

Propuesta de acciones para el manejo adecuado de desechos sólidos

Proposal of actions for the adequate management of solid waste

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Resumen

La manipulación especializada y la disposición final de los residuos sólidos representan un problema social por su influencia directa en la higiene del ambiente, magnificado por los niveles de generación de la urbe, las limitadas áreas de tratamiento y la poca conciencia ambiental. La investigación propone acciones para incrementar la educación ambiental y contribuir al manejo adecuado de los desechos sólidos en la Empresa de Consultoría, Diseño e Ingeniería Constructiva de Guantánamo, promoviendo el desarrollo sostenible y la resiliencia urbana. Se utilizaron métodos como el histórico lógico, análisis y síntesis, inducción-deducción, observación científica, entrevista no estructurada y análisis documental. El estudio realizado posibilitó un mejoramiento de la imagen y resiliencia urbana haciendo frente a la contaminación ambiental que intensifica el impacto del cambio climático.

Palabras clave: Desechos sólidos; Educación ambiental; Resiliencia urbana; Desarrollo sostenible.

Abstract

The specialized handling and final disposal of solid waste represent a social problem due to its direct influence on the hygiene of the environment, magnified by the levels of urban generation, the limited treatment areas and the low environmental awareness. The research proposes actions to increase environmental education and contribute to the adequate management of solid waste in the Guantánamo Consulting, Design and Constructive Engineering Company, promoting sustainable development and urban resilience. Methods such as historical-logical, analysis and synthesis, induction-deduction, scientific observation, unstructured interview and documentary analysis were used. The study made

possible an improvement of the urban image and resilience in the face of environmental pollution that intensifies the impact of climate change.

Key words: Solid waste; Environmental education; Urban resilience; Sustainable development.

Introduction

Environmental pollution is one of the main problems for the environment on our planet and increases as we develop socially. It has become one of the causes of climate change, mainly through global warming, as mentioned by Aquae (2021).

In this sense, Intramed (2023), warns that in the world more than 400 million tons of plastic are produced each year, half of which are designed for a single-use life. It is also estimated that less than 10% is recycled and that between 19 and 23 million tons of plastic waste end up each year in lakes, rivers and seas.

Due to this situation, the slogan "No Plastic Pollution" was chosen for the 2023 edition of World Environment Day, calling for an urgent global transformation focused on solutions to plastic pollution. Goicochea (2015) mentions that since the 1980s, in Latin America and the Caribbean, urbanization and growth processes have accelerated significantly. As long as this growth exists, the demand for natural resources also increases, as well as the volume of urban solid waste that must be transported, treated and finally disposed of. This situation has resulted in the environment of urbanized areas being unable to treat the environmental impacts generated and absorb them in a natural way.

In addition, FONPLANA (2018), points out that the production of solid waste in the cities of these regions, reached the mark of 540 thousand tons. About 145 thousand tons of waste is discarded daily, equivalent to 30% of the total production. The expectation is that by 2050, about 671 thousand tons of waste will be produced per day. This region today consumes more plastic than ever, but recycles less than anyone else, so that garbage floods rivers, valleys and beaches.

Cuba does not escape this situation, Quijano (s.f), emphasizes that at present the main environmental problems have been influenced by the lack of environmental awareness and education in a considerable percentage of the population, which have brought as consequences, in many occasions, its aggravation. This is inextricably linked to social indiscipline and the deficient application of current laws that favor the accumulation of waste in densely populated areas.

Authors such as (Martín et al., n.d.; ONEI2, 023 and Rodríguez, 2019), highlight the demographic and environmental situation of the municipality of Guantánamo, reporting alarming figures on the generation of solid waste. As of the end of 2022, the Guantánamo municipality has a population of 222

781 inhabitants, of which 214 036 are located in urban areas. It also has a housing stock of more than 164,000 homes and generates more than 150 kg/day of solid urban waste, which is gradually increasing as the urban population grows.

Often, for solid waste collection, priority is given to the blocks of the Centro popular council. However, in the southern, northern, eastern and western areas inside, the panorama of micro-dumps leaves much to be regretted.

