

# **The Financial Viability of Recycling Depots in a City of Rising Costs**

FINAL REPORT

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## Introduction

Even though recycling is promoted regularly by the City of Vancouver as a way of reducing environmental risks and creating social and economic benefits, it is not always an easy task to get Vancouver residents to participate. Although the aim is to provide access to free and convenient recycling opportunities for all, through initiatives like curbside collection, the City is also aware that not all materials are appropriate to be collected by curbside trucks; hence the need for alternative means of collection at centralized drop-off facilities.

It is known that if the available recycling options are not convenient enough, residents will dispose of their hazardous or recyclable materials within their garbage or abandon the materials on the street, generating illegal dumping, risking spills and increasing the potential for fires within the garbage.

Permanent collection facilities, known as Recycling Depots, have been created to manage the recycling and disposing of different materials. Currently there are two depots operated by the City and Vancouver:

- Residential Drop-off Area (RDO), located at the Vancouver Landfill, in Delta; and the
- Vancouver Zero Waste Centre (ZWC), located next to the Vancouver Transfer Station, in Vancouver.

Some revenue is generated from the sale of materials brought to the depot, and some funding comes from Extended Producer Responsibility programs (EPR), which are management systems based on industry taking responsibility for the products they produce through their full life-cycle. Different versions of EPR programs, also known as Industry Product Stewardship programs, have existed in BC since 1970. In the 1990's several new products were added to the stewardship model and in 2004 all of the existing programs were consolidated in a single regulatory framework, the BC Recycling Regulation. In 2008 the BC government amended the regulation to include electrical products, and in 2011 amended it again to include printed paper and packaging.

The City of Vancouver has been adding accepted materials to their depots over time, including some EPR materials, however it has not formally joined many of the programs. It was expected that participation from private depots and retail collection sites would satisfy residents' demands for accessible recycling; however, this has not been the case. Residents coming to dispose of garbage at City facilities have asked for a "one-stop drop" experience, which facilitates their recycling process and supports the City's Zero Waste initiatives.

Anecdotally it has been claimed by both private and public Recycling Depots that some EPR programs are not fairly compensating the collection facilities participating in their programs. These claims were supported by the Ministry of Environment and Climate Change Strategy,

and on April 24, 2018 the Ministry released a guidance document that reinforced its expectations about how the collecting and managing costs must be covered by the producers<sup>1</sup>.

The argument that the EPR programs have not been completely compensating the depots has been difficult to defend without a complete analysis of the cost to operate the City of Vancouver Recycling Depots as stand-alone facilities, and to further break down the cost per material or EPR program. In this context, an analysis of the effectiveness and sustainability of the Recycling Depots was required.

## Project Objectives

The following were the main objectives set out at the beginning of the project:

- Evaluate the capital and operating costs to accept, sort, store and manage materials at the Residential Drop-off Area and the Zero Waste Centre.
- Complete an activity-based cost analysis of the activities on site and determine a methodology for the allocation of costs among materials accepted.
- Create a dynamic costing model that can also be used as a tool to gather data and estimate costs of external recycling facilities in the future.
- Compare calculated costs to compensation offered by EPR programs for the management of their materials.
- Evaluate if the EPR programs are meeting the requirements of the Recycling Regulation, to pay the costs of collecting and managing their products.

While the initial project scope had anticipated the inclusion of the financial evaluation of additional depots within urban areas beyond the two City of Vancouver depots, due to time constraints this component was not executed. However, the model and the methodology are repeatable and could be made available to other recycling depot operators for their own use in evaluating costs by EPR program.

## Policy Context

The above-mentioned objectives acquire significant relevance if we take into consideration that the City of Vancouver aims to become the greenest city in the world by 2020, with three areas of focus: Zero Waste, Zero Carbon and Healthy Environments. To achieve this, in 2011 it created the Greenest City Action Plan, which establishes ten key goal areas of interest: Climate and

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<sup>1</sup> As stated in the Guidance Recycling Regulation published by the Ministry of Environment and Climate Change Strategy in April 2018 called *'Producers Paying the Cost of Managing Obligated Materials and Dispute Resolution'*: "...Purpose: To provide direction on the expectations of the Ministry regarding the need for extended producer responsibility plans under the Regulation to adequately provide for the producer collecting and paying the costs of collecting and managing products within the product category covered by the plan, whether the products are currently or previously sold, offered for sale or distributed in British Columbia."

