

# **Solid Waste Valorization Strategy in Bogota-Colombia as a Sustainable City Component**

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## **Abstract**

This paper will present the various solid waste collected, the collection process and at the end a business idea will be announced. the one that uses these residues; It seeks to highlight the current process of solid waste, because by optimizing these resources can reduce waste and in turn help the environment and society to obtain a cleaner production; It focuses on the town of Suba, one of the largest in the city of Bogotá D.C in which there is a wide variety of social activities ie micro businesses, businesses and residential area; The method of quartering is used to know the composition of waste that enter a specific route, in this case the waste begins to separate in organic, glass, paper and cardboard, plastics, metals, and others, subsequently this waste is heavy; Through this methodology we want to make the description, record, analysis and interpretation of the environmental problem; In addition, a business idea will be presented "Manufacturing and marketing of protectors health, "thinking of meeting the need of those who feel that public restrooms are unhygienic, to focus on the concept of sustainable city.

## **Keywords**

Solid waste, Sustainable City, Collection Center, Valorization.

## **1. -Introduction**

We will talk about strategic valorization of solid waste as a key element of the Bogota sustainability model; implemented in several localities of the city and where it will begin to be structured taking into account the important aspects of it and thus arrive an economic and innovative strategy. It is intended to focus first on an idea that is represented by the reuse of solid waste generated in the localities to carry a business plan with environmental responsibility strategy, environmental impact that will generate solid waste and finally a financial analysis; These three pillars are fundamental for the structuring of this project without forgetting that those companies that are an example of solid waste mitigation as Type B companies will be taken into account for the development of waste valorization, for which a start-up will be handled. systematic review of literature, going on to the investigative diagnosis with the use of an instrument that allows direct observation, an interview and an exploratory measurement such as quartering.

## **2. - Problem Statement**

The problem with waste begins in the development of modern society, when the management of our waste increases and gets worse year after year. Given this situation, it is important to analyze the factors that have increased the problem of urban waste so alarmingly. In general, four main causes can be identified:

1. Rapid population growth.

2. The concentration of the population in urban centers.
3. The use of rapidly deteriorating material goods.
4. The increasingly widespread use of non-return containers, made of non-degradable materials. (MOPT, 1992)

Therefore, in Colombia, urban growth and industrial activities have increased the generation of solid waste, without developing strategies for dealing with environmental problems related to the optimization of the use of natural resources, the development of monitoring programs and control for compliance with environmental standards, and the implementation of modernization and industrial reconversion programs aimed at increasing environmental and economic efficiency. (Gómez, 2000); the situation in the big cities is more complex, and even more, in a city like Bogotá D.C. "Because it is the city in Colombia that generates 2,102,890 tons per year" (Colombiano Newspaper, 2017).

So, day by day, the generation of solid waste is increasing, creating not only a social problem but also an environmental one, such as pollution; all this, because we simply do not have the culture of throwing this waste where it should be, if not that it is thrown in inappropriate places, such as streets, sewers, rivers, forests etc ... Forming negative consequences for the environment, health; both physically and visually, also with a high degree of affectation to our quality of life. Therefore the focus of the problem will be taken into account one of the largest localities of Bogotá that is Usme, because according to the local environmental plan of Usme 2017 - 2020 we see that the locality has a serious problem with air pollution, since it is burning large amounts of solid waste, so the main objective of this plan is that through technical, administrative and financial resources can be developed environmental improvement actions that allow a contribution of improvement and participatory awareness of the communities of each neighborhood that are part of the locality.

In Usme, for 2010, 179 clean-up points were identified, most of them located in UPZ Gran Yomasa (83), Comuneros (46) and Danubio (33), where previously the Aguas de Bogotá SA ESP consortium has a coverage in garbage collection of 100% in legalized neighborhoods; In spite of having this coverage, more than 170 critical points of accumulation of solid waste and debris in public spaces, green areas and in the roundabouts of the streams occur in the town. From the social - institutional dimension it is evident that there is a lack of education for the community to carry out adequate solid waste management and disposal processes. On the part of the cleaning consortium 102, it does not comply with schedules defined by this entity. This has increased the proliferation of pests and rodents, offensive odors, pollution of public space. These actions reinforce it, the deficiency in the operation of the zero waste program by recyclers in the absence of schedules and routes selectors in the schedules. Lack of appropriation of space and public goods. Fatal civic culture. Inoperance of environmental comparing. This affects the natural-institutional environment dimension, contaminating the main ecological structure, generating institutional burdens due to inadequate disposal of solid waste. (Secretary of Health, 2014)

