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# WASTE MANAGEMENT PLAN FOR COMPANIES IN THE MUNICIPALITY OF ÚRSULO GALVÁN, VERACRUZ, MEXICO

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**Abstract:** Since the dawn of humanity, the production of goods has been essential for satisfying needs, from primary or physiological needs to tertiary or self-actualization needs. Regardless of the type of need, the production process has been required to generate goods or services. These processes have become increasingly sophisticated and cutting-edge, resulting in high-quality production. However, even as processes continually improve, the generation of waste is unavoidable. If this waste is not managed properly, it creates complications, initially for businesses, as it represents an untapped resource that can jeopardize their finances. But more importantly, it can negatively impact the environment and, consequently, social well-being. Therefore, it is crucial to utilize all inputs, including waste. Consequently, it is increasingly common and highly beneficial for companies to implement waste management plans that allow them to optimize and utilize inputs and/or raw materials from the outset through the proper management and handling of waste generated during and after the production process, carrying out activities such as recycling, reuse, rental, reduction, and repurposing. This study aims to understand the waste management plans of companies in the municipality of Úrsulo Galván, Veracruz, Mexico. A descriptive, cross-sectional, and mixed-methods approach was employed. The study focused on companies of various types within the aforementioned municipality, and the subjects were the managers and/or employees of these companies. The data obtained allowed the study to achieve its objective and evaluate the working hypothesis. Significant results are presented regarding the activities implemented in the waste management plan.

**Keywords:** *Circular economy, preservation, utilities.*

## Introduction

The production of goods and services is a continuous activity. Production processes have always been carried out for this purpose and, in general, to provide well-being to society. Like any process, it must go through a series of stages ranging from the input of raw materials to transformation and the finished product. However, during the process, waste is generated, defined by the Law on Prevention and Comprehensive Management of Solid Urban Waste and Special Handling for the State of Veracruz de Ignacio de la Llave, (2018) as material, input, product, or by-product generated in the processes of extraction, processing, transformation, production, consumption, use, control, or processing, which is discarded and may be susceptible to reuse or requires treatment or final disposal.

Generating waste is practically inevitable; what is important is what happens to it, since, as the above law indicates, it can be reused if it is subject to an adequate management plan that brings economic benefits through savings or optimal use of raw materials, economic utility through sale or transactions, and finally, what should be most relevant, care for the environment.

Despite the above, there is information that, at least in Mexico, basic waste management continues to predominate, wasting those that are susceptible to being reincorporated into the productive system, which would reduce the demand and exploitation of new resources. This is supported by the

fact that 102,895.00 tons of waste are generated daily, of which 83.93% is collected and 78.54% is disposed of in final disposal sites, with only 9.63% of the waste generated being recycled. (SEMARNAT, 2017).

This indicates that for society, but mainly for the companies themselves that are in constant production, it is necessary to generate a superior design of materials. To this end, the General Law for the Prevention and Comprehensive Management of Waste in the United Mexican States (2023) proposes ways of managing waste, highlighting the importance of its use through a set of actions aimed at recovering its economic value through reuse, remanufacturing, redesign, recycling, and recovery of materials.

To this end, there must be specific plans that allow for adequate waste management in companies. These plans consist of the prevention and comprehensive management of waste, promoting the comprehensive management of urban solid waste and special waste in the country through the financing of studies or programs for prevention and comprehensive management and projects. Ministry of the Environment and Natural Resources (2018).

The objective of this research project is to learn about the waste management plans in companies in the municipality of Úrsulo Galván, Veracruz, Mexico. This is the area of influence of the educational institution where the project is being developed, but it is also an area of economic influence, where a number of companies from different commercial sectors are located. The research question is: What activities are implemented in waste management plans in companies in the municipality of Úrsulo Galván? The working hypothesis is that recycling, reuse, reduction, and rental are the most

frequently implemented activities in waste management in companies in the municipality of Úrsulo Galván, Veracruz, Mexico. Relevant information on the results obtained is presented, allowing us to meet our objectives and evaluate the hypothesis.

## Materials and methods

This research is part of the project entitled Evaluation of waste management in organizations as a benchmark for circular economy for sustainability, which is being developed in municipalities in the central area of the state of Veracruz. In this case, we specifically focused on the municipality of Úrsulo Galván, considering companies in the commercial, industrial, and service sectors. To obtain the population, we consulted the National Statistical Directory of Economic Units (DENU), which identified a population of 1,472 economic units. To obtain the study sample size, we used a formula for finite populations, with 95% confidence and 5% error, resulting in a total of 305 companies to survey.