Renewables, Green Buildings, Green Transportation, Zero Waste, Access to Nature, Clean Water, Local Food, Clean Air, Green Economy and Lighter Footprint.

Several strategic plans have been developed to address the Greenest City Action Plan's main objectives. This project is particularly related to the Zero Waste 2040 Plan, which envisions the City of Vancouver as being a zero-waste community by the year 2040 and provides the strategic framework and action plan to achieve such an ambitious objective.

The long-term objectives that inspired the Zero Waste 2040 Plan are to reduce environmental impacts through the conservation, reuse, recycling and recovering of resources, while creating social and economic benefits, all aligned to the broader objective of helping Vancouver develop a circular economy. Hence the need of a deeper analysis of the recycling processes that are part of this plan.

## Methodology Developed

Understanding the financial viability/sustainability of an operation implies having a real sense of the costs of the operation and the products or services provided. As well, it must address the revenues generated and determine if the costs are being covered by the revenues, per operation and per product or service.

The methodology was developed to facilitate informed decision making about the participation in EPR programs and to aid in negotiating fair compensation for participation. This model was conceived as a dynamic tool that can be used in different contexts, in bigger or smaller operations.

### Description of the Model

A mix of the traditional and activity-based costing methodologies was determined as the best approach to tackle the complex task of allocating the costs to the different materials. A model that clearly presents all the operational, administrative and capital costs, and that shows all the subtle and usually overlooked hidden costs was developed.

The model has been structured in a way that it is broad and general enough to cost a complex mix of operational and administrative service-driven processes and capital, within a diverse array of 28 materials; and at the same time, it is detailed enough to provide a realistic and reasonable way of allocating costs to each independent material with enough precision.

All the materials accepted at the facilities have been costed independently, whether they are EPR or Non-EPR materials. All the materials accepted generate activities within the depot, all these activities consume resources such as labour hours, equipment and capital; and the consumption of these resources generates costs.

Some materials that are collected have value as a commodity or generate revenue from EPR programs and other materials do not. The costing model clearly separates the revenue per material to accurately measure it against costs per material.

### Data and Sources

The model was based on information that can be replicated in the future and can also be verified and validated. Special attention was taken in the process of validating the data, as well as confirming that it corresponds to each particular depot, operation, material or period needed. In a few cases, assumptions were required to be able to reasonably relate some costs to the depots. These assumptions were mainly based on historical data.

The data and information used in the model is a mix of the following sources:

- Data provided by the Vancouver Transfer and Landfill’s Administrative department, extracted through the SAP system (official accounting and administration system);
- Data provided by the City of Vancouver’s Finance, Risk & Supply Chain Management department (Finance and EQS);
- Tonnage or volume of materials collected from the City of Vancouver weigh scale software and service provider data;
- Information obtained through physical observation at the RDO and ZWC, as well as interviews with the operation staff at both sites and the corresponding Superintendents; and also
- Available costing information from previous years.

### Cost Structure

The cost structure was developed mainly based on how the City of Vancouver tracks its expenditures, and through established practices found in several documents consulted during the research phase of the project (see References). Periods considered were 2016, 2017 and January to April 2018, with some exceptions made to include information from May or June 2018.

The costs for both depots have been classified as follows:

Cost Classification	Description	Source
Labour	Exclusively Operations workers and Equipment operators	Vancouver Transfer and Landfill’s Administrative department (SAP System)
Equipment	Loaders, forklifts, containers, bins used in the depot’s daily operations	City of Vancouver’s Finance, Risk & Supply Chain Management department (EQS)- (SAP System).