The problem of poor management of solid waste has some critical points which can be seen exposed on public roads, green areas and common areas, especially in places that have a market place. So this problem not only affects this locality, but also at a regional level, in this case the city of Bogotá, therefore what we want to achieve, is that this city is pleasant in all its contexts. The foregoing leads us to ask questions such as: How is solid waste to be harvested and reused in Usme? And how can we value solid waste through a company B in a specific business plan in the town of Usme?

### **3. - Solid waste management**

Nowadays we have a big problem with solid waste since we do not know how to take advantage of them, because we see how our streets accumulate waste due to the mismanagement that is given, this problem leads to a bad economy for our environment and that you can make good use of this waste, recycling to save natural resources that gives us our mother earth. In addition, for the correct disposition a color code is suggested in order to facilitate the identification of residual materials (Colombian Technical Standard, 2009).



Figure 1. Colors for the classification of solid waste.

And with the following table, it is observed how an orientation for the separation of waste in the source is given:

Table 1: Separation of waste at the source

Tipo de residuo	Clasificación	Ejemplos
Residuos no peligrosos	Aprovechable	<ul style="list-style-type: none"> <li>- Cartón y papel (hojas, plegadiza, periódico, carpetas).</li> <li>- Vidrio (Botellas, recipientes)<sup>A</sup>.</li> <li>- Plásticos (bolsas, garrafas, envases, tapas)<sup>A</sup></li> <li>- Residuos metálicos (chatarra, tapas, envases)<sup>A</sup></li> <li>- Textiles (ropa, limpienes, trapos)</li> <li>- Madera (aserrín, palos, cajas, guacales, estibas)</li> <li>- Cuero (Ropa, accesorios)</li> <li>- Empaques compuestos (cajas de leche, cajas jugo, cajas de licores, vasos y contenedores desechables)<sup>A</sup></li> </ul>
	No aprovechable	<ul style="list-style-type: none"> <li>- Papel tissue (papel higiénico, paños húmedos, pañales, toallas de mano, toallas sanitarias, protectores diarios)</li> <li>- Papeles encerados, plastificados, metalizados</li> <li>- Cerámicas</li> <li>- Vidrio Plano</li> <li>- Huesos</li> <li>- Material de barrido</li> <li>- Colillas de cigarrillo</li> <li>- Materiales de empaque y embalaje sucios</li> </ul>
	Orgánicos Biodegradables	Residuos de comida Cortes y podas de materiales vegetales hojarasca
Residuos peligrosos		<p>A nivel doméstico se generan algunos de los siguientes residuos peligrosos:</p> <ul style="list-style-type: none"> <li>- Pilas, lámparas fluorescentes, aparatos eléctricos y electrónicos</li> <li>- Productos químicos varios como aerosoles inflamables, solventes, pinturas, plaguicidas, fertilizantes, aceites y lubricantes usados, baterías de automotores y sus respectivos envases o empaques.</li> <li>- Medicamentos vencidos</li> <li>- Residuos con riesgo Biológico tales como: cadáveres de Animales y elementos que ha entrado en contacto con bacterias, virus o microorganismos patógenos, como agujas, residuos humanos, limas, cuchillas, entre otros.</li> </ul> <p>Para el manejo de estos residuos se recomienda no mezclarlos e informarse acerca de diferentes entidades que se encargan de su gestión.</p> <p>A nivel industrial, institucional y comercial esta reglamentado con base en la legislación vigente (véase anexo A)</p>
Residuos especiales		<ul style="list-style-type: none"> <li>- Escombros</li> <li>- Llantas usadas</li> <li>- Colchones</li> <li>- Residuos de gran volumen como por ejemplo: muebles, estanterías, electrodomésticos.</li> </ul> <p>Para el manejo de estos residuos se recomienda informarse acerca de servicios especiales de recolección establecidos.</p>

Source: (Colombian technical standard, 2009)

Also, to know which ones we can reuse to obtain the best possible profit when generating a new product.

