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Recycling programmes to minimise plastic through bottles in the Guayaquil area

Programas de reciclaje para minimizar el plástico a través de las botellas en la zona de Guayaquil

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Abstract

This is the result of the research project: 3R - training for environmental awareness, which aims to analyse the theoretical underpinnings of the recycling programmes implemented in Guayaquil in order to reduce the amount of plastic in the city. Exploratory research was carried out using a sample of different studies on recycling programmes. The methodology employed consisted of a documentary review, using record cards to collect information. The results highlight the relevance of several projects in promoting more sustainable practices, although many of them fail to fully achieve their goals. Furthermore, it is noted that several authors offer additional perspectives on recycling and environmental conservation. In conclusion, the analysis of the implementation of these recycling programmes serves to raise awareness of the actions undertaken and the need for effective compliance.

Keywords: Programmes, Recycling, Plastic, Environment, Guayaquil

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Resumen

Se presenta un resultado del proyecto de investigación: 3R - formando para la conciencia ambiental, que tiene como objetivo analizar los sustentos teóricos de los programas de reciclaje implementados en Guayaquil con el fin de reducir la cantidad de plástico en la ciudad. Se llevó a cabo una investigación exploratoria, utilizando una muestra de diversos estudios sobre programas de reciclaje. La metodología empleada consistió en la revisión documental, utilizando fichas de registro para recopilar información. Los resultados resaltan la relevancia de varios proyectos en la promoción de prácticas más sostenibles, aunque muchos de ellos no logran alcanzar sus metas por completo. Además, se observa que diversos autores ofrecen perspectivas adicionales sobre el reciclaje y la conservación del medio ambiente. En conclusión, el análisis de la implementación de estos programas de reciclaje sirve para crear conciencia sobre las acciones emprendidas y la necesidad de cumplirlas de manera efectiva.

Palabras clave: Programas, Reciclaje, Plástico, Ambiente, Guayaquil

Introduction

Exploring recycling programmes focused on reducing the use of plastic bottles in Guayaquil would be an appropriate and timely measure to address the increasing pollution caused by plastic bottles. Such programmes could include the installation of recycling bins in strategic locations throughout the city, facilitating the separation and collection of plastic bottles by citizens. In addition, participation could be encouraged through educational campaigns promoting the importance of recycling and its benefits to the local and global environment.

At the same time, policies could be established to encourage a reduction in the use of single-use plastic bottles, encouraging more sustainable alternatives such as the use of reusable bottles or drinking water filling systems in public places. This would not only contribute to reducing the amount of plastic waste, but also promote a cultural shift towards more responsible and environmentally friendly practices. Together, these efforts would help minimise the presence of plastic in Guayaquil's urban environment and mitigate the negative impacts associated with its contamination.

The city of Guayaquil faces a number of environmental challenges due to intense industrial activity, rapid urban growth and lack of adequate infrastructure to manage waste and emissions. Air pollution is a major concern, with alarming levels of harmful gases and fine particulate matter affecting air quality and the health of inhabitants. Vehicle emissions, manufacturing industries and waste burning contribute significantly to this problem, increasing the risk of respiratory and cardiovascular diseases among the population.

In addition, water pollution represents another major challenge in Guayaquil. The lack of adequate wastewater treatment, combined with industrial discharges and solid waste pollution, contaminates water bodies near the city, endangering both the aquatic ecosystem and the health of the people who depend on these water sources for their daily needs. This problem not only affects public health, but also has a negative impact on biodiversity and aquatic ecosystems, generating long-term consequences for the environment and the sustainability of the region.

The objective is to analyse the theoretical underpinnings of the recycling programmes implemented in Guayaquil in order to reduce the amount of plastic in the city, considering that collaborative programmes have been proposed both at the municipal level and through other entities. However, the aim is to understand the effectiveness and progress of these programmes and to determine whether they are being implemented as planned.

The analysis of the recycling programmes established in Guayaquil to reduce the amount of plastic is of utmost importance due to the growing concern about the negative environmental effects of this material (Monge, S., et al., 2019). Various entities, both at the municipal level and through collaborations with external organisations, have proposed initiatives to address this issue.