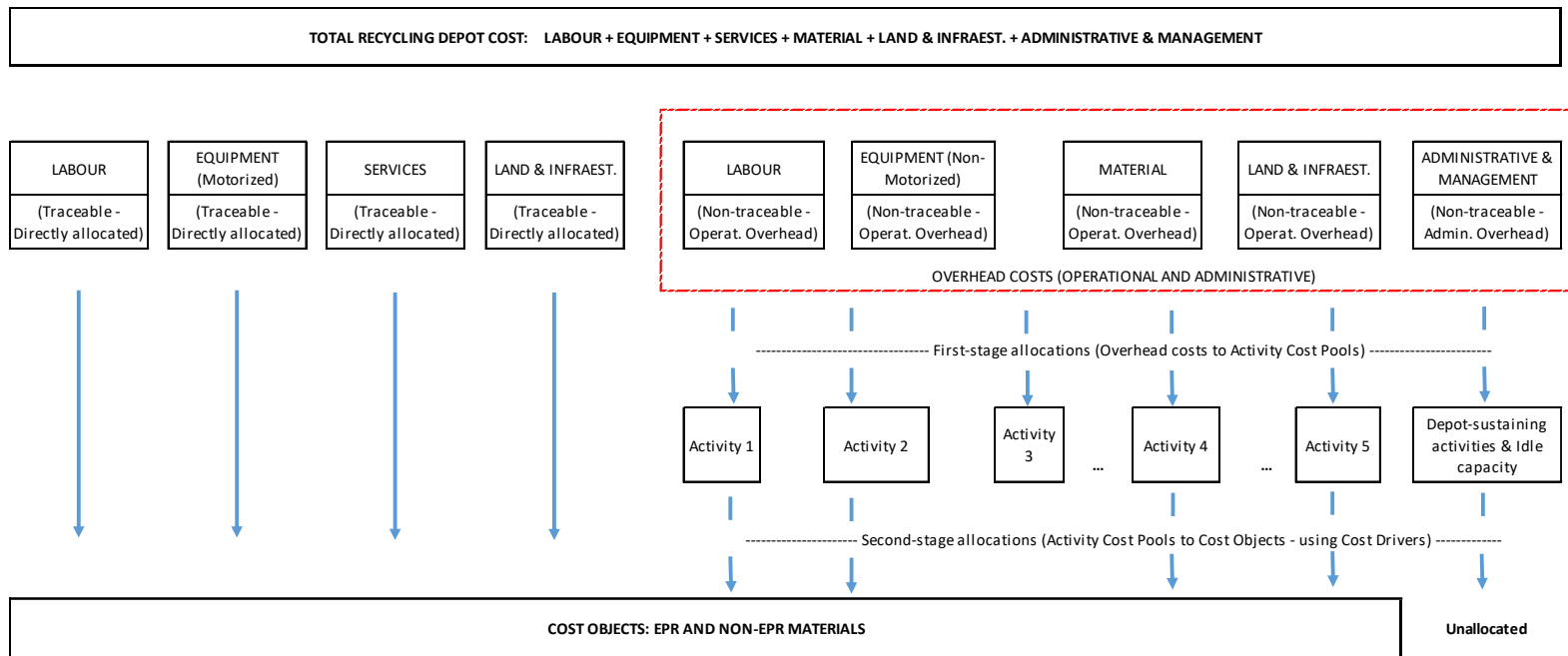
Material	PPE Materials, tools and work supplies	Vancouver Transfer and Landfill's Administrative department (SAP System).
Services	Hazardous Waste treatment services paid to third-party suppliers for the recollection and disposal of hazardous material.	Vancouver Transfer and Landfill's Administrative department (SAP System).
Land and Infrastructure	a) Land: yearly lease market value of identified properties with characteristics as similar as possible to the corresponding depot. b) Grounds and buildings' maintenance: expenses related to the maintenance of the sites where the depots operate.	a) Real and current land's lease postings with similar characteristics as the depots. b) Vancouver Transfer and Landfill's Administrative department (SAP System).
Administration and Management	Wages from Management, Superintendents, Weighmasters and Administrative staff, as well as administrative office equipment and supplies. Values have been adjusted to account only for the part corresponding to the depot.	Vancouver Transfer and Landfill's Administrative department (SAP System).