Solid waste collection in Guantánamo, varies due to technical equipment deficits, coincide with the causes of variability in solid waste collection in Guantánamo. Currently, there is a growing deterioration in the technical equipment of the Municipal Directorate of Communal Services that hinders the collection of solid waste in the popular councils of the territory, a reality that responds, among other aspects, to the economic effects of the U.S. blockade of Cuba, which has a negative impact on the arrival in the province of technologies, devices, equipment and spare parts relevant for better hygiene in urban and rural communities. This causes waste collection cycles to be extended and the accumulation of waste in the city.

The raw material collection points are often full or cannot accept more materials due to lack of transportation or money to pay for raw materials. In addition, they do not accept all types of materials or their prices vary. This hinders the proper disposal of solid waste in the city. In addition, there is excessive social indiscipline and almost no action by neighborhood organizations. There is even insufficient action by inspectors.

Solid waste contamination also influences the work environment, affecting work performance. According to Reyna (2021), the waste generated in offices consists mainly of paper and cardboard, which represent 90% of the total waste produced. Hazardous waste, consisting of printer toner, ink cartridges, batteries, disused fluorescent lamps, etc., requires special management and represents 5% of total office waste. Plastic and glass bottles and containers and cans represent 3%, while organic waste accounts for 2% of all office waste.

Due to the above mentioned problematic situation, the research problem is: How to contribute to environmental education to achieve an adequate management of solid waste in the Design Group belonging to the Guantánamo Consulting, Design and Constructive Engineering Company (ECODIC), and its radius of action?

With the objective of proposing actions to increase environmental education that contribute to the adequate management of solid waste in the Guantánamo Design Group and its radius of action, promoting sustainable development and urban resilience.

It is intended that the adequate management of solid waste in the Guantánamo Design Group and its radius of action will contribute to improve the quality of life and the urban image of the area. This could support the conformation of future urban planning and environmental strategies for the city assumed by the Provincial Directorate of Territorial Planning and Urbanism (DPOTU) and the Ministry of Science, Technology and Environment (CITMA).

Development

Sample and methodology

In the research, the scientific methods of historical-logical research, analysis and synthesis, induction-deduction, scientific observation, unstructured interview and documentary analysis were used. This allowed obtaining the main theoretical and methodological contributions for the Guantánamo Design Group and its radius of action, with the possibility of generalization to other popular rabbits affected by solid waste contamination.

It starts from the detailed knowledge of the territory where the Guantanamo Design Group is located and its subsequent characterization and diagnosis, revealing its relevance and significance within the Guantanamo municipality.

Characterization of the study area

The Caribbean popular council where ECODIC's Guantanamo Design Group is located is located in the Bano sub-county, one of the main rivers of the city, where a significant part of the solid waste generated in this area ends up.

It is bordered on the south by North 9th Street, from the intersections of Martí Street to the boundary of the Niceto Pérez municipality, passing between the nursing school and the Agostino Neto General Clinical Teaching Hospital, to the North, from the Central La Esperanza road, passing through Santa Rosa along the railroad line to San Idelfonso, continuing in front of the entrance to the Central House and to the back of the Commerce warehouses. It is located to the east, from 9 north along all the intersections of Martí Street passing by the Barceló Bridge, with the popular council of Los Cocos Confluente, and to the west, along the entire boundary of the municipality of Niceto Pérez with Guantánamo from La forestry passing by the western part of the Combinado de Prisons.

It has an approximate population of 35,123 inhabitants and a territorial extension of approximately 16.4Km² according to Ecured (s.f). Since its beginnings, the Popular Council has shown a marked growth, which has led to the production of large volumes of solid waste in this area.

In the research, a characterization of the Caribbean People's Council is carried out in terms of: land use; public spaces and urban furniture; green areas and the environment. After the characterization, a diagnosis was made to identify the main factors that influence solid waste contamination and the potential of the area.

Factors that influence solid waste contamination in the Caribbean popular council

- Lack of environmental awareness and education
- Lack of risk perception
- Deficit in solid waste collection
- Deterioration of containers and lack of protection of containers
- Social indiscipline
- Final disposal of waste
- Lack of recycling
- Deficient application of the laws in force

Potentialities of the Caribbean People's Council

- Existing parks and plazas can be used for community impact activities.
- There are public spaces to increase green areas.
- Presence of solid waste collection points.
- In a large number of streets there is infrastructure for public lighting, which facilitates the development of community activities.