These proposals may include the installation of recycling bins in public areas, awareness-raising and education campaigns on the importance of recycling, as well as incentives to encourage citizen participation in the recycling process. However, it is crucial to evaluate the effectiveness of these initiatives to determine whether they are achieving the desired results in terms of reducing the presence of plastic in the city.

To truly understand the impact of recycling programmes in Guayaquil, it is necessary to examine not only the amount of plastic collected, but also the implementation process and long-term results. This involves analysing the effectiveness of the existing recycling infrastructure, community participation and collaboration, as well as the management and supervision by municipal authorities. In addition, it is essential to assess whether the resources allocated for these programmes are being used efficiently and whether the objectives initially set are being met. Only through a thorough evaluation will it be possible to determine whether the recycling programmes in Guayaquil are fulfilling their purpose of reducing the presence of plastic in the city and contributing positively to the environment (Chicaiza, G., & González, E., 2016).

Ultimately, the analysis of recycling programmes in Guayaquil will not only provide a clear picture of their current effectiveness, but will also help identify areas for improvement and opportunities to strengthen these efforts in the future. This could involve implementing innovative strategies, expanding recycling infrastructure, improving waste management policies and promoting greater environmental awareness in the community. Ultimately, the aim is to ensure that recycling programmes in Guayaquil are effective, sustainable and contribute positively to reducing the presence of plastic and protecting the environment in the city.

It is essential to know the definitions of some of the aspects of this study as cited by Anzules, Í., & Castro, D. (2022), where it mentions that, atmospheric or environmental pollution refers to the existence of agents whether physical, chemical or biological; or a combination of these, in places and concentrations that can be harmful to the health, safety and welfare of the population, as well as to the balance of ecosystems and life in general.

The definition of air or environmental pollution provided by the authors highlights the presence of physical, chemical or biological agents, either individually or in combination, in places and concentrations that may have negative effects on people's health, safety and well-being, as well as on the balance of ecosystems and life in general. This understanding is fundamental to adequately address the pollution problem and to take effective measures to mitigate its impacts.

For Buteler, M. (2019), the presence of polluting plastics is most noticeable on beaches, but in the urban environment, micro-plastics derived from various products such as clothing, furniture, paints and vehicle tyres are affecting the quality of drinking water.

The author highlights that, in urban environments, micro-plastics from a variety of sources, such as clothing, furniture, paints and vehicle tyres, are contributing to drinking water contamination. This situation underlines the need to address both waste management in coastal areas and in urban settings to protect water quality and mitigate the negative impacts of plastic pollution on the environment and human health.Principle of the form

Plastic pollution causes blockages in energy production cooling systems and propeller vines, negatively impacting aquaculture development and deteriorating aesthetic aspects (Elias, R., 2015). The detrimental effects extend to all forms of marine life, including plankton, benthic invertebrates and large mammals.

Recycling is shown to be a preferable alternative to the massive accumulation of waste in landfills or sanitary landfills. Despite this, there are few formal recycling programmes available in the area, as mentioned by Rodríguez, J., & Villamil, J. (2023); which allows arguing that the lack of formal recycling programmes in the region hinders the effective implementation of these practices, resulting in inadequate waste management and greater environmental impact. It is essential that recycling programmes are established and strengthened to foster a culture of waste reduction, reuse and recycling in the community.

It is important to consider Correa, L. (2003), since a pilot recycling programme can achieve positive results if a prior process of familiarisation with the community is carried out, including stages of approach, management and awareness-raising, in order to thoroughly understand the challenges related to the inappropriate management of solid waste and to obtain the support of the population, the productive sector, governmental and environmental authorities, as well as local educational institutions.

This process, which involves outreach, management and awareness-raising stages, is essential to fully understand the challenges associated with inappropriate solid waste

management and to secure the support of various stakeholders, such as the population, the productive sector, governmental and environmental authorities, as well as local educational institutions. This strategy can be key to the success of the recycling programme and to fostering a culture of waste reduction, reuse and recycling in the community.

Materials and methods

In order to carry out the research process on the analysis of recycling programmes to minimise plastic in Guayaquil, an exploratory research approach is chosen. This type of research is suitable for investigating little-known phenomena or phenomena that have been little studied, thus allowing for an initial and in-depth understanding of the topic in question (Morales, N., 2015). Given that the effectiveness of recycling programmes in Guayaquil is a topic that has not yet been exhaustively explored, this methodology will provide a solid basis for further research.

