A Feasibility Study of a Modified Deposit-Based Return System for PET and other Recyclable Bottles and Containers

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Abstract:

The demand and supply for PET within Cagayan de Oro City is increasing by 3.1 percent per annum based on per capita consumption of 8.4 kg in 2020 and 9.5 kg in 2025. Supply was taken from the total off and on-trade sales multiplied by 91.5 percent less of demand from 2020 to 2025. Carbonated drinks (soft drink) rank second in terms of beverage sales with bottled water on top of the list. The consumers were satisfied with PET bottled drinks in terms of design, size, shape, and durability; strong customer service support; ability to respond to customer delivery needs; cost competitiveness of the product; and engagement with customer-specific needs and requests. In terms of supply, the main features preferred were recyclability, cost effectiveness, ideal for packaging, varied design possibilities and customized solutions. PET bottle market share of 28 percent averages is higher than supply with an average of 18 percent. A survey from the households revealed that DRS is generally acceptable in terms of managing a modified and centralized deposit return system to be owned and controlled by retailers, and manufacturers which assures that empty PET bottles are returned to recycling by means of reverse vending machine, and consumer deposits are refunded. There are 12 PET recycling companies in the Philippines but were not included as participants of the survey as the study is primarily concerned with market, financial, and management feasibility of establishing the system but are recommended to be included in conducting a full-blown feasibility study. The implementation of the proposed DRS for the city is estimated to cover a period of 19 months. Contingency plan for the implementation of the project was not included since the proposed deposit return system requires enabling laws by executive branch of the government whereby local retailers and manufacturers as well as consumers could be guided accordingly by the implementing rules and guidelines. Hence, contingency plan is held in abeyance.

Keywords:	MDRS, DRS, PET, Reverse vending machine
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1 INTRODUCTION

This thesis examines the practicability of establishing a modified deposit-based return system (MDRS). It focuses on the demand and supply analysis of PET, aluminum, and glass bottles for beverages along with the financial analysis as well as a survey of the acceptability of the deposit-based return system. Although these types of packaging materials particularly PET are cheaper and highly recyclable, their use worldwide has made collection and recycling efforts to keep them from polluting landfills or oceans failed to keep up [2]. This demonstrates that consumers are passive, that is, they do not contribute to eradicating pollution from plastic unless an innovative solution is in place [3]. Hence, the collection of used aluminum and glass bottles is of secondary importance as their commercial utilization market is comparably small and recycling can be done repeatedly without losing their integrity with less energy requirement [4]. Through a deposit-based return system (DRS), recycling of PET bottles can be increased at the same time reduce littering through a deposit system reclaimable upon return than as valueless waste plastic material. Through the modified system consumers are provided with ample opportunities to easily reclaim their deposits, cost of bottles added to the purchase price of bottled products when they dispose of the product at collection points [5]. This strategy has become more important today with the growing use of plastic containers. It has been repeatedly proven to be an effective driver for changing behavior, reducing littering, and increasing recycling across Europe. Millions of people live with a deposit-based return system (DRS) in many states in America and Australia while at the same time prevent littering of plastic, glass, aluminum, and steel containers. The crucial question however is whether recycling of PET bottles has future market potentials on account of the uncertainty of availability and quality of recycled PET products. However, with policy interventions involving tax incentives and charging of price premium for “Green” or “Recycled” plastics; taxes on the use of virgin plastics; enforcement of recycled content and labeling standards; and creation of consumer education and awareness campaigns on the benefits of recycled plastic bottles, toward a circular economy in the long run. The findings of the study will serve as a basis for developing a framework for the implementation of modified DRS in the Philippines. Because of its sustainability, it is envisioned that MDRS would increase the penetration of collecting PET bottles and increase the market through bottle-to-bottle recycling methods.

1.1 Aim of the study

The study aims to determine the feasibility of adopting a modified deposit-based return system (MDRS) in one city of Southern Philippines via market (supply and demand) prospects such as raw materials, revenue, costs, uses, supply chain, market share, needs assessment, customer satisfaction, and market projection and public perception on the acceptability of the proposed project.

1.2 Research questions and hypotheses

The study is hypothesis-free. It specifically answers the following questions:

1.2.1 What is the supply of PET, aluminum, and glass raw materials utilized for the production of beverage bottles?

The above question adheres in terms of the source of PET materials (imported or local), recyclability, revenue generation, cost, use, supply chain, market share, need assessment, customer satisfaction, supply projection, and reasons for future growth trends.

1.2.2 What is the demand for PET, aluminum, and glass beverage bottle production?

This considers the market share of PET, aluminum, and glass bottles demand and supply consolidation, forecast off-trade and on-trade of beverage consumption, and demand and supply consolidation.

1.2.3 What are the technical aspects of a deposit-based return system?

The technical aspect in terms of how a deposit follows a bottle or can, how material moves around a system, and how is it financed, and its cost-benefit analysis.

1.2.4 Financial analysis of the proposed DRS.

This considers the income statement, balance sheet statement, and cash flow statement.

1.2.5 What is the level of acceptability of the proposed modified deposit-based return system?

This tackles the deposit payment, reporting of returned packages, membership fee, expenses covered, management, features of a reverse vending machine, existing law and regulation, reclaim of value by customers, government control of MDRS, and the control of MDRS by a non-profit organization.

1.2.6 What action plan can be made for the implementation of the deposit-based return system?

2 METHODS

The study is set at one city of Southern Philippines which already has taken measures of reducing PET pollution through the Republic Act 9003 known as the Ecological Solid Waste Management Act of 2000 [6]. The study had a prior assumption that the law can become more effective and efficient if people themselves have the means to take more control of their PET bottles and become more sensitive to environment-friendly measures. The study conducted an industry survey represented by one of the two largest beverage and one largest beer company in the Philippines to determine the actual demand and supply conditions for PET, aluminum, and glass raw materials in one city in the southern Philippines. Moreover, 180 households were interviewed on the acceptability of MDRS as to implementation. Two sets of questionnaires were prepared: demand and supply questionnaire for two beverage manufacturing firms and MDRS acceptability questionnaire disseminated to 180 households located near the two largest retail/wholesale stores of the city. The scaled MDRS survey questionnaires were validated using the Cronbach Alpha consistency criterion. Data gathered were statistically treated to answer the research questions through the following formulae:

- Simple Percentage: $p = \frac{x}{n} \times 100$ [7]

  Where: p = Percentage
  x = raw score
  n = Total number of responses

- Mean: $\bar{X} = \frac{\sum X}{N}$ [8]

  Where: $\bar{X}$ = Mean
  X = Raw score
  $\sum$ = Summation
  N = Total number of participants

Table 1. Interval scale for the acceptability mean score interpretation.

Interval Scale	Score	Category	Interpretation
4.21 – 5.00	5	Strongly Agree	Completely Acceptable
3.41 - 4.20	4	Agree	Acceptable
2.61 – 3.40	3	Not sure	Somewhat acceptable
1.81 – 2.60	2	Disagree	Unacceptable
1.00 – 1.80	1	Strongly Disagree	Completely Unacceptable

- Cronbach's Alpha $\alpha = \frac{N.\bar{c}}{\bar{v}+(N-1).\bar{c}}$ [9]

  Where: N = number of items

  $\bar{c}$ = average covariance between item-pairs

  $\bar{v}$ = average variance

- Program Evaluation and Review Technique (PERT)

  Formula: $\mu = \frac{a+4m+b}{6}$ [10,11]

  Where: a = optimistic

  m = Most probable

  b = Pessimistic

  μ = Expected time (mean)

  Formula: $\sigma^2 = \frac{1}{36}(b-a)^2$ [10,11]

  Where: a = Optimistic

  b = Pessimistic

  σ^2 = Variance

3 RESULTS AND DISCUSSIONS

3.1 Profile and Supply Analysis

3.1.1 Profile of the participant company

One participant, a beverage manufacturer was interviewed and revealed that the company was operating for PET bottled beverage production for 17 years while 31 years for aluminum and glass bottled drinks. According to the Department of Trade and Industry (DTI) categorization, the company is considered a large scale with more than 200 employees [12].

3.1.2 PET bottle supply analysis – raw materials

In terms of new materials for PET bottle, Table 2 showed that the participant, a beverage manufacturer revealed that for virgin PET material, aluminum, and glass were all imported except for aluminum where raw materials that were availed locally. For recycle and reuse/refill all were sourced locally. It appeared that with the company alone, all raw materials for bottling beverages were imported as primary materials for new bottles while it utilizes local sources for recycling and reuses or refill. PET materials, aluminum, and glass may have been imported from China as the world's leading exporting country of these materials [13]. The findings also suggest that the company used two sources of raw materials either: single-use (virgin) and recycle or reuse/refill whichever is most available at any given time of need.

Table 2. Source of raw material of PET, aluminum, and glass bottles.

Source of Material by type of bottles	Single-Use (Virgin)		Recycle		Reuse/Refill	
	Imported	Local	Imported	Local	Imported	Local
PET Bottles	✓			✓		✓
Aluminum		✓				
Glass	✓	✓		✓		✓

3.1.3 Share to company revenue

In the light of market preference, the contribution to the company's revenue, glass bottles posted the highest contribution followed by PET bottles and then followed by aluminum bottles. Apparently, glass bottles remained the largest source of revenue for the company. This is of the fact that glass material comes in different colors used for a wide variety of styles including juices, soda, and concentrates while ensuring that the liquid remains unchanged in tastes and smell. Second in rank is PET bottles as a good alternative for glass as it can offer a similar clarity as bottles but with the added benefit of impact resistance, being lightweight, and will not leach chemicals into the product contained. At any rate, CO2 is used to carbonate beverages which gives soda its distinct fresh and bubbly texture that consumers might prefer. For instance, glass is a less permeable material than plastic and aluminum, it is much harder for the CO2 to escape. This means that in a glass bottle, soda will stay fresher and fizzier for a longer period. Hence, preferable by the consumers.

Table 3. Share to company's revenue.

Type of Bottle	Shares to Revenue	Rank
PET Bottles	2	Next Highest
Aluminum	3	Lowest
Glass	1	Highest

3.1.4 Total Cost Comparison of PET, Aluminum, and Glass Bottle

Results show that aluminum posted the highest cost of packaging beverages with 28%, 7%, and 13% respectively for direct and indirect cost and operating cost. PET ranked second with 25%, 11%, and 9% respectively. Glass bottles ranked last in the order with 17%, 4%, and 6% respectively.

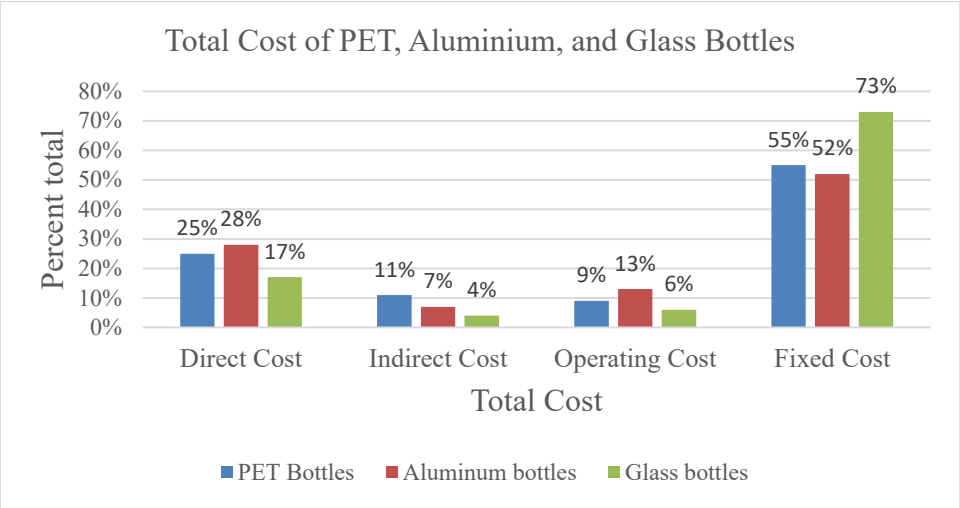

Figure1. Total cost comparison of PET, aluminum, and glass bottles.

Processing aluminum and drink cans are more expensive than plastic. The raw material cost for a can is about 25-30% higher than a PET bottle of a similar volume, according to analyst [14]. A general shift to aluminum cans would raise costs for drinks companies, as it changes manufacturing infrastructure, some of which are likely to be passed on to consumers, thus reducing products' competitiveness against plastic rivals. Another factor for preference for PET bottles is consumer convenience as plastic bottles can be recapped and reused while can remain opened and stay open. Plastic water bottles can also be sold in a range of sizes, while cans are more limited [14]. On the other hand, the glass bottle tends to be more expensive, as the material is more costly and the process to make them is more time-consuming. It is also not readily available, but also has fewer options, heavy, and has a greater chance of breaking. Aluminum cans made from 100% recycled materials has several advantages. Although, aluminum has a low transportation footprint and ease of recyclability, however, the extraction of raw bauxite is detrimental to the planet. New aluminum cans are not eco-friendly. Glass bottles are made from relatively innocuous raw materials and are, like aluminum cans, completely recyclable. Their weight and transportation footprint are their downfalls. Plastic does have a small carbon footprint when it comes to transportation, but it has a huge carbon footprint when it comes to manufacturing. Plus, the plastic that doesn't end up in a recycling bin can be a huge pollutant in our environment, killing wildlife and contaminating the ecosystems. The irresponsible use of plastic is ravaging the planet.