### Costs Allocation

Each material has different components, in terms of labour, equipment usage, disposal services needed to be subcontracted, health and safety requirements, space occupied, frequency of deliveries (by public), frequency of pick-ups (by EPR programs or third-party contractors), and so on. The cost structure developed identifies the particular proportions of each of the components and allocates the costs in a logical, reasonable and cost-effective way.

The following graph represents the way the total depot costs have been allocated to the different materials.





**Figure 1.** Graphical representation of the methodology followed for the costing of the Recycling Depots. Reprinted from *Managerial accounting: Tools for business decision-making*, by Weygandt, J. J. (2006), Copyright 2006 by John Wiley and Sons.

The left side of the graph represent the cost-structure costs that can be directly traced to the cost objects (materials), through clearly identifiable relations between the costs and the materials (labour hours, equipment usage, third-party services paid and space occupied per each of the materials).

On the right side are represented all the costs that cannot be directly traced to the cost objects, and that are allocated through the ABC Methodology. These costs are a mix of Operational and Administrative Overhead costs. In this part of the process, the remaining costs are allocated in two stages:

1. First stage: overhead costs are allocated to predefined activities (Activity Cost Pools). The Activity Cost Pools defined are the following: Directing (Customers) and Supervising, Sorting and Packaging, Administrating Facility (operational), Moving and Transporting Materials, Storing Materials, Managing Recycling Program (Administrative and Management).
2. Second stage: costs are allocated from the Activity Cost Pools to the Cost Objects. The following Cost Drivers were used to allocate these costs to the materials: labour hours, number of material pick-ups arranged, tonnes of materials received, exclusively-occupied area. The Managing Recycling Program activity is considered as an 'Organization-sustaining activity', and as such, its costs cannot be allocated directly to the materials and are expected to be covered through the sum of a factor assigned to each of the materials (Weygandt, 2006).

The total costs determined for each of the depots is then distributed and allocated between the several materials accepted at the depots, so each material has a proportion of the total costs, separated between the different cost components<sup>2</sup>.

Once each material was correctly costed, a cost-revenue analysis was implemented to determine if the current payment scheme provided by the Extended Producer Responsibility (EPR) programs compensate the depots for the process of handling and disposing the materials that are part of each of the EPR programs. Non-EPR materials that generate revenue can also be independently evaluated to determine if their costs are being covered.

## Revenue Allocation

Revenues come from two different sources:

- a) Collection Costs: Compensation paid directly by the agencies that manage the EPR Programs through established rates per unit of measure (tonne, kg, litre, boxes). These

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<sup>2</sup> Cost components for each of the materials: Labour, Equipment, Services, Land and Infrastructure allocated directly, as well as all the costs allocated to each of the defined activities and the depot's sustaining activities.

collection costs are expected to pay for the full cost of collecting and managing the materials accepted at the depots.

- b) Commodities Sales: Organizations that buy materials from the depots to then sell them as a material for remanufacturing after processing them.

Information obtained from the City SAP system was directly attributed to the corresponding material, less interpretation was necessary to allocate revenue.

## Main Cost and Revenue Observations

Following the compilation of all data, and allocation between resources and activities through the cost drivers the main observation was that costs exceed revenues by a large margin at both facilities. A larger body of work was undertaken as part of a detailed financial analysis for City of Vancouver staff, which built the foundation for the results presented within this report. Aspects of the financial analysis undertaken included:

- Cost components for the total cost of the depots and each of the materials;
- Cost distribution/proportion between the different depots and materials;
- Profit and loss statements per depot and per material, for a quick view of the relation between revenue and cost, as well as the cost structure;
- Cost per tonne or units, depending on the criteria that best applies;
- Breakeven analysis per material: to identify the potential rates for which all costs are covered and a sustainable operation per material and per depot is attained; and
- Revenue and cost comparisons with respect to the activities that form the costs of the depots and each material.

Summarized below is an analysis of compensation broken out by facility, and by EPR program, obtained through the development and use of the model. Even though the Landfill RDO and the ZWC are both recycling depots that are run by the City of Vancouver and have very similar administrative and operational structures, there are differences. Some differences are in aspects such as: number of operations workers, materials accepted at each depot, total size of the depot, space assigned to the materials, as well as frequency of materials being picked up. As each depot is an independent operation, the information is presented separately.