The study sample will consist of a selection of different previous studies conducted on recycling programmes in specific areas of the city of Guayaquil. It will seek to gather information from a variety of sources, including academic research, government reports, and studies conducted by non-governmental organisations and private entities. This will allow for a broad and diverse perspective on the effectiveness and scope of recycling programmes in the city.

The main technique used to collect data will be the desk review. This approach involves the search, collection and analysis of relevant documents related to the topic of study, such as reports, academic articles, government policies and other written materials (Paz, I., 2022). An exhaustive review of existing literature on recycling programmes in Guayaquil will be carried out, with the aim of identifying patterns, trends and areas of interest that may be useful for the research.

As an instrument for data collection, documentary data collection sheets will be used. These cards will allow for the organisation and systematisation of the information gathered during the documentary review, thus facilitating its analysis and subsequent interpretation (Useche, M..., et al., 2019). Each file will contain key details about the recycling programmes studied, including their objective, scope, methodology, results and conclusions. This technique will allow an orderly and structured record to be kept of the information collected, facilitating its subsequent analysis and the drawing of informed conclusions.

Results

The study conducted by Alava (2020) on the eco-efficient management of plastic waste in the Velasco Ibarra parish revealed that 61% of respondents expressed complete agreement and 29% agreed with waste separation. This indicates that, if this initiative is introduced in the area, approximately 362 out of 402 people would support the project, which would be a considerable success.

Bismark, C. (2021), conducted a study on the management of PET plastic and banana bags, where it was observed that the highest amount of waste was recorded during the third week, reaching 14.85 m3 of PET plastics, while the second week had the highest

amount of banana bags, with a total of 9.14 m3. In contrast, the first week presented the lowest amount of waste, with 10.82 m3 of PET plastics, and a similar volume was recorded for banana bags, with 7.6 m3.

For Luque, D. (2015), the inconveniences experienced during the process of implementing waste separation stand out as a significant aspect in the development of the programme. These obstacles may have arisen due to a lack of awareness or education about the importance of waste separation, as well as resistance to change on the part of the population. In addition, logistical factors, such as the availability of adequate containers and the lack of infrastructure for separate collection, may also have contributed to the challenges encountered. These results underline the need to address these barriers by implementing awareness-raising and education strategies, as well as improving the infrastructure and resources needed to facilitate effective waste separation in the community.

The results of the study by Chamba, P. (2011) show that a considerable amount of potentially recyclable solid waste ends up being landfilled directly due to contamination with inorganic waste. This situation arises mainly due to the absence of proper household sorting of solid waste. Most of the solid waste generated in various sectors is not subjected to any kind of treatment before being sent to the sanitary landfill.

Gómez, S., & Vélez, S. (2023), carried out a study to identify the presence of micro-plastics on the beach of San Jacinto, which revealed that the predominant type of micro-plastics identified in the study was film, with a total of 1088 particles per square metre (MP/m2), followed by fibres, with a total of 877 MP/m2. In terms of the most frequently found sizes, 1 mm was predominant with 492 MP/m2, followed by 2 mm with 497 MP/m2 and 5 mm with 605 MP/m2. In addition, during the dissemination of the results obtained, recommendations were provided and needs related to environmental protection and the proper management of the various wastes generated on the beach were identified.

These findings highlight the importance of addressing microplastic pollution in coastal environments, as these materials can have significant impacts on marine ecosystems and wildlife. Furthermore, the socialisation of the results and the recommendations issued underline the need to adopt measures to protect the environment and to properly manage waste, thus promoting more sustainable practices in the management of natural resources.Principle of the form

Alava's (2020) analysis of the eco-efficient management of plastic waste in Velasco Ibarra parish highlights strong support from the population for the implementation of waste separation. This finding suggests that the majority of residents are in favour of this initiative, indicating a high potential for the project's success if implemented in the area. Community support is critical to ensure the effectiveness and sustainability of any waste management programme, and these results suggest that the introduction of this practice would be well received and could have a significant positive impact on plastic waste management in the region.