Given the pros and cons, aluminum and glass material are expensive compared to other bottles, however, the company continues to provide carbonated and non-carbonated

drinks packaged in aluminum and glass to increase the supply of packaging material and maintain demand for a segment of the market which continues to buy aluminum packed beverage products. In terms of fixed cost, glass registered the highest (73%) followed by plastic (55%) and aluminum (52%). Fixed costs which constitute the largest account (60% average) however remain fixed irrespective of output level are expenses that must be paid whether any units are produced. They are fixed over a specified period or range of products. It often is used in conjunction with a sales forecast when developing a pricing strategy, either as part of a marketing or business plan. Onstad (2019), reported that recycling plastic is more complex that leads to degradation, and has lower reuse rates than aluminum such that aluminum can be a greener alternative. He added that the aluminum industry can play on the fact that its product is substantially recyclable, however, it uses huge amounts of electricity and has some chemical releases of greenhouse gas emissions. Moreover, since aluminum is lightweight and can make efficient use of space, less transport is usually needed than for plastics or glass, while less power is also needed to chill drinks in cans - particularly useful in tropical climes. Onstad (2019) further reported that simple economics is a major factor; aluminum is more expensive than plastic - the raw material cost for a can is about 25-30% higher than a PET bottle of a similar volume. Hence, a broad shift to aluminum cans would raise costs for drinks companies, also including new manufacturing infrastructure, some of which are likely to be passed on to consumers, thus hitting products' competitiveness against plastic rivals [14].

3.1.5 Off-trade and On-trade Philippine Beverage

Figure 2 reveals the off-trade, on-trade, and total trade of PET supply of beverage bottles in liters based on sales from 2011 to 2016 [15] and converted into kilograms based on the ratio 0.5-liter equivalent to 59.4 grams [18]. The total supply R^2 indicates high goodness of fit of the data (98.7%). The regression model reveals an increase by 28.7 million kilograms per year with a small standard error of 2.35 million kilograms the sample estimate deviate from the actual. There is nothing but chance present in the data and the Durbin-Watson statistics (2.52> DL and DU indicates that the error term is not correlated, hence, the model is good in predicting future supply values. When taken separately as off-trade and on-trade trend, figure 2 also indicates the same predicted direction with parameters (R^2 = .966, ρ = .000, SE = 2.28, DW = 2.49; R^2 = .997, ρ = .000, SE = .103, DW = 1.98) respectively.

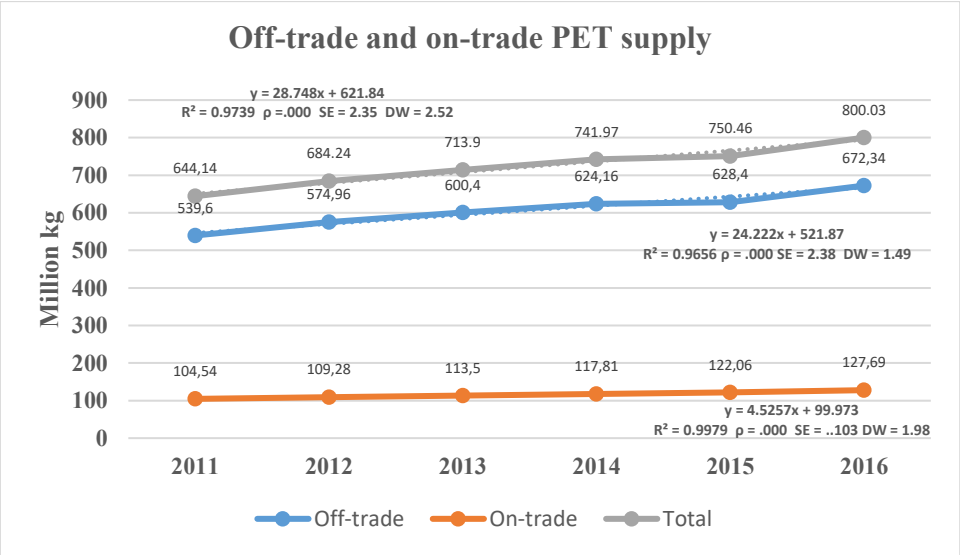

Figure 2. Off Trade and on-Trade PET supply. [15]

The data shows an upward trend as overall data points move in an upward direction at the national level. On other hand, the data shows a systematic trend showing an overall persistent and continuous rise in PET beverage sales. This could be attributed to the upward movement of population, income per capita, changes in product designs, additional product lines, and the like. The upward movement of beverage sales suggests large potential profits and therefore beverage companies are expected to respond by tapping potential investment opportunities in the long run. Along with this, the supply for PET bottle materials is expected to increase to maximize the potential for profits. However, there is a need for companies to understand the factors that may affect the value of plastic bottles versus aluminum or glass irrespective of general market conditions. For this, the company will also need to study the market and technologies, competition, and financial conditions of the company.

3.1.6 Projected Supply of PET bottles

The data on PET supply are national figures and must be disaggregated to estimate supply value by provincial, and city levels. Figure 3 shows the annual projection (2017-2025) from the actual PET bottle data sales in kilogram from 2011 to 2016. Total supply is expected to increase by 28.74 million kilograms which is a 2.77 percent compounded annual growth rate (CAGR) and the initial value of 823 million kilograms expected to reach 1,646 million kilograms in 25 years. Splitting the model into two separate parts, off-trade and on-trade supply will increase by 2.78 and 2.73 CAGR, respectively.

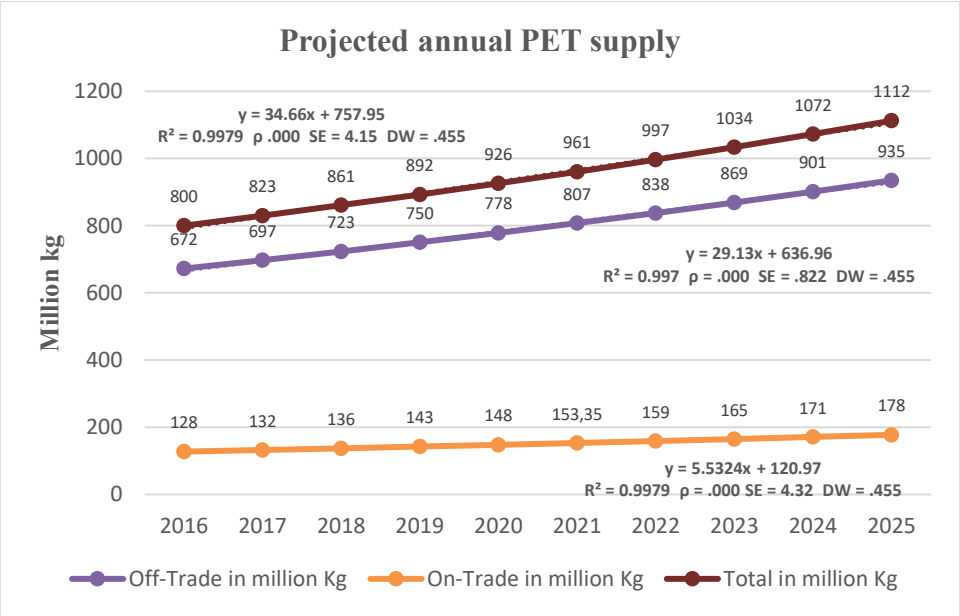

Figure 3. Projected annual PET supply. [15]

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3.1.7 Population estimate per region, province, and city

Figure 4 are national figures and needed further extrapolation by disaggregating them by population by region, province, and city. The table below shows the population estimate of Misamis Oriental (region 10), Northern Mindanao, and Cagayan de Oro City from 2020 to 2025 [17].

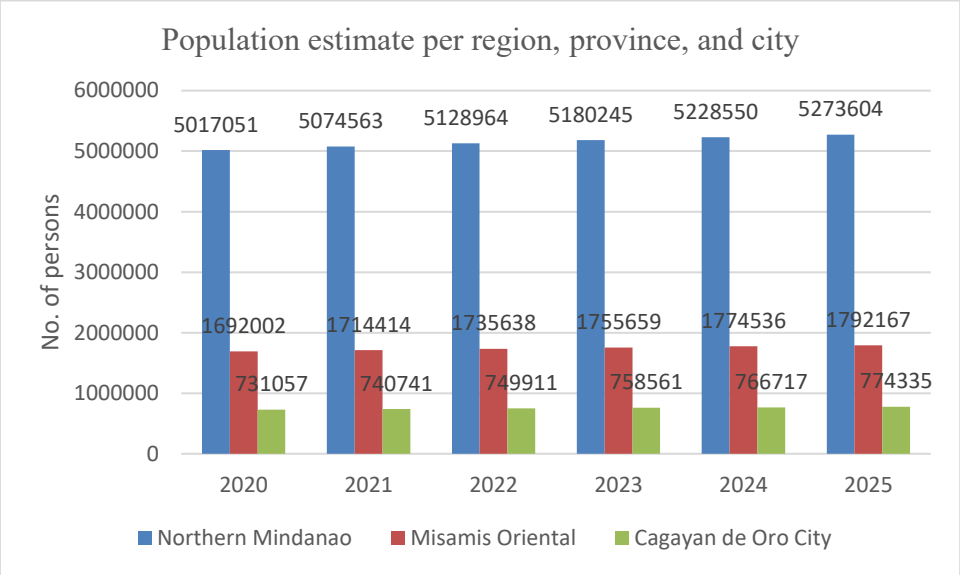

Figure 4. Population estimate per region, province, and city. [15]

The population in the region is estimated to increase by 0.83 CAGR percent, 0.96 CAGR percent increase in the province, and 0.96 percent CAGR in the city. In 2020 alone, the population of the region shares about 4.61 percent of the country's population, while the province shares about 33.72 percent of the region's population, and the city shares about 43.21 percent of the province population. These percentages can be used to estimate the supply of PET aluminum and glass bottles per capita.

On the account that Cagayan de Oro City is a geopolitical component of Misamis Oriental where the geographic spread is close and immediately accessible by land transportation the supply could as well include the province as target market. Currently, there are only two soft drink manufacturers in the area. On the other hand, even though consumption of regular and diet soft drinks has been on the decline, carbonated soft drinks are still a top revenue-generating beverage consumed. Soft drinks remain the number one beverage consumed at restaurants and other commercial foodservice outlets with some 18 billion servings ordered in the year in the US in 2016 [39]. Carbonated beverages are the second

most consumed purchased beverage at home, which is evidenced by the significant shelf space carbonated beverages capture at many supermarkets. On this account, there is strong reason to believe that the increasing consumption and supply will continue in the future.

3.1.8 Supply of PET per capita by province and city

The supply of PET bottles per capita per year 2.25 percent (CAGR) in the province and 2.07 percent in the city. This means that PET supply increases by .226 kilogram per years. The data show goodness of fit (99.8%) and significant (ρ = .000).

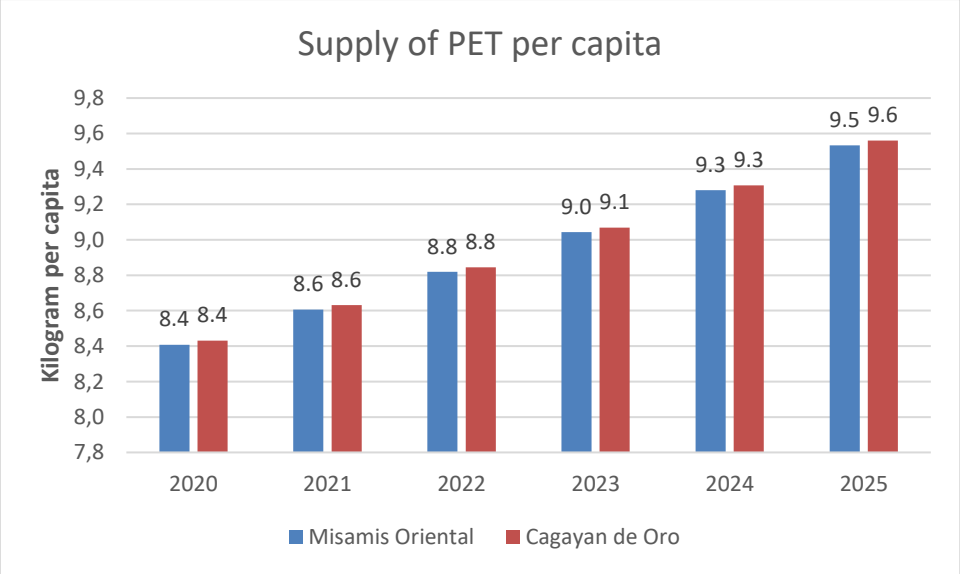

Figure 5. Supply of PET per capita per annum. [17]

The study uses of per capita of PET bottle consumption or supply as an index of PET growth is its usefulness in evaluating actual economic activities surrounding PET bottle production. If per capita consumption surpasses population growth rate, then per capita consumption of PET bottle will rise. Similarly, if both per capita consumption of PET and population growth rate are the same, then PET as an industry remain constant. Hence growth rate of population is an important indicator for the growth of PET bottles as an industry. Moreover, if per capita consumption does not surpass population growth rate then it must fall. Although, there other reasons for the increase in consumption per capita, the data in Table 8 suggest that PET consumption per capita growth of 2.11 percent exceeds population growth rate of 1.35 percent [40]. For as long the consumption rate is

higher than population growth rate, the use of PET material will continue together with potential technological improvement. This further suggest that there is a large potential for large increase in the supply of PET in the future unless restricted either by exhaustion of PET virgin materials or legal restriction on the use of PET materials as soft drink packaging. Per capita analysis can also serve as benchmark of measuring the industry's long run economies of scale. The current scale shows that PET consumption per capita is facing a long run increasing return to scale, hence, doubling the inputs of production will result in doubling the soft drink production and there doubling the needed packaging material whether aluminum, glass, and PET in the long run.