In the field research, observation, interviews, and surveys were used, employing a structured questionnaire as an instrument, which was applied to a first pilot test for validation during the period of January and February 2024. Subsequently, data collection was carried out during the period from March 2024 to August 2025.

The research uses a descriptive method, seeking to describe the frequency of implementation of waste management plans in companies in the municipality of Úrsulo Galván, Veracruz, Mexico, which are considered the object of study; and as subjects,

the managers, owners, and/or employees of companies; in addition, a mixed methodology is used to evaluate the frequency and activities established. To develop research techniques such as interviews and surveys, a structured questionnaire was used as an instrument, similar to a Likert scale with a rating scale and multiple-choice options, consisting of 27 questions covering various aspects of waste management plan activities. With the sample established, data was obtained using spreadsheet programs and the SPSS statistical program, which provided information for representation, analysis, interpretation, and obtaining results. This allowed the objectives to be met and the relevant conclusions and recommendations to be made.

## Results and discussion

Based on the data obtained, the following results are presented:

Regarding the line of business of the companies surveyed, 45% belong to the service sector, 28% to the commercial sector, and 27% to the industrial sector. (Figure 1).

The type of waste generated by companies in the area under study is mostly 88% municipal solid waste, 3% agricultural waste, and 2% hazardous, organic, industrial, and construction and demolition waste. (Figure 2)

When asked whether the company implements a waste management plan, 28% indicated that they do so frequently, 25% occasionally, 22% almost never, and 13% very frequently. The same percentage indicated that there has never been such a plan. (Figure 3)

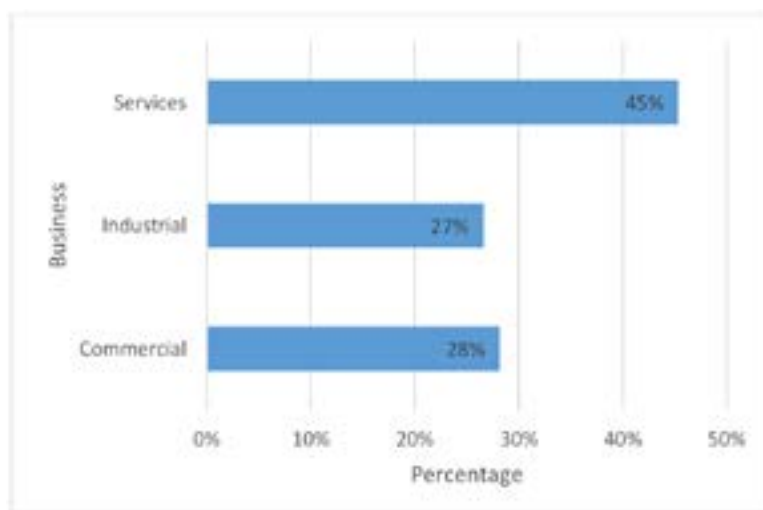


Figure 1. Business sector of the companies surveyed.

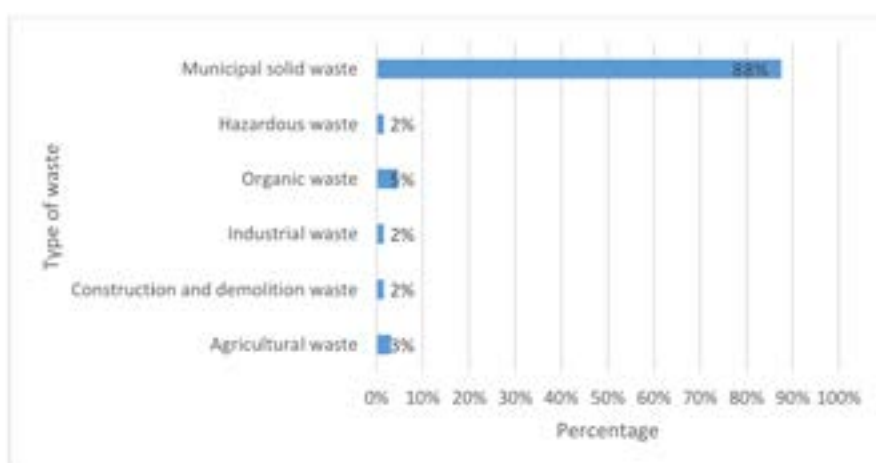
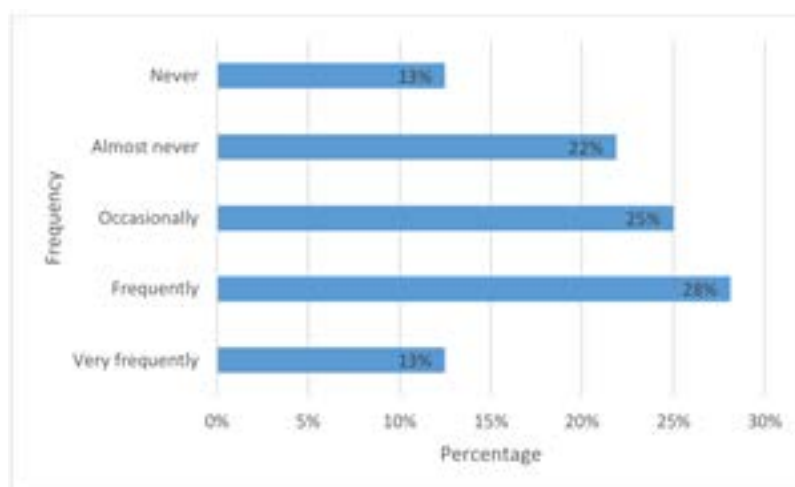