Cities are the engines of future growth, but they are also responsible for the largest share of CO2 emissions. At the global level, cities are the decisive factor of our climate. (Löscher, 2011). Likewise, it should have a good quality of life, which is what each person seeks, and what better to start a good business based on socio-environmental pillars, and thus promote corporate social responsibility for a good economic future. For this, you need to have a systematic approach and thought as it is known as the discipline that is responsible for analyzing all the systems that surround us, whether social, environmental, political, technological and of any kind, seeking to integrate all the factors, and business managers should be able to interrelate all the problems that arise in any system to provide a comprehensive solution implementing integrated management systems (Vasquez, 2018).

#### 4.- Business plan

"A strategic business plan is that plan that exposes the method to certain activity in a certain period in the future" (Stutely, 2000). Now, to be able to present this business plan, the CANVAS model created by Alex Osterwalder is the ideal one, since it has nine segments (see figure 2) (value proposal, customer segments, relationship with customers, distribution channels), key activities, key resources, key partners, cost structure, sources of income) that every business idea must take into account when carrying out your business idea.

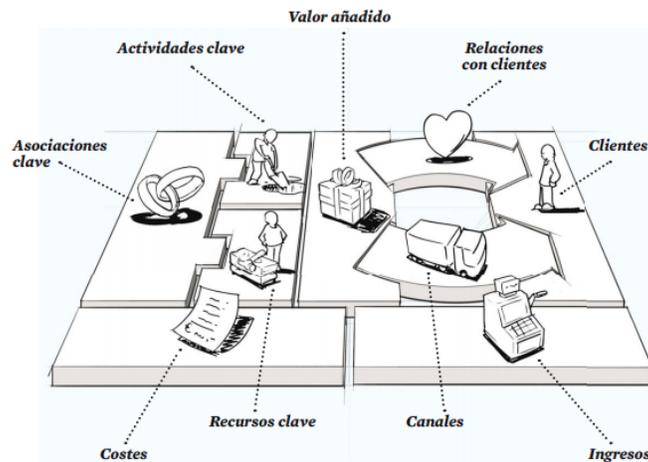


Figure 2. Model CANVAS. (Osterwalder, 2012)

Taking into account the above, the implementation of this model to the business idea, will help to improve the idea, especially in how it is going to enter the market in a clear manner so that, in this way, to stay in the market. In addition, the business plan model that I am going to deepen is the SENA type of entrepreneurship.

#### 5.- Business strategy

This business plan leads us to carry out a strategy, that is, the action line to be carried out to achieve a goal. The previous thing would be noticed in the interest to approach the knowledge of the new technologies (SAP), in order to consolidate the actions, and that these are made effective., The competitive advantage as a concept put the objective to show how the chosen strategy and followed by an organization, can determine and lay the foundations of their competitive work. (Garay, 2017).

This strategy is an excellent foundation for the business strategy that will be designed in the locality, since it teaches us to have an efficient use of the waste or raw materials that will be used, in addition to reducing the impacts that are generated in the cycle of product life. In cleaner production, it is necessary to study where the waste comes from and act before, so that costs can be reduced due to good waste treatment. This means that when starting a project we must analyze the context around it in order to ensure that the business or product is really focused on a real need of consumers, we must be clear about market trends in order to reach the need to Consumers and thus offer a useful product for their lives, know of competition in the

market, to know what their strengths and weaknesses are and thus be able to get it right, also have a key group to know who can sell the product to.

## **6.- Quartering**

Before planning the business idea and strategies, an investigation must be done in which it consists of knowing what will be the key raw material to carry out the business plan, for this reason the tool or method of the Quartering is defined, which serves us to know the composition of waste that enters the filling of a specific route. For example, we can know the composition of a specific stratum, the percentage of organic material that can leave the market squares, the fraction of inorganic material that is not being used, the amount of unusable material produced by a city, etc. (Rendón, 2012). And having the sample make weights or a diagnosis of each classification of waste found to know which is the most generated.

This means that the quartering helps us to confirm the data that I need; confirm in a very small and random sample the data that throws us the environmental plan of the town of Usme and the balance of the garbage collector with the mayor's office, therefore we go from a global analysis to a concrete analysis.