3.1.9 Reasons and uses of PET bottles

Based on a 10-item survey on the reasons for the use of PET, aluminum, and glass as packaging materials, results show that 60 percent, 50 percent, and 60 percent respectively of the major reasons.

Table 4. Reasons and uses of PET, aluminum, and glass bottles.

Type of Bottle	PET	Aluminum	Glass	
Recyclability	✓	✓	✓	✓
Cost-effective raw material	✓	✓	✓	✓
Ideal packaging for beverage	✓	✓	✓	✓
Varied packaging design possibilities	✓	✓	✓	✓
Can create a customized solution	✓		✓	✓
Product protection			✓	✓
Increasing customer preference				
Ease of manufacturing	✓	✓		
Others, please specify				

PET bottles are used for bottled water, carbonated drinks, and juices. The reasons for the utilization of PET bottles include cost-effective raw materials available, ideal for packaging beverage, varied design possibilities, can create a customized solution, ease of manufacturing, and recyclability. PET bottle is generally cheap making it more affordable to low-income consumers and being synthetic materials, it can be designed and manufactured in a way that meets the purchasing power of consumers. It has a good shelf life it is

less than a glass or aluminum bottle. Plastic beverage bottles can be easily shaped for pressurized products such as soft drinks. Also, it is very transparent, lightweight, refillable, and has a high safety factor if dropped. There are however limiting factors for plastic bottles such as the collection of the recycled material, maintaining the same shape with high internal pressure, which can cause human health concerns, a common material found on beaches and oceans, non-biodegradable and non-renewable, low recycling rate, and the like.

The reasons for the use of aluminum bottles include recyclability, cost-effective raw material, and ideal for packaging beverage, varied packaging design possibilities, and ease of manufacturing. Aluminum is 100 percent recyclable and can be recycled indefinitely without loss of quality or durability, repurposed, a higher recycling rate of about 68 percent, and less energy utilization in creating aluminum. Contrast, aluminum creates high carbon footprint in smelting and refining, relatively expensive in energy utilization, and pose some health risks. Glass bottles are used for their recyclability, cost-effective raw material, ideal packaging for beverage, varied packaging design possibilities, can create a customized solution, and product protection. Glass is preferred for its high recyclability, reliability, high transparency, impervious to CO2 loss, abundance of raw material, and long shelf life. In contrast, glass is heavier than aluminum and plastic it cost more to ship and deliver, frangibility, expensive processing, requires more energy to very high temperatures needed to manufacture glass. It results in higher CO2 emission,

Apparently, each type of soft drink bottle carries both advantages and disadvantages. In such a case, the researcher reserves some judgment on this issue as it is difficult to quantitatively assess the relative advantage of each type of bottle. The researcher feels that as technologies and innovation improving health safety, recyclability, cost-efficient, and eco-friendly methods of packaging will be forthcoming for each type of bottle.

3.1.10 Supply chain

The supply chain adopted by the company is business to business (B2B) and retail stores. This can be attributed to the fact that most beverages have a sufficiently long shelf life to allow them to be stocked and sold through outlets other than large, high turnover retail chains. Convenience stores can stock different brands and sell them at a premium to consumers. These stores often operate outside the normal supermarket hours, catering to

consumers who accept or even seek the "single-serve" purchase, albeit with its higher price. Vending machines use similar logic. The difference however is that machines function 24 hours and require little or no manual intervention. The incessant thirst of many new consumers for new beverages combined with trends to source locally and naturally opens doors for smaller producers in the bars and restaurants of their community. They often have a stronger card to play here than larger producers looking for bulk orders, although subsequent expansion may be another possibility.

3.1.11 Market share for PET, aluminum, and glass bottles

Table 10 revealed that the estimated market share for single-use PET bottles was 26 percent, 18 percent for the recycled bottle, and 11% for reuse/refilled out of the total market. For aluminum bottles, 17%, 11%, and 6% while 40%, 56%, and 63% share of the total market.

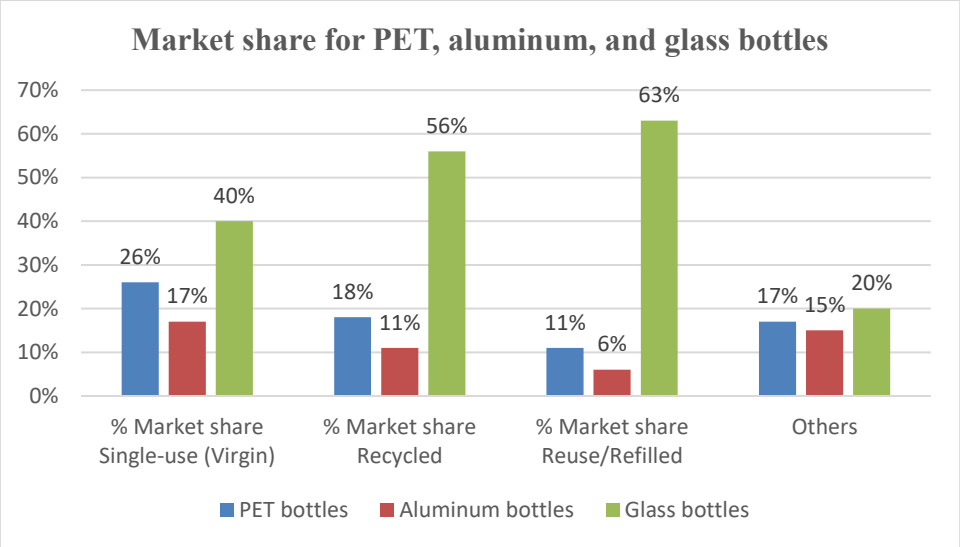

Figure 6. Market share in the supply of PET, aluminum, and glass bottles.

In terms of market share (percentage captured revenues from the market), glass bottles posted the highest percentage for virgin, recycled, and reuse/refilled. This could be attributed to the reusability of glass materials compared to plastic, Glass bottles are nonporous and can be used continuously worry to change in taste. Based on the study, unlike glass, plastic bottles have been shown to harbor an excessive number of bacteria [30] and make glass bottles are the preferred container for storing soft drinks or liquids. Another benefit of the glass bottle is the pure taste of liquids from glass bottles [31]. The scientist

has a link to this phenomenon since glass has the most inert substance used for packaging and therefore gives the most unaltered drinking experience. Another property that makes glass unique is its capability to be recycled endlessly in fact many companies will buy recycled glass for melting down and repurposing into other products. When compared to plastic, glass bottles are far more versatile than other containers while offering exceptional recycling properties. These properties account for the recyclability and reuse of glass bottles with zero littering, unlike single-use plastic.

3.1.12 Identification of market for PET, aluminum, and glass bottles

Market identification covers the following: ensuring customer needs, target market, channels, running a test market, and support system. To ensure customers' needs, the company conducted product reviews and social media that competitors do not currently supply, reviews of market research on the current trend and genuine customer needs, assessment of competitors' product ranges that the company can fill, and marketing programs aim to target relevant and important audience. In terms of the target market, the participant company conducted reviews on selecting the target market which ensures the company's focus resources on marketing priorities, uses communication channels such as salesforce, customers' newsletters, telesales, and email to announce a new product. Under channel, the company strengthens the motivation of the sales force, retailers, and distributors for the successful launching of a product. In the area of running a test market, the company ensures running a test market before a product is launched to gather information on all aspects of the product to minimize risk or failure. The company also chooses the target market with demographic characteristics as well as price, retail performance, and customer response to advertising, packaging, and sales promotion. Making use of the Support system covers existing government rules and regulations supporting the recycling of PET, aluminum, and glass bottles, and training of manpower before the launching of products.

3.1.13 Satisfaction with PET, aluminum, and glass bottle features

In terms of the company's satisfaction with PET, aluminum, and glass bottles, Table 12 revealed the company is satisfied with PET, aluminum, and glass features as packaging materials for beverages. These include features such as design, size, shape, and durability;

strong customer service support; ability to respond to customer delivery needs; cost competitiveness of the product; and engagement with customer-specific needs and requests.

Table 5. Satisfaction with product features of PET, aluminum, and glass bottles.

Product features	PET Bottles	Aluminum Bottles	Glass Bottles
Design, size, shape, and durability	Satisfied	Satisfied	Satisfied
Strong customer service support	Satisfied	Satisfied	Satisfied
Ability to respond to customer delivery needs	Satisfied	Satisfied	Satisfied
Cost competitiveness of the product	Satisfied	Satisfied	Satisfied
Engagement with customer-specific needs and requests	Satisfied	Satisfied	Satisfied

3.1.14 Mode of payments and future market trend

The preferred mode of payments is either cash or cheque while the future market trend is expected to increase five times the present volume. This trend is attributable to product satisfaction and forms of packaging.

3.2 Demand Analysis

3.2.1 Market share of PET, aluminum, and glass bottle consolidation

Glass bottles posted the highest percentage rating in terms of market share (percentage of revenues). Demand market shares revealed 56 %, 63%, and 70% for single-use virgin material, recycled, and reuse, respectively. Supply market shares show 40%, 56%, and 63% respectively. PET bottles ranked second with a demand market share of 37%, 26%, and 20% for single-use, recycled, and reuse materials respectively. PET supply market shares indicate 20%, 18%, and 11% respectively. For aluminum, demand market shares are 23%, 17%, and 13% respectively while supply shares indicate 17%, 11%, and 6% respectively.

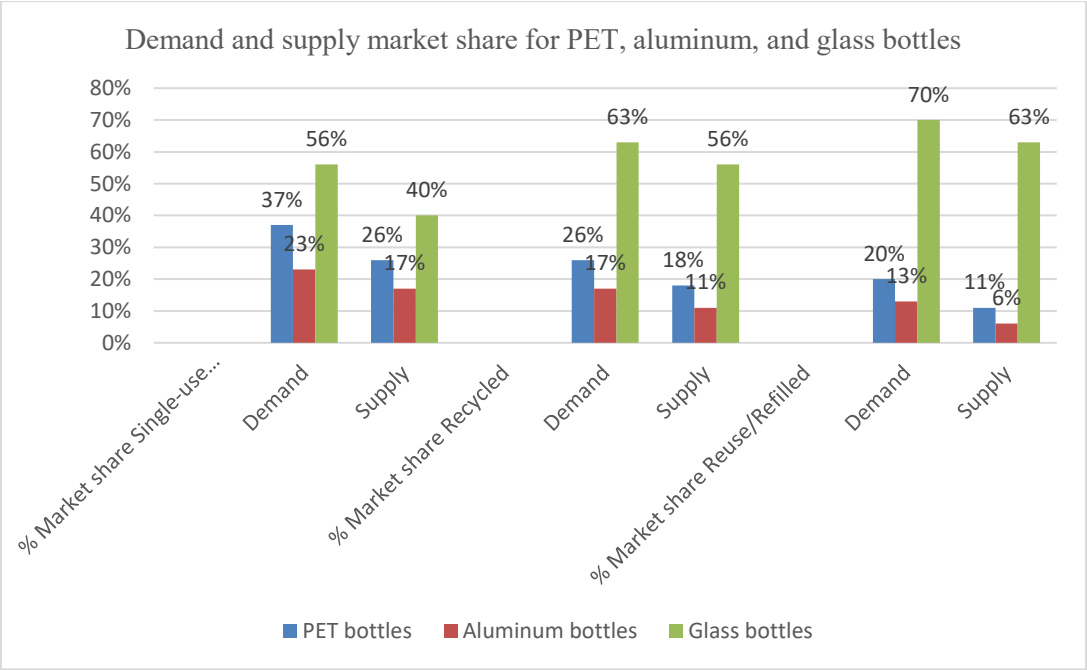

Figure 7. Market share for demand and supply of PET, aluminum, and glass bottles.

Glass demand and supply market shares posted the highest percentages with an average market gap of 10 percent. The market gap is the difference between demand and supply for PET, aluminum, and glass bottles the consumers' need that supply has not yet met. Hence, for glass bottles, there is an opportunity to increase its customer base by penetrating the gap in the market and filling it. The gap also describes the uniqueness of the company's beverage bottles that needing upgrades or improvement to sell in a new market and increase its sales considerably. PET demand and supply market shares follow the same direction but with a smaller percentage, next to glass bottle market shares. PET posted a market gap of 12 percent. Aluminum bottles posted the lowest in rank in terms of demand and supply market share but also following the same predicted direction with a gap of around 7 percent. The findings suggest that the company should determine whether it should exploit the gap on account that demand exists and had to be met by applying marketing methods of achieving it and it is profitable. If these factors are present, then there is a good chance that the company can increase its customer base and look for alternative investment strategies.