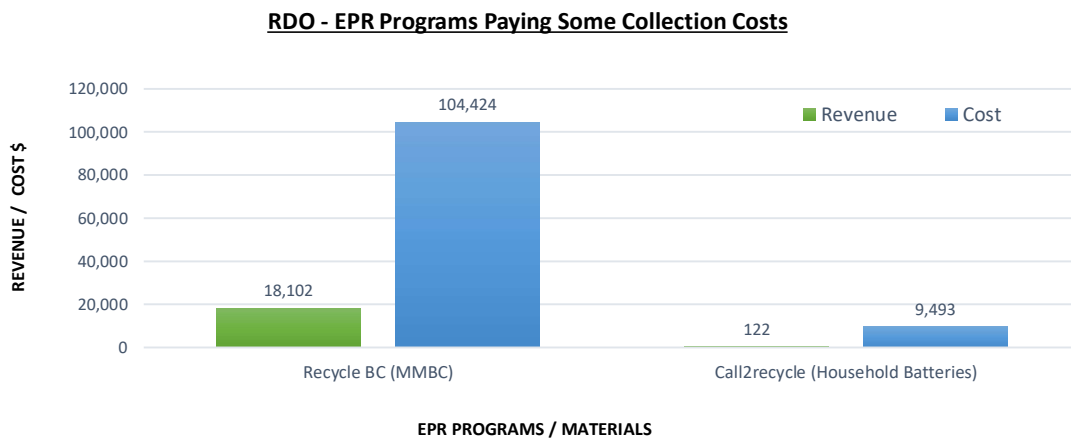
### Residential Drop-off Area:

Considering that the RDO is located at the Vancouver Landfill, there are some shared costs between both garbage and recycling operations. However, those shared costs have been separated and allocated to each operation independently.

When comparing the yearly average total revenue received through the mentioned sources at the RDO with the total cost from operating the depot, it was observed that the revenues account for only 29% of the total costs.

When considering just the revenues paid by the EPR programs, revenues cover only 2% of the total cost to operate the RDO depot. If the City were to participate in all the EPR Programs and actually receive some collection costs from those programs, revenues would cover 6% of the total cost of the depot. In this case the gap between revenue and costs would still significant at around 94% of the total cost.

The following graphs provide a clear picture of the disproportion between revenues and the real costs of managing the different materials.



**Figure 2.** Relation between revenue and cost from the two EPR programs that currently pay some collection costs.

As it can be observed in Figure 2, in the case of the two EPR programs that currently pay collection costs to the City for the management of their materials, revenue/cost relation is 17.3% for Recycle BC (Mixed materials) and 1.3% for Call2Recycle (Household Batteries).

The significant difference that can be observed when comparing both materials can be attributed to the fact that Recycle BC as a program manages several materials, sub-classified in 5 categories: packaging and printed paper, cardboard; glass bottles and jars; paper, plastic, and metal containers; plastic bags and overwrap; and plastic foam packaging. Each of these categories has a particular space designated and demands different operational labour activities as well as equipment usage.

Call2Recycle, for instance, only manages household batteries and has a very different cost component. It is still demanding in labour because of its particularities in terms of batteries sizes and special packaging required, but much less space is required for storage and no equipment usage is needed.

These differences in the relative proportions of the costs components can be observed throughout all the materials, in some cases clearer than others. The model addresses graphically all those differences.



**Figure 3.** Relation between revenue and cost from the EPR Programs that are not offering to compensate collection costs.

