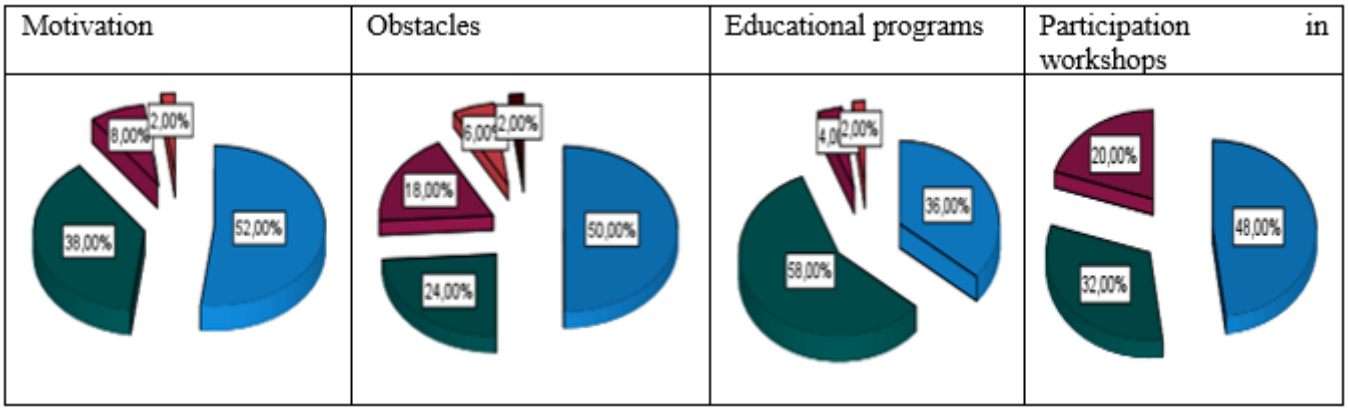

Fig 6 representative Importance for the Present Study
Elaboration: Own
Fountain: People of Manabí

Fifty-two percent of respondents (26 people) agree that they are motivated to recycle out of concern for the environment, while 38% (19 people) strongly agree, representing a 90% positive response. Eight percent (four people) remain neutral, and only 2% (one person) strongly disagree. This reflects the fact that the vast majority of respondents feel a strong environmental motivation toward recycling, with only a small proportion expressing indifference or disagreement.

Regarding the Obstacles such as lack of information prevent you from recycling more frequently responded and50% of respondents (25 people) agree that a lack of information makes it difficult for them to recycle more frequently, while 24% (12 people) strongly agree, adding up to 74% affirmative responses. 18% (9 people) remain neutral, while 6% (3 people) disagree and 2% (1 person) strongly disagree. These results indicate that a lack of information is perceived as a major obstacle by the majority of respondents,

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although a small percentage does not consider it a significant impediment.

If you think that more educational programs on recycling should be implemented in the province of Manabí and36% of respondents (18 people) agree with the need for more educational programs, while 58% (29 people) strongly agree, totalling 94% of responses positive. 4% (2 people) are neutral, and only 2% (1 person) disagree. This demonstrates a majority consensus among respondents on the importance of implementing more educational programs on recycling in the province.

According to whether would participate in workshops or programs on recycling if they were available in their provinces and communities? The response was yes.48% of respondents (24 people) agree that they would participate in these recycling workshops or programs, while 32% (16 people) strongly agree, making 80% of the responses affirmative. Twenty percent (10 people) remain neutral, with no extreme opinions about their participation. These results reflect a high willingness among respondents to participate in educational initiatives on recycling if they were available, although a fifth remain indifferent.

IV. DISCUSSION

The main conclusion demonstrates that recycling offers attractive economic benefits for creating an IB, and intermediaries are the main beneficiaries of this activity. Recyclers are limited by their working conditions, and the association model is not considered a viable solution for improving their income.(Cajamarca et al., 2019)

The authors believe that recycling offers significant economic benefits, especially in the creation of new income (NI), where intermediaries are the main beneficiaries of this activity. However, recyclers face limitations due to their working conditions, and the association is not perceived as an immediate solution to improve their income level.

The proper management of organic waste is achieved through various treatments that involve recycling these organic materials, transforming them into value-added products. On the other hand, Solano and others point out that proper management of organic waste is achieved through various treatments that transform these materials into value-added products. (Solano et al., 2022)

Battery recycling is necessary to reduce environmental impact and properly manage valuable and toxic materials. With the growth of the electric vehicle market, increased demand for recycling is expected, making it necessary to invest in recycling facilities for safe and sustainable battery management, maximizing material recovery and minimizing environmental impact.(Moreno, 2023)

Understandably, Moreno asserts that battery recycling is essential to reducing environmental impact and properly managing both valuable and toxic materials. With the growing electric vehicle market, increased demand for recycling is anticipated, necessitating investment in specialized facilities to ensure safe and sustainable battery management, maximizing material recovery and reducing environmental impact.

The interview with the environmental engineer from the San Vicente Regional Government (GAD) provides a qualitative and expert perspective on the main challenges, enabling factors, and policies related to recycling in Manabí. This approach allows for a deeper understanding of topics such as the lack of infrastructure, cultural barriers, and the importance of environmental education as a driver of change. Furthermore, the surveys offer a quantitative overview, reflecting the community's perceptions, attitudes, and practices regarding recycling. This method is ideal for identifying trends and measuring residents' knowledge, willingness, and perceived obstacles.

The combination of interviews and surveys is highly effective in understanding both the structural challenges and community perceptions surrounding recycling in Manabí. While the surveys reflect majority support for recycling, qualitative interview findings highlight the need to overcome systemic barriers and strengthen collaboration among key stakeholders. The implementation of more educational programs, along with policies that improve the conditions of recyclers and infrastructure accessibility, presents a viable path toward a more formalized and sustainable recycling system in the region.

The interview provides a contextual and strategic framework, while the survey complements this information by providing specific data on the attitudes and practices of Manabí residents. For example, the near-unanimous consensus on the priority of recycling (98% in the survey) reinforces the interviewee's observations about the growing environmental awareness in the region.

V. CONCLUSIONS AND RECOMMENDATIONS

Environmental education plays a fundamental role in transforming community perceptions of waste, highlighting the need to implement educational programs in schools and communities to encourage reduction, reuse, and recycling. The high willingness of respondents to participate in workshops and educational programs reinforces this need as a key means of increasing the adoption of sustainable practices.

A lack of adequate infrastructure, limited financial resources, and cultural resistance due to low awareness hinder the effective implementation of recycling programs in Manabí. However, respondents' positive perceptions of the need to prioritize recycling and the accessibility of collection points point to an opportunity to overcome these challenges through more inclusive and collaborative initiatives.

Recycling represents a significant source of income for informal recyclers, albeit under precarious working conditions. Formalizing this activity through the creation of cooperatives, training, and the provision of protective

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equipment could improve their conditions and ensure their integration into a sustainable system. Furthermore, recycling contributes to the development of small businesses, strengthening the local economy and promoting a positive social impact.

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