3.2.2 Off-trade sales percentage for the demand for beverage

Ranked in descending order, bottled water ranked highest in demand in 2020 to 2021 with an average percentage of 39.45 percent, followed by carbonates (36.85%), concentrates (13%), juice (3.825%), sports and energy drink (3.74%), RTD tea (2.68%), and RTD coffee (0.235%).

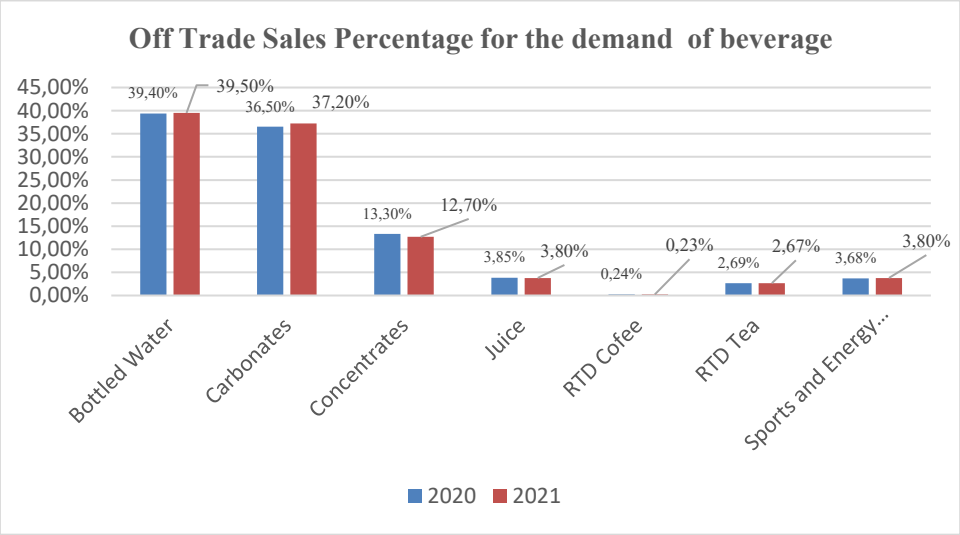

Figure 8. Forecast in volume percentage of beverage demand (2020-2021). [15]

Of the total forecast volume of beverage, bottled water ranked the highest followed by carbonates and concentrates. The data in the Table reveals that bottled water, carbonates (soft drink), and concentrates are likely to be the major sources of PET demand and supply in both the short-run and long run. These beverages shall be the major PET sources the proposed project shall aim to collect, sort, and recycle PET bottles - three major beverage products sold. Table 12 showed that bottled water sold 5,316.3 million liters in 2021 followed by carbonates with 4,993.3 million liters [15]. These products constitute roughly 76 percent in 2020 and 77 percent in 2021 of the total volume of beverage sold the rest 24 percent and 23 percent are distributed to other beverages [15].

3.2.3 Demand and supply consolidation

The figure below showed that the demand market hovers around 36.07 percent average while supply hovers around 27.56 percent, hence a gap of 8.5 percent average. Both demand and supply posted a percentage yearly increase of 3.1 compounded annual growth rate.

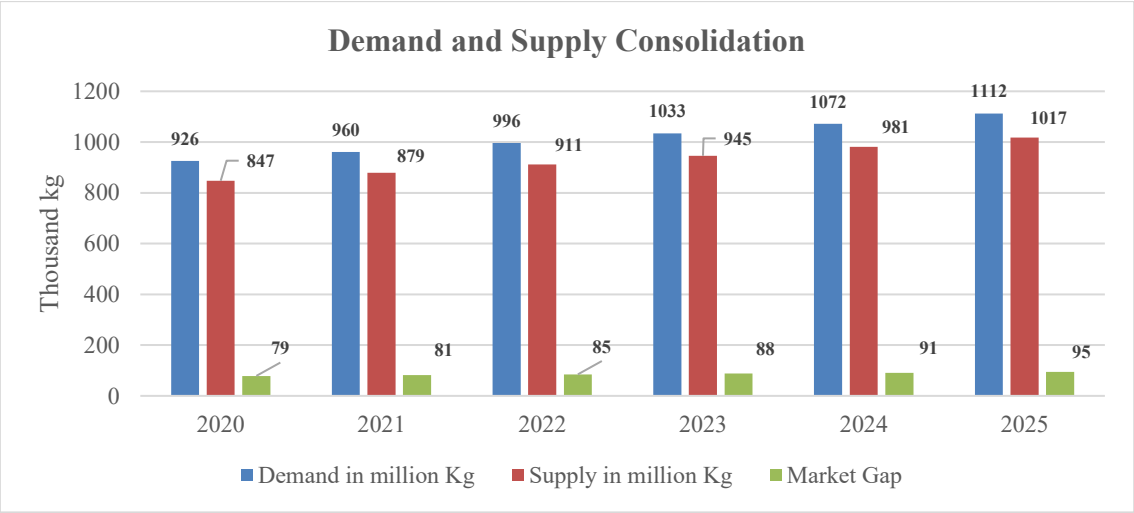

Figure 9. Demand and supply consolidation of PET, aluminum, and glass bottles. [15,17]

Both demand and supply increase by 3.1 percent faster than the population growth of 1.35 percent. This suggests that demand and supply will rise in the long run. In a monopolistic market, the entry of other firms with similar but differentiated products into the same general market (like concentrates, juices, tea, sports, and energy drinks) will shift the demand curve faced by a competing firm. As more firms enter the market, the quantity demanded at a given price will decline, and the firm's perceived demand curve will decline. The shift in marginal revenue will change the profit-maximizing quantity that the firm chooses to produce since marginal revenue will then equal marginal cost at a lower quantity. However, this possibility is likely true when cross demand elasticity of demand is high. In a study of elasticity for different types of beverages, the cross elasticity of soft drinks is almost equal to unity [32]. This suggests that the overall price increase of soft drinks will result in a proportionate increase in demand for other beverages. Similarly, a decrease in soft drinks will result in a proportionate increase in the demand for the soft drink. This high elasticity is attributed to the presence of substitutes making the demand for soft drinks price-sensitive, spending on other products like fruits and vegetables, level of income, and the like.

The supply elasticity of soft drinks is positive, that is, the higher the price of soft drinks, the higher the price will be. The concept of elasticity helps in determining the demand of the product if the changes are made in terms of the price of the product, in consumers' income, and change in the price of other alternative products in the market. The elasticity of demand shows how the demand for the company's product rises at each level with the changes occurring in three different terms. Soft drink manufacturers should be able to get

the idea of product supply to the market by knowing these terms to increase the revenue for the company. A proper analysis done over the factors can help the company in understanding the market competition and to supply its product accordingly.

3.3 Technical Aspects

3.3.1 Deposit Return System

A deposit-refund system combines a tax on product consumption with a refund when the product or its packaging is returned for recycling [18]. Deposit-refunds are used for beverage containers, lead-acid batteries, motor oil, tires, various hazardous materials, electronics, and more. Also, researchers have shown that the approach can be used to address many other environmental problems beyond waste disposal. By imposing an up-front fee on consumption and subsidizing "green" inputs and mitigation activities, a deposit-refund may be able to efficiently control pollution in much the same way as a Pigovian tax [19]. Theoretical models have shown that alternative waste disposal policies, such as virgin materials taxes, advance disposal fees, recycled content standards, and recycling subsidies are inferior to a deposit-refund. These results have been corroborated in calibrated models of U.S. waste and recycling. Moreover, in theoretical models that consider joint environmental problems and product design considerations, the deposit-refund continues to have much to recommend it as a component of an overall socially optimal set of policies [20]. More empirical research into deposit-refund systems is needed, particularly the upstream systems used for many products. In these systems, the processors, or collectors of recyclables rather than consumers receive the refund. Upstream systems may have lower transaction costs and better environmental outcomes than traditional downstream systems.

In the nutshell, DRS works simply as a container deposit schemes work by adding a small extra deposit on top of the price of a beverage, such as those in plastic and glass bottles and aluminum cans, which is refunded to the consumer when they return the empty drink container for recycling. Also known as bottle deposit schemes, deposit refund/return systems (DRS), or bottle bills, they are typically established through legislation passed by state or national governments. Container deposit schemes for non-refillable beverage

containers have been around for several decades, and those for refillable containers for centuries, with early inceptions, used particularly for glass collection.

Figure 10. Deposit Return Procedure. [20]

A deposit-based return system in practice is centrally administered. It involves three major aspects; 1) how a deposit follows a can or bottle, 2) how recyclable material moves around the system, and 3) how it is financed. The process begins with the manufacturer or distributor who sold PET bottled products to the stores which pay the product price plus the fully refundable deposit to the manufacturer/distributor. However, the manufacturer/distributor would not keep the refundable deposit to himself he has to forward it to the system administrator which is a non-profit organization composed of retail and industry stakeholders responsible for managing the deposit system. The consumer buys the product from the stores (the bottle and the fully refundable deposit). The deposit amount is always displayed separately from the beverage price in the store. The consumer then takes the bottles to the store for the redemption of the deposit. In principle, every store throughout the country would accept the consumer's bottle through a reverse vending machine or manually over the counter where the consumer and takes back the deposit in full. Later, the system administrator arranges to pick up the bottles from the store for counting, sorting, packing, and sale and pays back the deposit to the store. In addition to the deposit, the system administrator pays an extra handling fee for each bottle collected by the store. Hence, the loop is closed, and a zero-sum game is established. Unlike a tax, a deposit fully redeemable by the consumer. Hence, there is no need for public discussion about the negative financial effects of deposit. [21]

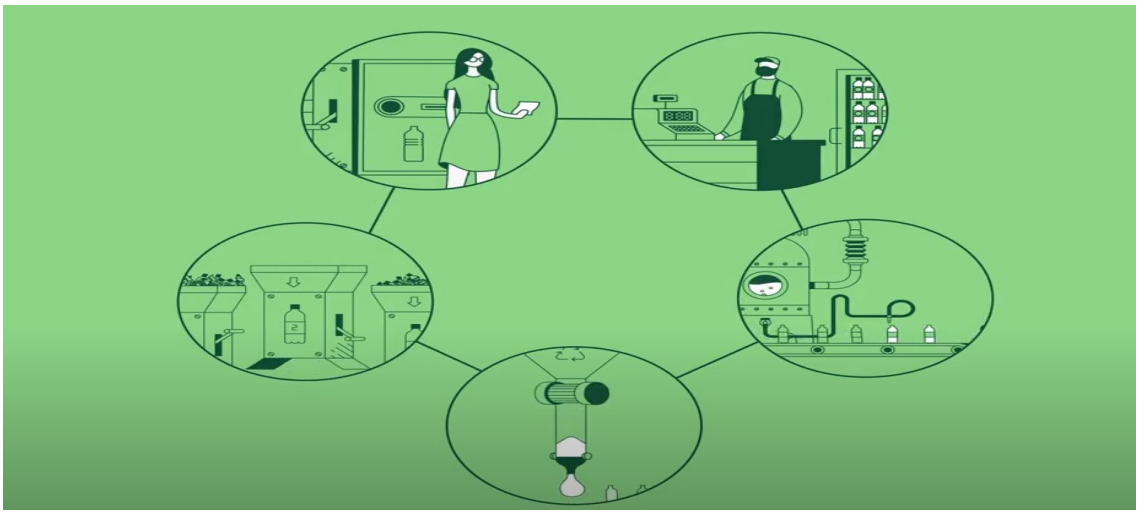

Figure 11. Deposit Return System. [21]

How does the empty bottle move around the system? The empty bottles arrive at the system administrator counting and sorting center. Here the bottles are sorted and baled together with thousands of other bottles of the same color and quality. This bale is then sold to a plastic recycler who further process the material. Labels and caps are removed from the recycling. The bottles are then crushed, washed, and processed into recycled plastic. In the production of new bottles, recycled plastic is then mixed with new plastic and made into a new bottle preform. The preform is heated in the bottling plant and inflated into a new bottle with labels and distribute to the manufacturer/distributor, and the cycle of the bottle is finally completed.