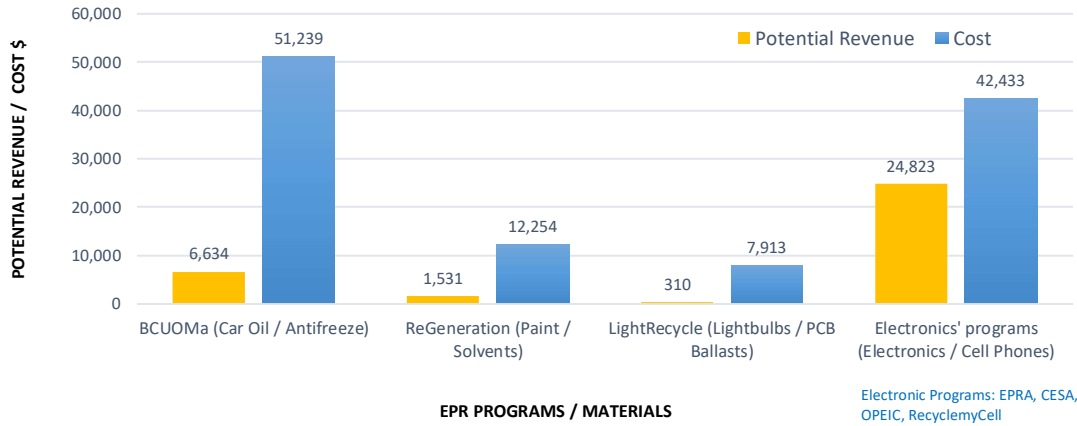
Currently, the EPR Programs presented in Figure 3 are either programs that generate commodity sales revenues or are structured not to offer any collection costs. In the case of AlarmRecycle the City has officially joined this EPR program but AlarmRecycle is not offering to compensate for collection costs as they indicated they were meeting their accessibility targets and didn't need additional sites.

Revenues showed for the Major Appliance Recycling Roundtable and Canadian Battery Association came from the direct marketing of this material by the City of Vancouver. Through the sale of major appliances as scrap metal, the RDO receives an average yearly revenue of approximately \$15,000; however, the identified costs for this operation (\$48,737) are slightly more than 3 times the revenue it provides. Major Appliances' operation costs are relatively high as compared to other materials mainly because of intensive equipment usage and space occupied.

Currently MARR is running a pilot program which the City joined in April 2018 that is offering collectors some compensation for their operations. The fee structure of the pilot is a fixed fee, varying between appliances with or without refrigerant. Commodities sales for the City vary depending on scrap metal markets. Therefore, the financial viability of the program will change from year to year. Future analysis will help determine if the established fees are covering their specific program costs.

Considering the volatility components of the metal commodity market, it is necessary to highlight the importance in determining mechanisms to adjust the future fees to be paid to the fluctuations of the markets.

**RDO - EPR Programs COV Does Not Receive Collection Costs From**



**Figure 4.** Relation between revenue (potential) and cost from EPR Programs City of Vancouver does not receive collection costs from.

The EPR programs shown in Figure 4 do offer compensation to official collection sites with a signed contract. The City of Vancouver has not entered into an agreement with these programs at this location, but does receive these materials. When observing the potential revenues that could be obtained if the corresponding collection costs were offered by these EPR programs, even though it would help to fund part of the service provided to Vancouver residents, the fees offered are still lower than the fees that would be needed to have sustainable independent operations.

The City collects a number of distinct EPR program materials together, in one electronics stream. Through a breakeven analysis it can be observed, for example, that the current rates offered by the Electronics EPR Program is still around 40% below the rate needed to break even.

As it can be observed, there are significant differences between the costs of each of the materials presented. Depending on the characteristics of the materials, the relative proportions of labour demanded, space occupied and equipment usage can vary significantly. Some hazardous materials require payment for services provided by third party collectors. These costs are directly linked to those materials when identified and can also extend the difference in costs with other materials apparently similar in its characteristics.