Analysis of the amount of waste collected during different weeks reveals interesting patterns in the generation of PET plastic waste and banana sleeves. The data shows that the third week recorded the highest amount of PET plastic waste, while the second week was notable for the highest amount of banana bags. This finding could be due to

seasonal factors, changes in consumption patterns or even specific events that occurred during those weeks. These results highlight the importance of regularly monitoring and analysing waste generation to identify trends and patterns that can influence waste management strategies and promote more sustainable practices.

Other authors consider that, the identification of several setbacks during the initiation of the waste separation process highlights the complexity and challenges associated with the introduction of new waste management practices in a community. These setbacks can be attributed to a number of factors, such as lack of environmental awareness among the population, resistance to change and the need to adapt to new routines. In addition, the existing infrastructure may not be adequately prepared to handle waste separation, which hinders effective programme implementation.

It is essential to address these barriers through educational strategies that promote the importance of waste separation, as well as improving infrastructure and logistics to facilitate this process. By overcoming these initial challenges, progress can be made towards more efficient and sustainable waste management, resulting in significant benefits for both the environment and the wider community.

The findings presented in the study by Chamba, P. (2011) highlight a significant problem in solid waste management. The considerable amount of potentially recyclable waste that ends up in landfills due to contamination with inorganic waste reveals a lack of efficiency in household waste sorting. This situation highlights the need to implement more effective measures for waste separation at household and sector level. These results underline the importance of implementing policies and programmes that promote more efficient and responsible solid waste management, with the aim of minimising environmental impact and promoting the reuse and recycling of materials.

The study carried out by Gómez and Vélez in 2023 at San Jacinto beach represents a significant contribution to understanding the impact of micro-plastics in the coastal environment. The findings revealed the predominant presence of micro-plastics, especially films and fibres, ranging in size from 1 mm to 5 mm. These results highlight the urgent need to address micro-plastic pollution, as well as to implement measures to protect the marine ecosystem. Furthermore, the recommendations provided during the dissemination of the results underline the importance of promoting sustainable waste management practices and environmental protection at San Jacinto beach and similar coastal environments.

The analysis of recycling programmes to reduce the use of plastic bottles in Guayaquil raises important questions that require further research. What is the actual impact of these programmes on reducing plastic pollution in the area? How do these programmes affect community participation and environmental awareness? What are the specific challenges faced by these programmes in Guayaquil and how can they be overcome? Are there innovative alternatives that could improve the effectiveness of recycling programmes in the region? These questions suggest the need for further studies to further evaluate and improve recycling programmes in Guayaquil in order to develop more effective strategies to minimise the use of plastic bottles and reduce pollution in the area.

Conclusions

The authors' analyses highlight the importance of community support and the need to improve solid waste management in Guayaquil. Others, highlighting strong support for waste separation, highlight the lack of efficiency in household waste sorting, which results in a considerable amount of recyclable waste being deposited in landfills. These findings underline the urgency of implementing effective policies and programmes to promote more efficient and responsible waste management in the region.

On the other hand, the study provides specific insight into micro-plastic pollution in the coastal environment and solid waste management in general, highlighting the predominant presence of micro-plastics on San Jacinto beach and the urgent need to address this issue. These findings complement previous studies by highlighting the importance of implementing measures to protect the marine ecosystem and promote sustainable waste management practices in and around the coastal areas of Guayaquil.

In conclusion, the study reveals a number of challenges and opportunities for improving waste management in the region. The findings by various authors highlight the importance of community support and environmental awareness for the success of these programmes, as well as the need to implement effective education and awareness strategies. In addition, there is evidence of the need to address initial barriers, such as lack of adequate infrastructure and resistance to change, by improving logistics and implementing policies that promote waste separation and recycling. These findings highlight the importance of adopting a comprehensive and collaborative approach to tackling plastic waste in Guayaquil and working towards a more sustainable future.

In this sense, the studies conducted provide a solid basis for future research and actions to improve waste management and reduce plastic pollution in and around Guayaquil. There is a clear need to further deepen the understanding of the factors influencing the effectiveness of recycling programmes and to identify innovative strategies to address existing challenges. It is also essential to involve various stakeholders, including government, business, civil society and academia, in the search for collaborative and sustainable solutions to promote more efficient waste management and protect the environment, and to consider recycling programmes.

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