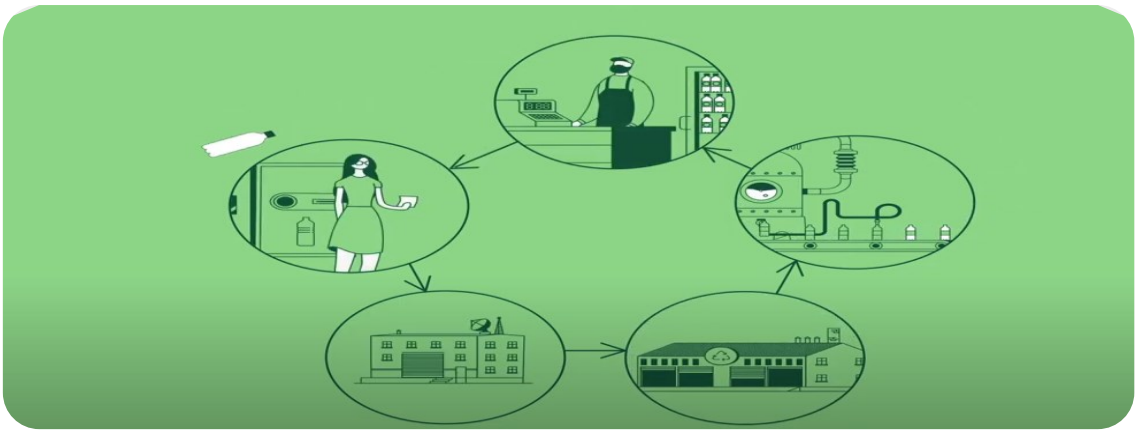

Figure 12. Bottle movement in the Deposit Return System. [21]

So, who will finance all of this? Surprisingly, there is no required public money at all. The system is set up and operated by the retail industry on a non-profit basis and finance through three channels. The unredeemed deposits from bottles that are not returned to the stores, the revenues earned from the collected materials, and the small administration fees paid by the beverage manufacturers/distributors finance system. The system aims to operate at the lowest cost possible for everyone involved.

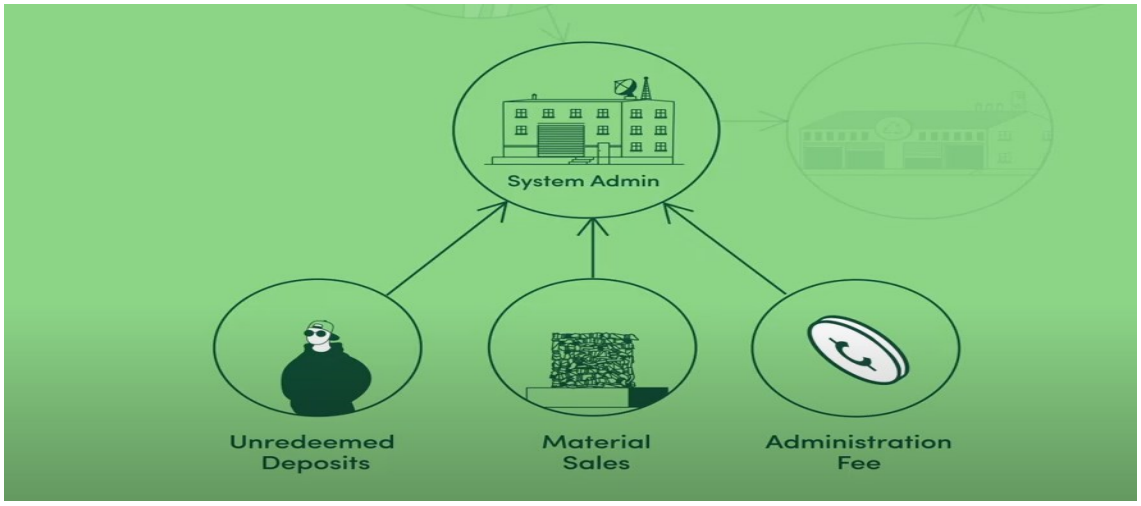

Figure 13. Financing of the system. [21]

How would the system administrator know the number of unredeemed deposits? Does he need to know what is sold to understand what comes back? The answer is in the bottle's barcode. The barcode carries information as to product brand, measurements, material composition, and deposit value. [21]

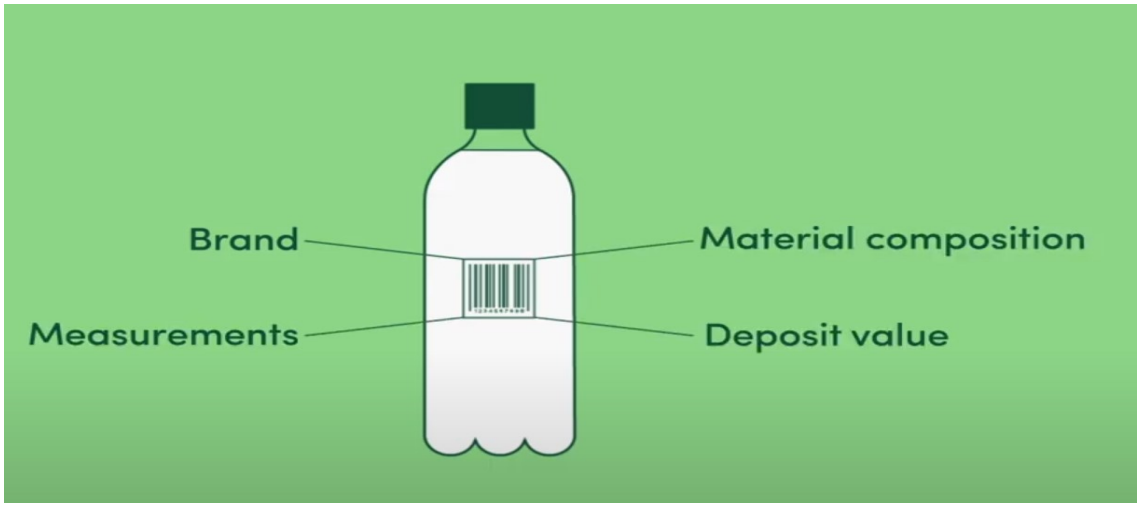

Figure 14. Information in the barcode. [21]

3.3.2 Cost-benefit analysis of deposit-based return system

A compilation of 21 studies that examined the costs and benefits to municipalities of implementing (or expanding) a DRS for beverage containers. It is noteworthy that, although different in scope, location, author, and year, each study reported significant net cost savings to municipalities [22]. One of the key elements missing in most of these analyses is the savings resulting from the reduced or avoided costs of collection, treatment, and disposal by the municipal waste management system. The benefits associated with the implementation of the container recycling program: 1) Savings in alternative container treatment costs. Recovered beverage containers do not reach waste containers and thus savings are achieved in alternative waste treatment costs; 2) Cleaner public spaces. Unfortunately, containers are often not disposed of properly, but simply left in public spaces, at times even posing health risk (such as injury from broken glass bottles). The program considerably reduces the number of containers thus disposed of. Furthermore, even containers disposed of this way are collected by collectors; 3) Reduction in landfill volumes. Collection and recycling of containers significantly reduce the amount of waste sent to landfill. The effect of the program is significant in this respect as beverage containers are generally of large volume relative to other types of waste, and do not biodegrade (and thus constitute an environmental nuisance for many years); 4) Positive externalities of the utilization of recycled materials. Implementation of the program results in more recycled material entering production processes, thus reducing pollution created by these processes. For instance, the energy required to recycle aluminum is only 5% of that required to create new aluminum [23]. In turn, these energy savings lead to reduced air pollution; 5) Job creation leading to economic growth. Implementation of the law has led to the creation of hundreds of jobs – in areas such as collection, sorting, transport, and treatment of empty containers [24]. For reasons explained below, however, we treat this aspect as a potential additional benefit of the program and do not incorporate it into the main cost-benefit analysis.

3.3.3 Simple process of reverse vending machine

In this section the step procedure of the Reverse Vending Machine (RVM). In the diagram waste plastic materials acts as input and then check by several sensors. The first machine checks through the sensors whether the plastic material is received, or made of Plastic, or

whether it is empty. According to that, the weight sensor weighs the received plastic item and gives output to the user in form of coins as per the weight of the item [25]. The operation of RVM involved three steps (input, process, and output) as shown in figure 6.

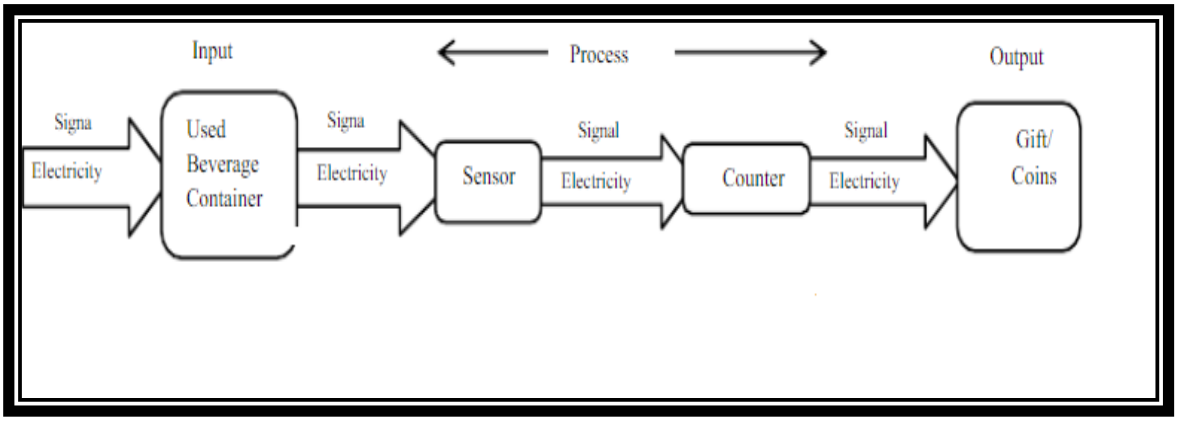

Figure 15. Reverse vending machine block diagram. [25]

The user can insert plastic of any shape in a Reverse Vending Machine. After inserting the plastic, it is checked by three Sensors. It is first checked by a capacitive proximity sensor, then by an infrared photoelectric sensor, and last checked by the strain gauge weight sensor. After the three checks, the user then will get coins based on the weight of the Plastic. Moreover, the capacitive proximity sensor is used for the detection of metallic and non-metallic objects (plastic, tin, Aluminum, wood, etc.). It uses the variation of capacitance between objects and sensors. The infrared photoelectric sensor is used to detect the presence of non-ideal things as an input i.e., water, non-water-based fluids, stones, etc. This sensor uses standard visible LEDs that pass-through water and detect it using a 1450 nm wavelength. Lastly, the strain gauge weight sensor is used to determine the weight of up to 1 Kg of items. It is in the form of a straight bar and translates pressure or force into an electrical signal [25].

3.3.4 Flow diagram

The flow diagram of the Smart Plastic Recycle Machine. The flow starts by receiving the input, which is the plastic bottle or any other plastic thing. The sensor then detects the plastic. If the sensor does not detect any plastic, the flow comes to a stop. If the sensor detects a plastic, the sensor sends the plastic to the next sensor for water-based liquid detection after this weight sensor checks plastic weight and give different output according to weight range. [26]

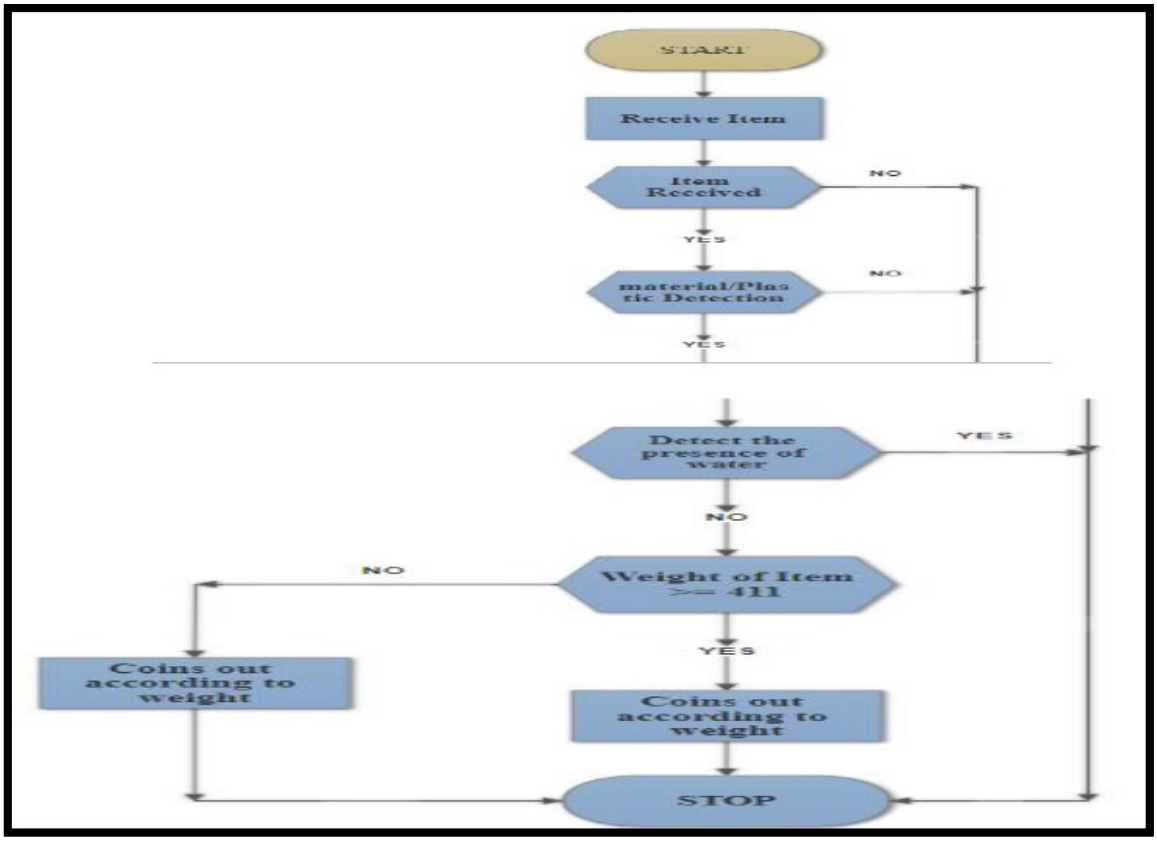

Figure 16. Reverse Vending Machine flow diagram. [26]

3.4 Financial Feasibility

3.4.1 Details of financial assumptions

- Only two beverage companies are existing in the city with a joined target market of around 50,000 liters each with 25,000 liters production per annum are herein treated as a single/joined business undertaking.
- PET bottles assume to take 75 percent of the total packaging materials.
- 1 kilogram of PET is 80 soda bottles each with 12.5 grams weight so that for 100 kilograms there are 6,400 bottles of beverage.
- The price of virgin PET per kilogram is ₱1.00 and ₱ 0.30 for recycling.
- PET cost recovery is based on 1.50 cents mark-up per bottle.
- PET bottles are taken to have separate accounting in this study.
- Fixed cost is estimated at 1.2 million (40% of total assets).
- The companies' credit sales are 15 to 30 days with an inventory of 20% of sales.