**Zero Waste Centre:**

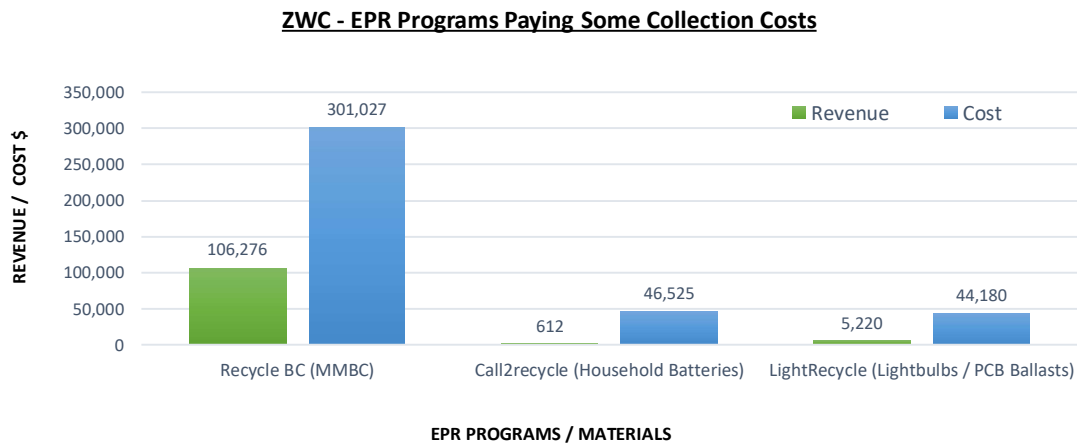
As mentioned, there are some differences between the operations at the ZWC and the RDO. The differences between the materials accepted and the amounts of these materials accepted at each depot can explain different costs structures and cost behavior at the depots.

The yearly average of materials that are collected and managed at the ZWC, for instance, is approximately 2.2 times the materials accepted at the RDO. However, some materials accepted

only at the RDO are very labour and equipment intensive, and others are considered hazardous materials and require services from third-party suppliers.

Total costs at the ZWC are slightly better covered by the total revenues that come from Collection Costs and Commodity Sales. The yearly average total revenue through these sources represents 31.2% of the total costs. Still, the gap to become a sustainable operation is quite significant.

Revenues paid by the EPR Programs account for 12% of the total costs at the ZWC. This is a much better situation when compared to the 2% covered at the RDO. As it can be observed in the following figure, this is mainly originated by the revenues that come through Recycle BC. The amount of Recycle BC materials collected at the ZWC is approximately 6 times the amount collected at the RDO.

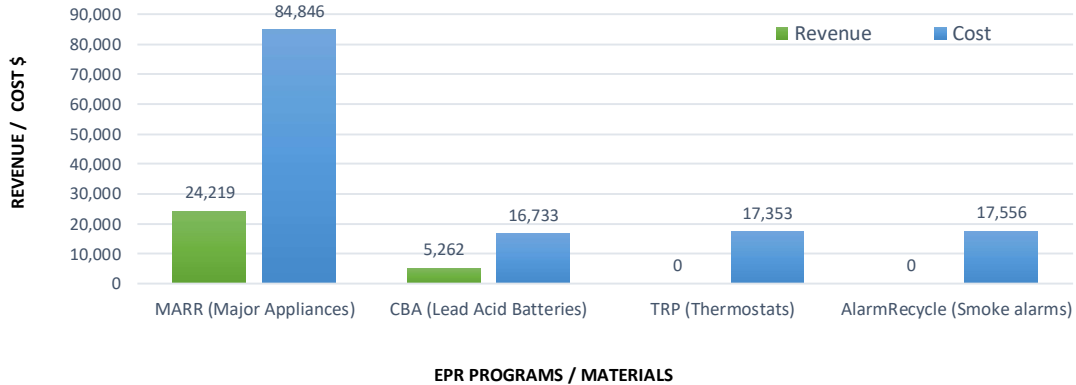


**Figure 5.** Relationship between revenue and cost from the EPR programs that currently pay some collection costs.

The relative better coverage of Recycle BC’s costs is explained also by some economies of scale due to the amounts of total mixed materials collected, but also because of the relative proportions of each of the materials.

As it can be observed in Figure 6, EPR Programs such as MARR and CBA that provide commodity sales revenues, cover in average of 30% of their costs. As in the RDO, TRP and AlarmRecycle are not providing any revenues to the City, but in the ZWC this is more noticeable due to the higher costs of around \$17,000 yearly average.