Already obtaining the selected raw material and a good business plan, the shareholder must be convinced that not only will profitability be generated in the new business idea, but that it will generate a great impact on the environment, and thus, that it will be converted for this shareholder one of its objectives when entering its capital to the economic activity, doing it with security and confidence. Therefore we talk about basing ourselves on a model of type b companies, that also, the economic benefits are quite good, since it is obtained from a totally transparent treatment and without that small or tangled letter that sometimes is used to convince the shareholders, (Correa, Gatica, Abromavay, & Van Hoof, 2014) Affirms "Opera with high standards of management and transparency, while seeking the best financial performance and allows the sharing of profits between shareholders. His philosophy is that the best way to provoke a social or environmental change is through the market. "Being that way, the company type B becomes a reliable company in the market, and being reliable, it will be much more efficient.

## **7. - Results**

To confirm the reports of the cleaning management companies on the management of solid waste in the localities, an exploratory type sample was determined to determine the model of the quartering, and thus meet the second specific objective of the investigation, which, is to characterize the different types of solid waste in the town of Usme, in order to establish a specific sample and the specific traceability of these. Therefore these 4 places were chosen

- a. - Residential - Family house swept the Aurora
- b. - SME - Mini market ZCHARIT
- c. - Student - Psychopedagogical School Monseñor Jaime Alberto Bonilla Nieto
- d. - Company - Market Square Barrio la Aurora

The characterization was carried out according to the schedule of activities, starting in the residential area, spreading on a Monday as trash collection by promoambiental SAS is done these days on Monday, Wednesday and Friday, so at the time of the quartering they get more waste than other days, because they are three days before the respective collection and final disposal of the waste, which allowed us to obtain a better sample (see figure 3).



Figure 3. Residues; Residential place

It is clear that the highest percentage of waste is that of food wrappers and non-recyclable waste, as second place we have the cardboard either in a box or in a tube, because many house of the locality they work with fabrics or in satellites of confection to distribute to the center or to different points of the city and thus to sell in wholesale, and lastly the pet because the society is quite consuming of liquids.

## **Conclusions and recommendations**

After all the analyzed and carried out in the investigation in the city, the following conclusions have been reached:

It shows that there is a need to give greater importance to this problem, to achieve a degree of awareness, which allows us to finally obtain a greater organization in the waste to achieve mitigate the negative impact that has on the environment.

It shows the different methods to achieve the recovery and use of waste to give them a good handle and in turn generate income, not only helping the economy but the environment

The situation that is experienced every day in this city is quite worrying, so it generates a large environmental problem, either by culture, or lack of knowledge of the community in the management of solid waste, but if a Proper management of solid waste, we can mitigate that pollution and help the economy of the country.

There is a great variety of usable waste in the city, which are being poorly managed and these could have a great impact on the socio-economic development of the area.

According to the study carried out in the business plan, it is feasible to carry out a business project based on recycling, since at all times we see waste in the streets, which we can make good use of them, and thus be able to mitigate the environmental impact , and in addition, generate a good profitability.

Once this research is completed, the inhabitants of the city must identify the waste, which can be used and those that cannot be used to develop a sustainable and solid management.

Perform constant sampling and in more places to confirm the percentage of usable and non-usable waste generated in this locality.

Make a respective commitment from the mayor to the cleaning company, to have a more extensive follow-up, about garbage thrown in the locality, and not reach to reach inappropriate places.

The following recommendation is for all the inhabitants of this town, since with their commitment and good management in solid waste, we can generate a good economy for the country, through the use and valorization of these.

The business plan can be viable as there is the necessary capital to start the business, because thanks to the study and research that was done, if it is possible to enter the market in this area, as it is a rare product in the town.

And last recommendation, generate awareness, culture and obedience in the management of solid waste, so we can have a better quality of life.

## **References**

## **Biographies**

**William E. Mosquera-Laverde** graduated as chemical engineer from the National University of Colombia, in 1993; Specialist in Higher Education at a Distance, National Open and Distance University - UNAD, in 2010 and full Masters in Environmental Management, University of the Andes, Bogota in 2014. Professor of Environmental Management at the Universidad Cooperativa de Colombia, co-researcher of the Strategic Noesis Group (UCC), Director of the Seedbed Ecoestrategicos 023. Assistant professor Researcher, Business Administration Program, courses oriented Environmental Management, Operations Research, Quality Management, and Finance. I work with the UCC's entrepreneurship center and sustainability management in vulnerable communities and as a consultant to industrial companies since 1995.

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