- Tax is assumed at 30% of net sales.
- The annual cost of goods sold is 20% of the total value.
- Depreciation is based on the straight-line method for 10 years.
- Operating cost is estimated at 20 % of net sales per annum.
- All financial figures are projected according to the movement of the inflation rate of 2.5% per year.

3.4.2 Projected income statement

The joint companies will have a net income growth rate of 5.17 percent CAGR from 2021 to 2024 and are expected to double in 13.5 years. The companies' gross margin (Net Sales – Cost of goods sold) is positive in all years of operation, that is, 288,000; 292,200; 302,580; and 310,144.5. These are sales revenues the companies retain after incurring the direct costs associated with producing the goods it sells, and the services it provides. The higher the gross margin, the more capital a company retains on each peso of sales, which it can then use to pay other costs or satisfy debt obligations. The net sales figure is simply gross revenue, less the returns, allowances, and discounts. On the other hand, the companies' net profit margin 1 (Net sales – Expenses)/Net Sales is 16.35%; 17.11%; 17.85%; and 18.58% from the year 2021 to 2024, respectively. The profit ratios were based on the assumption that the PET recycling enterprise is a new venture. The profit margin can be improved by increasing sales and reducing costs. Theoretically, higher sales can be achieved by either increasing the prices or increasing the volume of units sold, or both.

Table 6. Projected Income of PET bottles in the city.

	2021	2022	2023	2024
Gross Sales of PET bottles at 1.50 (₱)	480,000	492,000	504,300	516,907.5
Less: Cost of Raw material (direct cost)	96,000	98,400	100,860	103,381.5
Net Sales (₱)	384,000	393,600	403,440	413,526
Expenses:				
Operating Cost (₱)	86,000	88,150	90,353.7	92,612.5
Depreciation(₱)	120,000	120,000	120,000	120,000

Tax at 30% of Net sales (₱)	115,200	118,080	121,032	124,057.8
Total Expense (₱)	321,200	326,230	331,385.7	336,670.3
Net Income	₱62,800	₱67,370	₱72,054.3	₱76,855.7

3.4.3 Projected balance sheet

The companies' current ratios (current asset/current liabilities) of 1.15; 1.158; 1.16; and 1.17 reflect the companies' ability to meet their current liabilities that can be paid by their current assets. Its debt-to-asset ratio is equal to 1 through the years since the companies are not resorting to debt to finance its recycling plant. The companies can recoup their investment by the pay-back period (Total Initial Investment)/average retained earnings equivalent to 18.6 years liquidated mainly by the earnings of PET bottles alone.

Table 7. Projected balance sheet of PET bottles in the City.

	2021	2022	2023	2024
Current Asset: Gross Sales of PET bottles at 1.50 (₱)	480,000	492,000	504,300	516,907.5
Building, Machinery and Equipment (₱)	1,200,000	1,080,000	960,000	840,000
Total Asset	₱1,680,000	₱1,572,000	₱1,464,300	₱1,356,907.5
Total Liabilities				
Current: Cost of Raw material (direct cost) (₱)	96,000	98,400	100,860	103,381.5
Total Current Expenses (₱)	321,200	326,230	331,385.7	336,670.3
Retained Earnings (₱)	62,800	67,370	72,054.3	76,855.7
Fixed Asset: Bldg. Machinery & Equipment (₱)	1,200,000	1,080,000	960,000	840,000
Total Asset & Liabilities/Equities	₱1,680,000	₱1,572,000	₱1,464,300	₱1,356,907.5

3.4.4 Projected cash flow Statement

Cash flow ratios compare the other elements of the DRS financial statements. A higher level of cash flow indicates a better ability to withstand declines in operating performance, as well as a better ability to pay current liabilities. It also gauges the liquidity of the business which is important in evaluating the proposed DRS reported profits. The increasing cash flow margin ratio (cash inflows/sales) of 13%, 13.69%, 14.28%, and 14.86% from 2021 to 2025 gives a reliable metric of cash generated by PET bottles alone per unit of sales. The current liability coverage ratio (cash flow from operation/current liabilities) of 1.49, 1.51, 1.52, and 1.53 from 2021 to 2025 indicates that for PET bottles alone the proposed DRS is generating enough cash to pay for its current obligations and further indicates that the PET bottle undertaking is not prone significant risk of bankruptcy. The net cash inflow to net income of 1.0 from 2021 to 2025 indicates that the proposed DRS is not engaging in any accounting trickery intended to inflate earnings above cash flow.

Table 8. Projected cash flow statement of PET bottles in the City.

	2021	2022	2023	2024
Inflows: Current Asset: Gross Sales of PET bottles at 1.50 (₱)	480,000	492,000	504,300	516,907.5
Gross Sales	₱ 480,000	₱ 492,000	₱ 504,300	₱ 516,907.5
Outflows: Current: Cost of Raw **material (direct cost)**	96,000	98,400	100,860	103,381.5
Total Current Expenses	321,200	326,230	331,385.7	336,670.3
Net Inflows:	62,800	67,370	72,054.3	76,855.7
Beginning Balance	₱ 62,800	₱ 130,170	₱ 202,224.3	₱ 279,080

3.5 Acceptability of MDRS

A survey on the acceptability of the Modified Deposit Return System was conducted. The acceptability of DRS was solicited from college students in two major universities in one city of Southern Philippines. The items of the questionnaire cover the circular flow from collecting, sorting, and processing used PET, aluminum, and glass beverage bottles to recycled/reused bottle products. Each question was measured through a Likert scale and was interpreted using mean and standard deviation. The items were statistically validated using the Cronbach alpha consistency criterion with consistency coefficients of 93 .5 percent. The table shows that putting up a DRS in the city was generally acceptable. Specifically, the participants consider DRS acceptable in terms of delivery of beverage products product for sales in a retail/wholesale company and pays the deposit to the manufacturer or importer of the beverage in the price of the product (3.947); return point and the processing plant report the returned packages to the company (4.023); beverage manufacturers and importers must pay membership fee to the deposit-based return system to be exempted from packaging tax as an incentive for recycling (3.824); fees collected from the members will cover the expenses of the return system (the result of i.e. logistics, the transportation of the packages in different stages of the recycling chain, the compensations paid to the return points, and the processing of materials, among other things (4.017); deposit-based return system should be managed or administered by a non-profit company (4.017); consumer must identify a can or plastic bottle belonging to a deposit-based return system of the company on the basis of the deposit marking on the package which also indicate the value of the deposit (4.171); and reverse vending machine identifies a deposit bottle or can by comparing its barcode and shape to the information in the reverse vending machines register (3.824). Moreover, the participants rated the following items completely: the consumer pays the deposit when buying the product and receives it back when returning the empty package to a returning point (4.216), and a decree should be implemented on the recycling of different beverage packages through a deposit-based return system which enables the efficient collection of packages for recycling (4.304).

Table 9. DRS acceptability mean score interpretation.

Acceptability of DRS	Mean	SD	Interpretation
In DRS, the manufacturer or importer of the beverage delivers the product for sales in a retail/wholesale company which pays the deposit to the manufacturer or importer of the beverage in the price of the product	3.947	1.237	Acceptable
The consumer pays the deposit when buying the product and receives it back when returning the empty package to a returning point	4.216	1.185	Completely Acceptable
The return point and the processing plant report the returned packages to the company	4.023	1.116	Acceptable
The company pays the deposits to the return points per the number of reported returned packages	4.140	1.118	Acceptable
A decree should be implemented on the recycling of different beverage packages through a deposit-based return system which enables the efficient collection of packages for recycling.	4.304	1.040	Completely Acceptable
Beverage manufacturers and importers must pay a membership fee to the deposit-based return system to be exempted from packaging tax as an incentive for recycling	3.824	1.199	Acceptable
The fees collected from the members will cover the expenses of the return system (the result of i.e., logistics, the transportation of the packages in different stages of the recycling chain, the compensations paid to the return points, and the processing of materials, among other things).	4.017	1.095	Acceptable

The deposit-based return system should be managed or administered by a non-profit company.	4.017	1.095	Acceptable
The return system should be managed/administered by the government	3.721	1.204	Acceptable
The consumer identifies a can or plastic bottle belonging to a deposit-based return system of the company based on the deposit marking on the package which also indicates the value of the deposit.	4.171	.982	Acceptable
The reverse vending machine identifies a deposit bottle or can by comparing its barcode and shape to the information in the reverse vending machine's register.	3.824	1.199	Acceptable
Overall Mean	4.019	1.134	Acceptable

4 CONCLUSION

The proposed DRS is a sound alternative that requires the collection of a monetary deposit on beverage containers (refillable or non-refillable) at the point of sale and/or the payment of refund value to the consumers. When the container is returned to an authorized redemption center or retailer, the deposit is partly or fully refunded to the redeemer (presumed to be the original purchaser). The system is effective especially when the government may pass container deposit legislation to 1) encourage recycling and complement existing problems of recycling programs, to reduce energy and material usage for containers, 2) to reduce PET beverage bottles along highways, in lakes, and rivers. 3) a reasonable deposit provides an economic incentive to clean the environment and a significant source of income to some poor individuals and non-profit civic organizations, and 3) to extend the usable lifetime of taxpayer-funded landfills as deposits that are not redeemed are often kept by distributors or bottlers to cover the costs of the system (including handling fees paid to retailers or redemption centers to collect, sort, and handle the containers) or are turned over to the governmental entity involved to fund environmental programs. DRS is an effective initiative to restore and sustain the ecological balance and before managing plastic bottle disposals effectively. It is a widely used initiative that entails a series of financial refunds on smooth-drink, juice, milk, water, alcohol-beverage, and another reusable packaging at the point of sale. When the bottle or container is returned to an authorized redemption center or the unique vendor in a few jurisdictions, the deposit is partly or fully refunded to the redeemer, presumed to be the unique purchaser. The findings study revealed that the supply of PET bottles will double in 11.4 years such that further schemes are needed to identify other potential problems and the conditions of how and why legislation needs to be implemented.

On contrary, further developments are recommended to improve the next research case. So, to speak, detection of whether the items are leading questions is an overdue undertaking since the collection of data has already been completed and there is no way of redoing the survey again given the time constraint. The detection of leading questions will be undertaken in the next research case in the future. On the other hand, the study has no definite time framework for the formulation of a contingency plan for the implementation of the proposed project as it is foremost dependent on legislative action which also requires public consultation. In addition, local legislative action, a national enabling law that must be

passed and approved by Congress. Besides, there are many support groups in support or contrast to the proposed project hence requires for public consultation both at the city and national level. Furthermore, the infrastructure for recycling is beyond the scope of the study. The study is foremost concerned with the market, financial, technical, and broad management aspects of the feasibility of the DRS. However, the recycling companies should have been included as participants of the study to cover the complete chain of the deposit-based return system and further justify its feasibility. Thus, it is recommended for it to be included in a full-blown study in the future.

5 ACTION PLAN

The implementation of the proposed DRS consists of two phases: 1) initiation and 2) implementation which includes organization and start of the operation. The initiation phase covers the following: 1) presentation of DRS to the council committee on Ecology and Environment and secure the needed scheduled of presentation to the City Council; 2) followed by the presentation of DRS at the City Council with social media, radio, and TV coverage; 3) securing city ordinance on the proposed DRS; 4) presentation of the proposed DRS to PCFMI, PRA, and PARMS for their endorsement; 5) acceptability survey of DRS by soft drink manufacturers, retailers, and plastic recyclers. The presentation includes the following important matters: 1) amount of deposit by manufacturer and retailers, 2) product registration, 3) pledging security, 4) reporting of sales through the intranet, 5) and registration of membership and 6) deposit and recycling fee (see project implementation and evaluation chart).