Figure 2. Type of waste generated by companies.



3. Frequency of use of the waste management plan in the company.

Regarding the treatment activities carried out in the company, 49% specified separation or recycling, 27% indicated no activity, 11% separation or recycling and composting, 5% biodigestion, 3% separation, collection, and shredding, and as a repeat, we have the options of composting, separation, recycling, shredding, and compaction with 2%. (Figure 4).

Setting waste reduction and reuse targets is an important activity. In this regard, 27% of companies indicated that they do so occasionally, 22% almost never, 21% never, 16% frequently, and 14% very frequently. (Figure 5).

Regarding waste reuse, the majority (33%) indicated that they do so occasionally, 23% very frequently, 20% never, 19% almost never, and only 5% very frequently. (Figure 6)

Waste treatment in specialized plants is an activity that 36% of companies indicated they never do, 28% occasionally, 17% frequently, 11% almost never, and 8% very frequently (Figure 7).

According to the results obtained, it is clear that waste generation is inevitable and

that most of it is municipal solid waste. We agree with Rodríguez & López, who specify that there are several factors that aggravate this problem, such as the high and continuous growth in waste production levels, high consumption rates, and the lack of an adequate management and control system (2020).

However, most companies indicated that they frequently use waste management programs, with activities such as waste separation and recycling. According to Pellegrini and Reyes (2009), cited by Reyes et al (2015), this is an excellent way to classify waste at source and ensure its proper final disposal. In this regard, they point out that recycling contributes to strengthening environmental culture and, consequently, to the sustainable use of natural resources worldwide.

There are other alternatives that include reuse in their waste management plan, specifically 23%, which is in line with Palomino & Huisa (2021), who assert that the reuse and recycling of solid waste in Latin America is still in the process of transitioning to a circular economy in solid waste management.

