

Circular economy: transforming wastes into goods and changing behavior for charity.

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Abstract

The circular economy concept is based on strategies to achieve principles related to reusing, recycling, redesigning, repurposing, remanufacturing, refurbishing, and recovering water and waste materials to preserve natural resources. It provides the conditions to encourage economic and social actors to adopt strategies toward sustainability. Therefore, our community was motivated to contribute to three TerraCycle enterprise programs: disposing of unused cleaning sponges, writing materials, and plastic toys in a proper way. However, the main goal was not only to collect hard recycling wastes but also to bring awareness to our community. The most important was to convey the concept that garbage no longer exists and the productive process must work repurposing the wastes generated. Some trash bins were used to collect the waste and placed in the school and in one condominium. Besides the bins, a thermometer sticker was used to indicate in means of temperature the number of collected wastes in grams. After six months approximately 20 kg of waste were delivered to TerraCycle. The primary data shows that the community is more alert to proper waste disposal, avoiding the accumulation of long last decomposing materials into landfills and therefore contributing to protecting the water resources.

Key words: community, reverse logistics, solution, wastes.

1. Introduction

The continuous global population growth is inextricably linked with increase in waste generation. These wastes, which include household waste, building and construction waste, chemical and hazardous waste, sludge and ash need to be disposed of. All over the world, landfills have long been, and still are, a destination to both domestic and industrial wastes. Improper landfill management causes deterioration in environmental qualities. One of the leading pollution problems caused by Municipal Solid Waste (MSW) landfill is landfill leachate. The major environmental impacts associated with leachate are pollution of groundwater, since many of the thousands of landfills, active or abandoned, have been operated

with little regard for groundwater contamination. Groundwater contamination becomes inevitable, especially when the bottom of the landfill is below the water table, or if the material separating the dump from the aquifer is permeable. Such pollution of groundwater may last for decades or centuries, thereby posing serious threat to groundwater security [1]. Therefore, reducing pollutants into landfills are desirable.

A circular economy keeps materials, products, and services in circulation for as long as possible. The Save Our Seas 2.0 Act refers to an economy that uses a systems-focused approach and involves industrial processes and economic activities that are restorative or regenerative by design, enables resources used in such processes and activities to maintain their highest value for as long as possible, and aims for the elimination of waste through the superior design of materials, products, and systems (including business models). It is a change to the model in which resources are mined, made into products, and then become waste. A circular economy reduces material use, redesigns materials, products, and services to be less resource intensive, and recaptures “waste” as a resource to manufacture new materials and products [2].

Circularity is embraced within the sustainable materials management (SMM) approach. A circular economy approach under the SMM umbrella demonstrates continuity in the emphasis on reducing negative lifecycle impacts of materials, including climate impacts, reducing the use of harmful materials, and decoupling material use from economic growth and meeting society’s needs. It has set out a transformative vision for the waste management system – one that is inclusive, more equitable, and reflects the urgency of the climate crisis – by releasing a series of strategies that will be dedicated to building a circular economy for all [2].

Overconsumption and a throwaway culture have led to a global waste crisis. While even complex trash is technically recyclable, most materials are not profitable to recycle. As a result, waste piles up in landfills and pollutes our planet while virgin materials

are extracted from the earth to create new products. An enterprise called TerraCycle, created strategies of businesses together with government, entities, communities that eliminating the “Idea of Waste”, works globally to keep trash out of landfills or from incineration. Through collaboration and innovation, they developed the world's solutions in everything from recycling to reuse. They develop free recycling programs. These programs are free recycling solutions for typically hard-to-recycle waste streams. Community can join as many programs as they like to help reduce your impact on our planet [2]. Terracycle programs are current developed in 20 countries: Asia Pacif (Australia, New Zealand, Japan, Korea, China), Americas (Brazil, United States of America, Canada), Europe (Belgium, Denmark, Spain, Nonwage, Switzerland, German, France, Netherlands, Swiss, Austria, Ireland, United Kingdom). The Research & development (R&D) team of Terracycle and partners analyzes the materials to determine the right way to process them into something new. This includes how to break down the waste, separate it into its building blocks, and then recycle those materials for new applications. [3].