Phase two covers organization and operation as follows:1) tiers and options for purchasing Reverse Vending Machine, 2) information search, 3) evaluating purchase alternatives, 4) purchase decision and 5) delivery and installation. The proposed DRS will be presented to the chairman of the committee on ecology and environment who will introduce a proposed bill of city ordinance for adoption. This activity will be covered by radio and TV media and will be further strengthened by social media. After the proposal shall have been delivered by the council and ready for approval, the proposed DRS will be presented to the PARMS. PCFMI, and PRA. With strong support from these associations, the researcher will then begin the survey on the acceptability of the system by manufacturers and retailers as to their benefits and responsibilities to wit: mechanics of the reverse

vending machine, administration, security contract, product registration, reporting of sales, and other instruction. After the survey and results shall have been obtained, registration for membership will follow. Following the first phase will be the options for purchasing the reverse vending machine (RVM) and information search. The gathered data will be evaluated preceding the purchase decision. Lastly, when all the areas of concern shall have been duly undertaken, delivery and installation will follow.

The researcher conducted armchair speculation on the timetable for implementation plan using the critical path method (CPM) and project evaluation technique (PERT) which are found in appendix 4 and 5, respectively. The process of implementing the proposed DRS for the city is estimated to be completed within 19 months. The probability that the implementation of the project within the 15th month is 97.26%. The beginning activity (presentation of the proposed DRS to the chairman on a committee on ecology and environment) is the only activity with a slack period of 2 months. The rest of the activities are considered critical. Below is the PERT network and PERT CPM and implementation activity table.

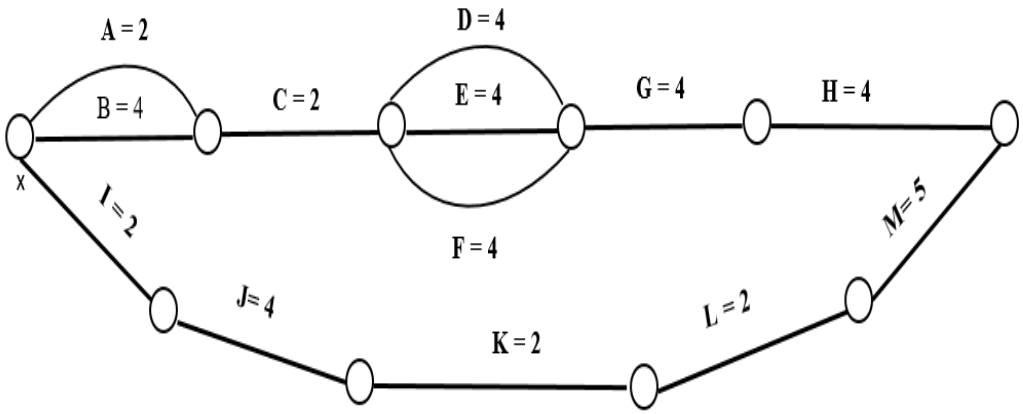

Figure 17. PERT network.

Table 10. Implementation activity.

Tasks	Nineteenth - Month Timeline																			Person Responsible	Deliverables
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
A																				Chairman on Committee on Environment and Ecology	Scheduled presentation of the proposed DRS at the city council.
B																				Researcher, TV and Radio Station Managers and broadcast personnel	Publicity of Media news of tape recorded and video footages on TV news coverage.
C																				City Mayor Members of the City Council	Approval of City Ordinance with implementing rules and Guidelines.
D																				Chairman and/or representative	Letter of endorsement
E																				Chairman and/or representative	Letter of endorsement
F																				Chairman and/or representative	Letter of endorsement
G																				Beverage manufacturers Beverage Retailers	Survey results and methodology
H																				Beverage manufacturers Deverage Retailers	Approved membership application
I																				Researcher Sales Agent	A copy of separate financial study on purchasing, renting, and leasing options best suited to the economic and financial performance of the organization
J																				Researcher Sales Agent	A copy of the list of product features such as price, durability, capacity, mode of purchase, discount, warrantee, maintenance, etc.
K																				Researcher Sales Agent	A copy of the costs and benefits of a product brand considering price, durability, capacity, mode of purchase (buying, lease, rent)
L																				Researcher Sales Agent	Purchase, lease or rent
M																				Researcher Sales Agent	Shipment and tracking consideration

(A) Presentation of DRS proposal to the city council's committee on environment and ecology

(B) Public Awareness Campaign on DRS with social media, radio, and TV news coverage on the proposed DRS presented at the City Council

(C) Approval and Endorsement of City Government Officials accompanied by publicity

(D) Presentation of the proposed DRS to the Philippine Chamber of Food Manufacturers Inc. (PCFMI) and endorsement

(E) Presentation of DRS to the Philippine Retailers Association in the Philippines (PRA)

(F) Presentation of the Philippine Alliance for Recycling and Materials Sustainability (PARMS)

(G) Survey on Acceptability of the System by Manufacturers and Retailers as to their benefits and responsibilities with the mechanics of the reverse vending machine, administration, security contract, product registration, reporting of sales, and other instruction.

(H) Registration of Membership

(I) Tiers and Options for Purchasing of Reverse Vending Machine

(J) Information Search

(K) Evaluating Purchase Alternatives

(L) Purchase Decision

(M) Delivery and Installation

Table 11. PERT CPM.

Activity	Predecessor	Optimistic	Most Probable	Pessimistic	Mean (μ)	Variance (σ^2)	SD	ES	EF	LS	LF	Critical Path
A	-	1	2	3	2	0.111111	0.333333	0	2	2	4	Slack
B	-	3	4	5	4	0.111111	0.333333	0	4	0	4	Critical
C	A, B	1	2	3	2	0.111111	0.333333	4	6	4	6	Critical
D	C	3	4	5	4	0.111111	0.333333	6	10	6	10	Critical
E	C	3	4	5	4	0.111111	0.333333	6	10	6	10	Critical
F	C	3	4	5	4	0.111111	0.333333	6	10	6	10	Critical
G	D, E, F	3	4	5	4	0.111111	0.333333	10	14	10	14	Critical
H	G	2	3	4	3	0.111111	0.333333	14	18	14	18	Critical
I	-	3	4	5	4	0.111111	0.333333	0	2	3	5	Slack
J	I	3	4	5	4	0.111111	0.333333	2	6	5	9	Slack
K	J	1	2	3	2	0.111111	0.333333	6	8	9	11	Slack
L	K	1	2	3	2	0.111111	0.333333	8	10	11	13	Slack
M	L	4	5	6	5	0.111111	0.333333	10	15	13	18	Slack

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APPENDIX 1. SURVEY QUESTIONNAIRE (SUPPLY)

SURVEY QUESTIONNAIRE
(Form 1 – Supply of Beverage Bottles in Cagayan de Oro City)

IMPORTANT NOTE. The items in this survey questionnaire are grouped into two parts: supply and demand for PET, aluminum, and glass beverages bottles. This is of the fact that your company supplies its demand. Hence, many of the items are the same however have different cost accounting and should be treated separately. Please answer all the items mainly within the perspective of ***demand*** and ***supply*** including supply for and demand from other companies. Answer the items or sub-items that apply solely to your company's market in Cagayan de Oro City, Philippines.

A. Company Profile. Please specify the number of years of operation in the manufacturing of PET, aluminum, and glass beverage bottles.

- No. of years in operation. Please specify for each type of bottle.

  PET bottles _____years
  Aluminum bottles _____years
  Glass bottles _____years

- Size of Beverage Bottle Operation. The size of your beverage bottle operation is classified according to the Department of Trade and Industry (DTI) category of micro, small, and medium enterprises (MSME). Please check the appropriate box. You can add additional line box/es for more information

  - ☐ Micro
  - ☐ Small
  - ☐ Medium
  - ☐ Large

CATEGORY OF **MSME**		
Enterprise	By Asset Size	By number of employees
Micro	Up to 3.000.000	1 – 9
Small	3.000.001 to 15,000,000	10 - 99
Medium	15,000,001 to 100,000,000	100 - 199
Large	100,000,001 and Above	200 and Above

Source: DTI, 2010

B. SUPPLY ASPECT (For Supplier of PET, aluminum, glass beverage bottles only)

1. Type of beverage packaging bottles your company manufactures. Please indicate also if raw materials used are recycled, single-use, and reuse. Also, specify if the source of raw materials is imported or local. Please check the appropriate box/es.

Type of Bottle/ Source of Raw Material	Single use (Virgin)		Recycled		Reuse	
	Im-ported	Local	Im-ported	Local	Im-ported	Lo-cal
PET Bottles						
Aluminum Bot-tles						
Glass Bottles						

2. Of the three types of beverage bottles which one shares the largest revenue your company manufacture? Please ranked from highest (1) – lowest (3) category.

   PET_____ Aluminum_____ Glass_____

3. What percentage does the total accounting cost of production to the revenue for each type of beverage bottle your manufacture? Total accounting production cost includes direct, indirect, fixed, variable, and operating cost. The information obtains herein is very important in the study as it determines the financial feasibility of the proposed project. Please specify the percentage of each accounting cost of each type of beverage bottle. For your reference, the following costs are operationally defined as follows:

Direct costs are related to producing a good or service. These include raw materials, labor, and expense or distribution costs associated with producing a product. The cost can easily be traced to a product, department, or project.

Indirect costs are expenses unrelated to producing a good or service. An indirect cost cannot be easily traced to a product, department, activity, or project.

Fixed costs do not vary with the number of goods or services a company produces over the short term.

Variable costs fluctuate as the level of production output changes, contrary to a fixed cost. This type of cost varies depending on the number of products a company produces. A variable cost increases as the production volume increases, and it falls as the production volume decreases.

Operating costs are expenses associated with day-to-day business activities but are not traced back to one product. Operating costs can be variable or fixed.

Cost/Type of bottle	% Direct cost	% Indirect cost	% Fixed cost	% Variable cost	% Operating cost
PET bottle					
Aluminum bottle					
Glass bottle					

4. What is your company's actual and target annual volume of products supplied to Cagayan de Oro City for the last three years? Please specify in kilograms/tons per year. If the kilogram and tonnage measure cannot be estimated accurately, please indicate the most likely average per year.

For Single use:

Year	PET (in kilogram/ton)		Aluminum (kilogram/ton)		Glass (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

For recycled:

Year	PET (in kilogram/ton)		Aluminum (kilogram/ton)		Glass (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

For reuse:

Year	PET (in kilogram/ton)		Aluminum (kilogram/ton)		Glass (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

5. What is/are the end-uses of your manufactured beverage PET, Aluminum, and Glass bottles?

   - ☐ Bottled water
   - ☐ Carbonated soft drinks
   - ☐ Food bottles and jars
   - ☐ Non-food bottles and jars
   - ☐ Fruit juices
   - ☐ Beer
   - ☐ Others, please specify_____

6. Please specify the reasons responsible for the behavior of your annual production. For example, the reasons why PET, aluminum, or glass bottle production shares a larger percentage than other raw materials (e.g. cost of raw materials, regulations, ease of manufacturing, transportation, demand, regulations, and the like). Please check the appropriate box or boxes.

   ○ Polyethylene Terephthalate (PET)

   - ☐ Cost-effective raw materials available
   - ☐ Ideal packaging for beverage
   - ☐ Varied packaging design possibilities
   - ☐ Can create a customized solution
   - ☐ Product protection
   - ☐ Increasing consumer preference
   - ☐ Ease of manufacturing
   - ☐ Recyclability
   - ☐ Others, please specify_____

   ○ Aluminum

   - ☐ Recyclability
   - ☐ Cost-effective raw material
   - ☐ Ideal packaging for beverage
   - ☐ Varied packaging design possibilities
   - ☐ Can create a customized solution
   - ☐ Product protection
   - ☐ Increasing consumer preference
   - ☐ Ease of manufacturing
   - ☐ Others, please specify_____
     _____

○ Glass

- □ Recyclability
- □ Cost-effective raw material
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Others, please specify_____

7. In terms of the supply chain, what channel of distribution your company adopted? Please check the appropriate box or boxes.

- □ Business to Business (B2B) – company to company
- □ Retail
- □ Households
- □ Others, please specify_____

8. What is your estimated percent market share of the entire supply market (100%) for PET, aluminum, and glass bottles by the source of raw materials? Please specify in percent.

Type of Bottles and Raw materials	Single-used (Virgin) % Market Share	Recycled % Market Share	Reuse % Market Share
PET bottles			
Aluminum Bottles			
Glass Bottles			

9. Indicate the ways your company has or will have identified your target market for PET, aluminum, and glass bottles? Please appropriate box or boxes.