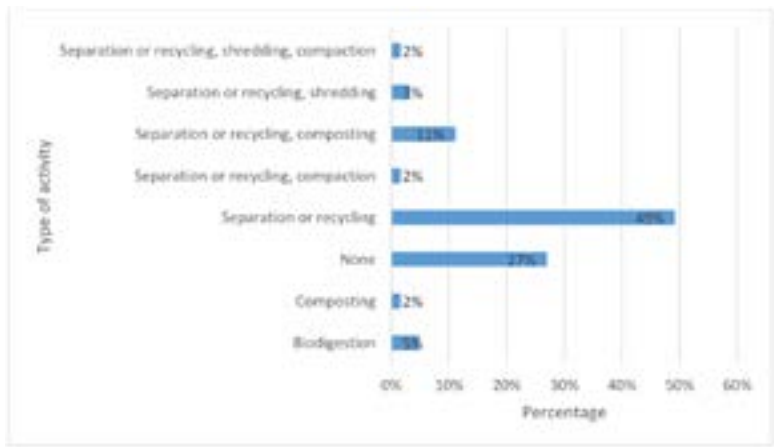


Figure 4. Waste treatment activities generated by companies

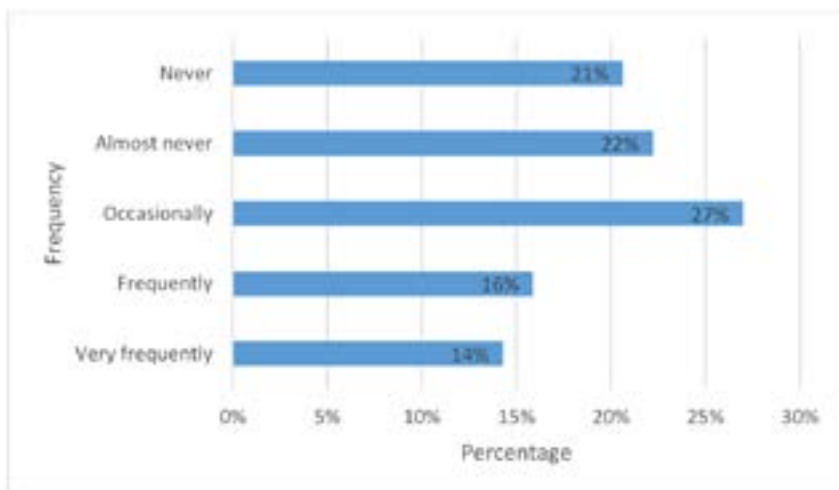


Figure 5. Setting waste reduction and reuse targets in companies.

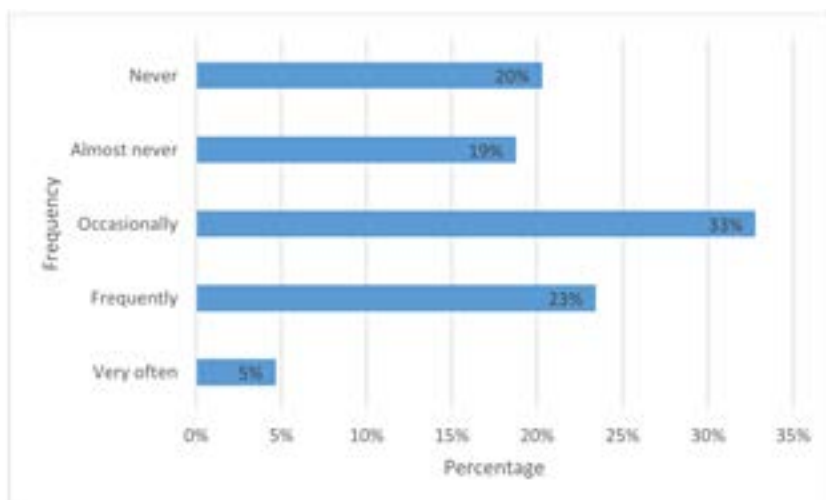


Figure 6. Reuse of waste or old objects so that they can be used again.

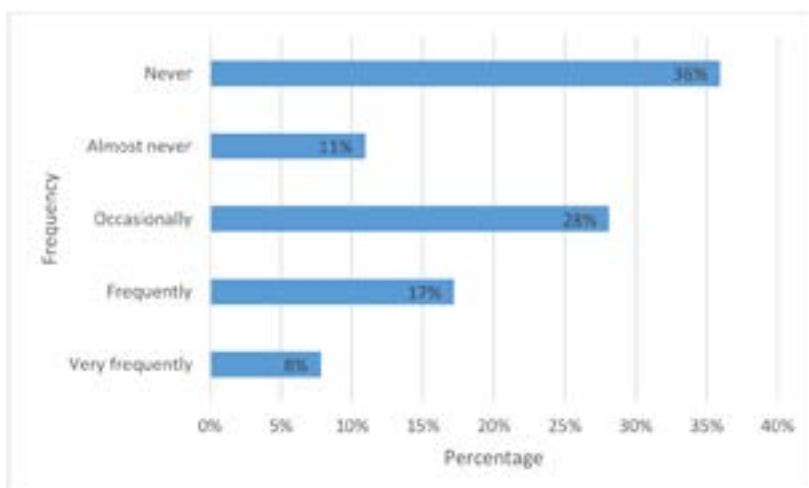


Figure 7. Treatment of waste generated by the company in specialized plants.



## Conclusions

1. The results indicate that waste management and handling plans are implemented in companies in the municipality of Úrsulo Galván, where they mainly carry out recycling, reuse, and material reduction activities. This implies that management activities are relatively basic, as they do not resort to a superior design in waste treatment.

2. The use of technology and the use of or agreements with companies dedicated to waste treatment are not essential activities, as they do not use specialized plants for this purpose.

3. With the above information, we can say that the objective of learning about waste management plans in companies in the municipality of Úrsulo Galván, Veracruz, Mexico, was achieved. It was clearly identified that the activities carried out in this plan need to be strengthened and that more specialized strategies should be included for the economic benefit of the company, but mainly for the care of the environment. Likewise, the hypothesis mentioned above was proven: recycling, reuse, reduction, and rental activities are the most frequently implemented waste management activities in companies in the municipality of Úrsulo Galván, Veracruz, Mexico, even though it was identified that the frequency is not really high.

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