In this work, we have adopted reverse logistics. It is a type of supply chain management that moves goods from customers back to sellers or manufacturers. We have subscribed to three partnership Terracycle programs and have developed strategies to bring up to the community the idea there is no waste. The behavior of throwing all wastes away has no sense since this action directly affects the limited Earth's resources, a finite planet, where human beings live, and therefore garbage will accumulate in our "home".

2. Methodology

After studying different strategies to decrease the number of house waste improperly disposed of in the environment, TerraCycle programs were the choice. The most suitable programs for our community were the collection of the following unused materials: plastic toys and gaming, cleaning sponges, and writing material. Different brands are accepted in these programs. In Brazil, the Terracycle programs, for every 100 grams of the toys delivered back to Terracycle, 10 points (R\$0,10) are deposited in the account and for cleaning sponges and writing materials 2 points (R\$0,02). The shipment for Terracycle are free of charge, however, they adopt the strategies to reduce the carbon footprint by adopting the minimum weight for packages to score in the program. The minimum weight for each program is 100g, 2kg, and 5 kg, respectively for toys, cleaning sponges, and writing materials. The money deposited

in the account will be directly donated to charity institutions and there is not any possibility of withdrawing the money for personal propose.

To collect the materials (toys, sponges, and writing material) trashes were acquired and put in specific places. The chosen locals were the main door of a high society condominium and the main halls of the school, CEFET-MG Varginha, buildings. Trashes were properly identified with stickers indicating the type of waste to be collected. Communities were instructed by messages using WhatsApp groups. And for school students and school workers, email and personal talk strategies were applied. Wastes collection started on March 2022 and continued up to now.



Figure 1: Trashes for wastes disposal. From left to right wastes of writing material, toys and cleaning sponges. Trashes were available in the main door of condominium.



Figure 2: Trashes for wastes disposal. From left to right wastes of writing material and cleaning sponges. Trashes were available at the main halls of school building.

Trashes were verified by the working team periodically and materials were stored until the required weight was accomplished. When the goal was achieved, the materials were organized in cardboard paper boxes freely available in the local supermarket and sent to Terracycle free of charge. To stimulate selective disposal plastic cases were put inside each classroom. These cases were used to collect paper from students' daily routines. Paper wastes were collected by City Hall's selective collection programs.

3. Results

After six months of campaign we succeed in collect the three different wastes (Table 1). However, the large amount was collected in the main entrance of the condominium. Unfortunately, in both places school and condominium, trashes were used in inappropriate way. Several time citizens and students throw organic material and others inside the trash that impair the proper segregation of wastes for the programs. Wastes material are contaminated making unfeasible. Due to the start of the rainy season, trashes in the condominium has to be kept to avoid rain water accumulation and consequently allowing mosquitos and diseases spread. However, during this period wastes can be directly hand out to program staff.

Table 1: Kind and amount of wastes collected

Wastes	Units	Weight (kg)
Sponges	500	4
Writing Material	-	3,6
Toys	-	12
Total		19,6

Figures 3 and 4 are flyers used for awareness purposes in social media channels.



Figure 3. Flyer send to the community by social media groups to bring up reflection and awareness.



Figure 4. Post of Instagram with the directions of kind of writing materials accepted in the program and what must be thrown in the trash.

4. Conclusion

Despite the project has succeed in avoiding almost 20 kg of hard recycling wastes to be accumulated in the environment, in the local's landfills or dumps, the amount of the wasted rescued are insignificant comparing to number of people attendant in the campaign. The school community has more than 600 citizens and condominium more than 200. The sum is 800 people, considering only adults and teens. Therefore, we need to develop better strategies to motivate citizens for proper waste disposal. Besides more work must be made to alert for the proper discharge avoid mixing the desirable material with organic matter or other contaminants. We need do expand the project to evening to attend college students.

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References

- [1] Abiriga, D., Vestgarden, L. S., Klempe, H. (2020) **Groundwater contamination from a municipal landfill: Effect of age, landfill closure, and season on groundwater chemistry.** Science of The Total Environment v. 737, p. 1- 11.
- [2] U.S. Environmental Protection Agency- EPA, (2022). **National Recycling Strategy.** Available on; < <https://www.epa.gov/recyclingstrategy/what-circular-economy>> . Access 01 July 2022.
- [3] Terracycle. Available on <https://www.terracycle.com/en-US/about-terracycle/>. Access 01 July 2022.