Customer Needs

- □ Product reviews from social media that competitors do not currently supply
- □ Reviews of market research on the current trends of genuine customer needs
- □ Assessment of competitors' product ranges that the proposed project can fill
- □ Marketing programs aim to target relevant and important target audience

- ☐ Others, please specify_____

Target Market

- ☐ Selecting a target market that ensures the company's focus resources on marketing priorities
- ☐ Uses communication channels such as salesforce, customers newsletters, telesales, or email to announce a new product
- ☐ Advertising or public relations to create awareness of the product
- ☐ Others, please specify_____
  _____

Channels

- ☐ Motivating Salesforce. retailers, and distributors for the successful launching of the project
- ☐ Understanding real customers' benefits of the new product
- ☐ Provide guides and incentive programs to motivate and generate sales
- ☐ Others, please specify_____
  _____

Running a Test Market

- ☐ Running a test market before launching the product to gather information on all aspects of the product to minimize the risk of failure
- ☐ Choose the target market with demographic characteristics like the target market in terms of price, retail performance, and consumer response to advertising, packaging, and sales promotion.
- ☐ Others, please specify_____
  _____

Support System

- ☐ Existing government rules and regulations supporting the recycling of PET, aluminum, and glass bottle-to-bottle materials
- ☐ Tax incentives
- ☐ Training of manpower during the construction and installation of the project
- ☐ Others, please specify
  _____

10. What are your major customers for PET, aluminum, and glass beverage bottles in Cagayan de Oro City in terms of their satisfaction with PET, aluminum, and glass bottles; mode of payments; satisfaction with product features, or marketing program they want to?

10.1 Satisfaction for beverage bottle or container. Please check the appropriate box or boxes.

Bottle	Very satisfied	Satisfied	Somewhat satisfied	Not satisfied
PET				
Aluminum				
Glass				

10.2 Product features and marketing services (PET bottles).

Key Performance Indicators	Very satisfied	Satisfied	Somewhat satisfied	Not satisfied
Product design, size, shapes, and durability				
Strong customer service support				
Ability to respond to customer delivery needs				
Cost competitiveness of the product per unit				
Engagement with customers specific needs and requests				

10.3 Mode of payments from customers. Please check appropriate box or boxes

- ☐ Cash
- ☐ Cheque
- ☐ Mail Transfer/Telegraphic Transfer
- ☐ Bill of Exchange
- ☐ Promissory Note
- ☐ Bank Draft
- ☐ Others. Please specify_____

11. Do you think your company will have more market for beverage bottles in the future?

    11.1 If your answer is yes, how many times larger will your market be in the next five years? Please specify how many times_____

    11.2 What do you think are the reasons responsible for the increase in your market in the future? Please specify_____

APPENDIX 2. SURVEY QUESTIONNAIRE (DEMAND)

SURVEY QUESTIONNAIRE
(Form 2 - Demand for Beverage Bottles in Cagayan de Oro City)

IMPORTANT NOTE. Answer only the items or sub-items that specifically applies solely to your company's sales coming from Cagayan de Oro City, Philippines.

1. Size of Beverage Bottled Product Manufacturing Department. The size of your operation is classified according to the Department of Trade and Industry (DTI) category of micro, small, and medium enterprises (MSME). Please check the appropriate box. You can add additional line box/es for more information

    - ☐ Micro
    - ☐ Small
    - ☐ Medium
    - ☐ Large

CATEGORY OF MSME		
Enterprise	By Asset Size	By number of employees
Micro	Up to 3.000.000	1 – 9
Small	3.000.001 to 15,000,000	10 - 99
Medium	15,000,001 to 100,000,000	100 - 199
Large	100,000.001 and Above	200 and Above

Source: DTI, 2010

- Does your company have its PET, aluminum, and glass beverage bottle production department? Please check the appropriate box or boxes below.
  YES ☐ NO ☐

- If yes, is the volume of production enough to supply the company's demand for PET, aluminum, and glass bottles? YES NO

A. Demand Aspect

1. Type of beverage packaging bottles your company consumed per annum. Please indicate if raw materials used are recycled, single-use, and reuse. Also, indicate if the supply for the bottles is imported or locally sourced. (Please check the appropriate box).

Type of Bottle/ Source of Raw Material	Single use (Virgin)		Recycled		Reuse	
	Imported	Local	Imported	Local	Imported	Local
PET Bottles						
Aluminum Bottles						
Glass Bottles						

2. Of the three types of beverage bottles which one shares the largest revenue of your company's manufactured beverage? Please ranked from highest (1) – lowest (3) category.

   PET_____ Aluminum_____ Glass_____

3. What reasons you can account for the behavior of your company's choice of beverage bottle packaging behavior?

○ Polyethylene Terephthalate (PET)

- □ Cost-effective raw materials available
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Recyclability
- □ Others, please specify_____

○ Aluminum

- □ Recyclability
- □ Cost-effective raw material
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Others, please specify_____

○ Glass

- □ Recyclability
- □ Cost-effective raw material
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing

- ☐ Others, please specify_____
  _____

4. What is your actual and target average annual demand for PET bottles, aluminum, and glass bottles (in kilogram/ton)?

   For single-used (Virgin)

Year	Demand for PET bottles (in kilogram/ton)		Demand for Aluminum bottles (kilogram/ton)		Demand for Glass bottles (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

For recycled:

Year	Demand for PET bottles (in kilogram/ton)		Demand for Aluminum bottles (kilogram/ton)		Demand for Glass bottles (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

For reuse:

Year/Demand	Demand for PET bottles (in kilogram/ton)		Demand for Aluminum bottles (kilogram/ton)		Demand for Glass bottles (kilogram/ton)	
	Actual	Target	Actual	Target	Actual	Target
2017						
2018						
2019						

5. What percentage does the total accounting cost of production to the revenue for each type of bottled beverage your company manufacture? Total accounting production cost includes direct, indirect, fixed, variable, and operating cost. The information obtains herein is very important in the study as it determines the financial feasibility of the proposed project. Please specify the percentage of each accounting cost of each type of beverage bottle. For your reference, the following costs are operationally defined as follows:

Direct costs are related to producing a good or service. These include raw materials, labor, and expense or distribution costs associated with producing a product. The cost can easily be traced to a product, department, or project.

Indirect costs are expenses unrelated to producing a good or service. An indirect cost cannot be easily traced to a product, department, activity, or project.

Fixed costs do not vary with the number of goods or services a company produces over the short term.

Variable costs fluctuate as the level of production output changes, contrary to a fixed cost. This type of cost varies depending on the number of products a company produces. A variable cost increases as the production volume increases, and it falls as the production volume decreases.

Operating costs are expenses associated with day-to-day business activities but are not traced back to one product. Operating costs can be variable or fixed.

Cost/Type of bottle	% Direct cost	% Indirect cost	% Fixed cost	% Variable cost	% Operating cost
PET bottled beverages					
Aluminum bottled beverages					
Glass bottled beverages					

6. What do you use manufactured beverage PET, Aluminum, and Glass bottles for? Please specify by checking the appropriate box or boxes.

6.1 For PET bottles

- ☐ Bottled water
- ☐ Carbonated soft drinks
- ☐ Food bottles and jars
- ☐ Non-food bottles and jars
- ☐ Fruit juices

- □ Beer
- □ Others, please specify_____

6.2 For Aluminum containers

- □ Bottled water
- □ Carbonated soft drinks
- □ Food bottles and jars
- □ Non-food bottles and jars
- □ Fruit juices
- □ Beer
- □ Others, please specify_____

6.3 For Glass bottles

- □ Bottled water
- □ Carbonated soft drinks
- □ Food bottles and jars
- □ Non-food bottles and jars
- □ Fruit juices
- □ Beer
- □ Others, please specify_____

7. Please specify the reasons responsible for the behavior of your annual consumption of PET, aluminum, and glass bottles? For example, the reasons why PET, aluminum, or glass bottle production shares a larger percentage than other raw materials (e.g. cost of raw materials, regulations, ease of manufacturing, transportation, demand, regulations, and the like). Please check the appropriate box or boxes.

○ Polyethylene Terephthalate (PET)

- □ Cost-effective raw materials available
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Recyclability
- □ Others, please specify_____
  _____

○ Aluminum

- □ Recyclability
- □ Cost-effective raw material
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Others, please specify_____

○ Glass

- □ Recyclability
- □ Cost-effective raw material
- □ Ideal packaging for beverage
- □ Varied packaging design possibilities
- □ Can create a customized solution
- □ Product protection
- □ Increasing consumer preference
- □ Ease of manufacturing
- □ Others, please specify_____

8. In terms of the supply chain, what channel of distribution your company adopted? Please check the appropriate box or boxes.

- □ Business to Business (B2B) – company to company
- □ Retail
- □ Households
- □ Others, please specify_____

9. What is your estimated 3 –year average percent market share of the entire demand market for beverages (100%) by type of bottle use and source of raw materials? Please specify in percent.

Type of Bottles and Raw materials	Single-use (Virgin) Material % Market Share	Recycled Material % Market Share	Reuse Material % Market Share
PET bottled beverages			
Aluminum Bottled beverages			
Glass Bottled beverages			

10. What are your major customers for PET, aluminum, and glass beverage bottled beverages in Cagayan de Oro City in terms of their satisfaction with PET, aluminum, and glass bottled beverages; mode of payments; satisfaction with product features or marketing program they want to?

    10.1 Satisfaction for beverage bottle or container. Please check the appropriate box or boxes.

Bottle	Very satisfied	Satisfied	Somewhat satisfied	Not satisfied
PET				
Aluminum				
Glass				

    10.2 Mode of payments from customers. Please check appropriate box or boxes

    - ☐ Cash
    - ☐ Cheque
    - ☐ Mail Transfer/Telegraphic Transfer
    - ☐ Bill of Exchange
    - ☐ Promissory Note
    - ☐ Bank Draft
    - ☐ Others. Please specify_____

11. Do you think your company will have more markets for beverages in the future?

    a. If your answer is yes, how many times larger will your market be in the next five years? Please specify how many times_____

    b. What do you think are the reasons responsible for the increase in your market in the future? Please specify_____
    _____

12. Why do customers buy from your company's bottled beverage/s? Please check appropriate box below as 5 = strongly agree, 4 = Agree, 3 = Not sure, 2 = Disagree, 1 = strongly disagree.

KPI	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Trust of the product and services					
Competitiveness of the brand of the product					
Respond to the ethics and moral of delivering quality products					
Indirect or direct customer need fulfillment					
Provides economic and social value to the customers					

13. What single aspect of your brand that stands out and makes clients trust you?

KPI	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
High trust factor					
Identify and build one factor to another that makes the company preferable over competitors					
Financial strength that appeals to your brand differently					
The perception amongst peers, consumers, and society alike					
Technology update and application					
Charging the right price					
Constant and prudent communication with customers about the benefits of brand improvement					

APPENDIX 3. DRS ACCEPTABILITY QUESTIONNAIRE

Survey Questionnaire
(Form 3 – Acceptability of DRS)

The items below describe how the deposit-based return system operates in many European countries as demonstrated in figure 2. It is important to note that the Philippines does not have a deposit-based return system. However, if the country should adopt one that is similar or modified, the level of acceptability of the system can be determined by your ratings in each item. Please rate each item by checking the appropriate box as:

5 = Completely acceptable (CA)
4 = Acceptable (C)
3 = Somewhat acceptable (SA)
2 = Unacceptable (U)
1 = Completely Unacceptable (CU)

Acceptability of DRS	**CA**	**A**	**SA**	**U**	**CU**
In DRS, the manufacturer or importer of the beverage delivers the product for sales in a retail/wholesale company which pays the deposit to the manufacturer or importer of the beverage in the price of the product					
The consumer pays the deposit when buying the product and receives it back when returning the empty package to a returning point					
The return point and the processing plant report the returned packages to the company					
The company pays the deposits to the return points following the number of reported returned packages					
A decree should be implemented on the recycling of different beverage packages through a deposit-based return system which enables the efficient collection of packages for recycling.					
Beverage manufacturers and importers must pay the membership fee to the deposit-based return system to be exempted from packaging tax as an incentive for recycling					
The fees collected from the members will cover the expenses of the return system (the result of i.e. logistics, the transportation of the packages in different stages of the recycling chain, the compensations paid to the return points, and the processing of materials, among other things).					
The deposit-based return system should be managed or administered by a non-profit company.					

The return system should be managed/administered by the government					
The consumer identifies a can or plastic bottle belonging to a deposit-based return system of the company based on the deposit marking on the package which also indicates the value of the deposit.					
The reverse vending machine identifies a deposit bottle or can by comparing its barcode and shape to the information in the reverse vending machines register.					

APPENDIX 4. Cronbach's Alpha Result

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.935	.935	11

Item Statistics

	Mean	Std. Deviation	N
Item1	3.9474	1.23794	171
Item2	4.2164	1.18568	171
Item3	4.0234	1.11647	171
Item4	4.1404	1.11838	171
Item5	4.3041	1.04089	171
Item6	3.8246	1.19985	171
Item7	4.0175	1.09262	171
Item8	4.0117	1.09538	171
Item9	3.7251	1.19824	171
Item10	4.1637	.98044	171
Item11	3.8246	1.19985	171

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item1	40.2515	76.378	.758	.	.927
Item2	39.9825	79.041	.658	.	.931
Item3	40.1754	78.004	.764	.	.927
Item4	40.0585	79.538	.678	.	.930
Item5	39.8947	79.295	.752	.	.927
Item6	40.3743	76.765	.766	.	.927
Item7	40.1813	77.479	.813	.	.925
Item8	40.1871	77.577	.805	.	.925
Item9	40.4737	80.686	.566	.	.935
Item10	40.0351	81.481	.671	.	.931
Item11	40.3743	76.765	.766	.	.927