The Guantánamo Design Group is located on San Gregorio Street at square 18 Norte, in the Caribe popular council of the municipality of Guantánamo. The premises occupied by the Group is not owned by the Company, it belongs to the Procedures Unit of the Ministry of the Interior (MININT) Guantánamo, where the population frequently goes for the services provided here. Part of the public that goes to this Unit is the population surrounding this center, which contaminates the environment and can transport this contamination to the work center.

The Guantánamo Design Group is mainly dedicated to offer professional technical services of projects, design, engineering, consulting and topography applied to construction for investments and works. As well as the elaboration of three-dimensional models, elements of signage and photography of architectural, engineering and construction themes, development, assistance and processing with computer techniques, elaboration, reproduction, copying and commercialization of technical documentation, technical and professional training, which includes the preparation of personnel and other participants in the investment process.

The solid waste generated in the Group is related to the daily operation of the Company in the services explained above. This waste consists of paper, cardboard, cardboard, printer toner, ink cartridges, batteries, plastic containers.

Factors influencing solid waste contamination at Group of Design Guantánamo:

Lack of environmental awareness

- Lack of risk perception
- Final disposal of waste
- Lack of recycling

Potentialities of the Guantánamo Design Group

- The company's management is supported by the protection of workers' health and safety.
- The Group's quality policy includes an integrated management system in accordance with current quality, environmental, occupational health and safety, and internal control standards, as well as applicable laws and regulations.
- Technical and professional training is provided to workers and other participants in the investment process.

Delimitation of the study area

After characterizing the Caribbean People's Council and the Guantánamo Design Group, the area where the study will be carried out is delimited (see figure 1). The identification of this area was complemented with data provided by the population, who identified the most affected area by solid waste contamination, based on their experience over several years.

Figure 1: Study area



Source: Own Elaboration

The selected area is quite critical in terms of impacts from solid waste pollution, due to the predominance of micro-landfills, most of the waste collection containers are in poor condition, and the land is largely occupied by three- to four-story multi-family buildings that produce a considerable volume of waste.

Figures 2, 3, and 4 show the growth the study area has experienced in recent years. This demonstrates the change compared to the initial years of its creation, when there were few buildings, generally constructed with limited resources. It now has a fairly extensive infrastructure, encompassing historical and tourist sites, among others.

Figure 2: Growth of the Caribbean People's Council in 2003



Source: Taken from Google Earth (2023)

Figure 3: Growth of the Caribbean People's Council in 2010



Source: Taken from Google Earth (2023)

Figure 4: Growth of the Caribbean People's Council in 2023



Source: Taken from Google Earth (2023)

Results

Based on the analysis carried out in the study area, the main factors that influence solid waste contamination were determined, as well as the potential of the area; the following actions for the adequate management of solid waste are proposed.

Proposed actions for adequate solid waste management

Guantánamo Design Group

- To control compliance with the procedures established in the company's Integrated Management System so that current environmental regulations are not violated during the performance of the services provided.
- To increase the development of environmental training courses for workers.
- To collect raw materials for delivery to the Raw Materials Company.
- To designate separate warehouses for waste collection.
- To apply the "Three R's Rule": Reduce, Reuse and Recycle. Consume only what is necessary, recycling, reusing and repairing when possible.
- To avoid using disposable material such as plastic cutlery, cups and bottles. It is better to use glass or earthenware cups and glasses.
- To reduce the use of plastic (bags, bottles) these can be used more than once and through recycling.
- To reduce paper consumption as much as possible, filing information digitally and making as few paper copies as possible. Documents that are not final can be corrected on screen and/or saved as drafts on the computer; this saves ink and paper.
- To use both sides of the paper and, if possible, make reductions of the originals to reduce the use of the resource before recycling it.
- To recycle toner and ink cartridges.
- To disseminate the rules, regulations and laws that control environmental activity and encourage the confrontation of detected violations.

Community

- To conduct comprehensive training activities with different institutions such as the House of Culture, Municipal Library, Hygiene and Epidemiology, the Committee for the Defense of the Revolution (CDR), the National Association of Small Farmers (ANAP), the Federation of Cuban Women (FMC), Health, the National Institute of Sports and Recreation (INDER),

Communal, CMKS Broadcasting, Agroforestry Company, Education, CITMA. They can include educational talks, workshops, circles of interest and other actions for the conservation and care of the environment.

- To create circles of interest in environmental protection with children, adolescents and young people in the community that facilitate activities such as collecting raw materials, planting trees, visits to natural environments that promote the need for their protection. Learn to reuse, make crafts with products such as plastic bottles, nylon and paper. They should be able to take this knowledge to their schools and raise awareness among others. Make toys with recycled material (egg cartons, paper, cardboard, plastic bottles), which they can then donate to children's circles or elementary schools.
- To promote children and youth painting contests that reflect the actions of children, youth and adults in terms of environmental preservation.
- To publicize in the media (radio, press, television, internet), the activities carried out in favor of the environment, in order to bring the knowledge of the impact of solid waste pollution and the strategy to other communities in the city.
- To develop environmental training courses for the community and local entities.
- To promote cleanup work in parks and near the Bano River is a way to raise awareness about the amount of waste that is dumped in the environment, contaminating the soil, water, air, animals and plants. In this way, micro-dumps are eliminated as much as possible.
- To develop of educational talks in schools, organizations and the community about environmental care, as well as the damage to the health of people, plants and animals caused by environmental pollution.
- To collect raw materials in the RDCs and deliver them to the Raw Materials Company.
- To designate differentiated deposits for the collection of waste.
- To reduce the use of plastic (bags, bottles) that can be used more than once and through recycling.
- To avoid the use of disposable material such as plastic cutlery, cups and bottles. It is better to use glass or earthenware cups and glasses.
- To conduct sanitary hearings in each RDC.

- To disseminate the rules, regulations and laws that control environmental activity and encourage the confrontation of detected violations.

After eliminating landfills, create in their place, gardens and nurseries with fruit, medicinal and ornamental plants to improve the image of the community and avoid the creation of new landfills. These spaces can also be occupied with urban furniture: benches, lights, baskets.

In spite of the actions proposed for the adequate management of solid waste, we cannot forget that environmental education is a process that should last and involve the greatest possible number of the population.

Discussion

The proposal achieved positive results in terms of the deepening of the characteristics and problems of environmental character in the Guantánamo Design Group and its radius of action. This has an impact on the definition of actions that responded to the needs of the object of study.

In addition, environmental education is increased with the development of activities that contribute to the joint work of most of those involved in the implementation of this proposal.

The workers and inhabitants of the area are able to identify one of the main environmental problems to which they are exposed and its impact on the community, being able to look for possible solutions to them with better preparation. At the same time, they can feel identified with the environment and assume the consequences of their actions in a responsible manner; satisfactorily carrying out actions aimed at the dissemination of environmental protection; interpreting the influence of environmental pollution due to improper handling of solid waste in the environment and for their own health. Likewise, emphasis is placed on the practice of lifestyles in harmony with the environment.

The above allowed confirming that the activities designed are feasible to provide a solution to the management of solid waste generated in the study area and contribute to the interest of the Cuban State in the protection and care of the environment and the confrontation of the impact of climate change in the country. This constitutes a contribution for the future urban planning of the study area and other areas vulnerable to solid waste contamination.

Conclusions

The analysis of the theoretical foundations related to the adequate management of solid waste made it possible to determine the need to protect the environment by increasing environmental education, both in the workplace and in the community. Similarly, the study of the regulatory framework for the adequate management of solid waste in Cuba demonstrated the political will of the State to protect and conserve the environment, as a measure to mitigate the impact of climate change in the country. In the research, the characterization of the Guantánamo Design Group and its radius of action was carried out, from which the fundamental causes that provoke contamination by solid waste in this area were obtained, which made it possible to elaborate a set of actions for the adequate management of solid waste in the site, This made it possible to elaborate a set of actions for the adequate management of solid waste in the area, based on the factors that influence contamination, using solutions that promote environmental education through the dissemination of current laws, community activities, recycling and environmental culture, while at the same time improving the urban image with the creation of green areas, the elimination of contaminating focuses, an increase in areas for the collection of solid waste and an increase in urban furnishings.

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