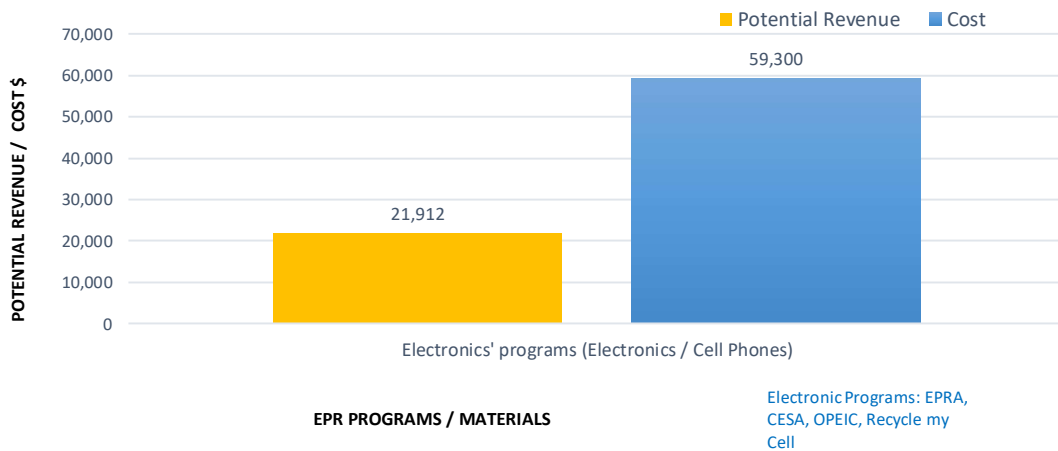
**ZWC - EPR Programs Not Offering Collection Costs**



**Figure 6.** Relation between revenue and cost from the EPR Programs that are not offering to compensate collection costs.

As it can be derived when comparing revenues and costs between the materials and, furthermore, analyzing the composition of those costs, every material received at the depots implies the use of resources that generate costs. The fact that thermostats, for example, occupy around 3% of the area occupied by major appliances and the amount of this materials collected is relatively low compared to major appliances, and still account for costs of around \$17,000, clearly express the existence of hidden costs often overlooked (mainly overhead and ‘organization-sustaining’ costs).

**ZWC - EPR Programs COV Does Not Receive Collection Costs From**



**Figure 7.** Relation between revenue (potential) and cost from EPR Programs City of Vancouver does not receive collection costs from.

When considered the total cost of collecting and managing all the electronic materials that come from different sources, and compared to the potential revenue, the coverage rate is even



lower than at the RDO. In the ZWC only 40% would be covered if the City decided to enter into an agreement with the EPR programs that manage electronics.

In this case, the need of rates that better compensate the costs of collection and managing the electronic materials is more evident. All the operations have to stand alone and be sustainable, independently of their location or relative volume compared to other materials. In the case of a material that accounts for 10 to 15% of the total costs generated by the EPR Programs, the need of accessing to better compensations is even more relevant for the general sustainability of the programs, not only the particular depots.

## Conclusions

- The process of compiling the data, accessing formal and informal information and determining common grounds between both depots' operations, was very complex and time-consuming because of the amount of recycling materials considered in the costing objectives and the structure and availability of detailed data related to each of the materials in the City of Vancouver administrative and financial SAP system. Most of the data available is related to broader operations, with lack of detail.
- It is clear that even with all the types of materials accepted in the depots, the compensation rates paid or offered to the City of Vancouver and the commodity sale revenues available at current market values, that neither of the recycling facilities (RDO and ZWC) would be sustainable in the long run if evaluated as a for profit business model. The gap between total costs by depot and total revenue is on average 70% of the total costs.
- When evaluating the different materials accepted at the depots, it can also be stated that none of the materials is able to break even. Depending on the particularities of each material and the revenues that their particular EPR program or the situation of the commodity market, some materials are able to cover between 30 to 35% of the capital and operating costs of accepting, sorting, storing and managing them at the City of Vancouver Recycling Depots. Approximately one third of all the materials accepted cover 0% of their corresponding costs.
- The costing methodology developed allocates every expense into the different materials, in different proportions. The fact that every dollar is allocated to a material, either through direct allocation or Activity Based Costing, implies that every material received at the depots, either small or big, hazardous or not, labour or equipment intensive or not, generates costs.

- Even though a significant amount of the labour costs and equipment usage can be directly traced to the materials, as it has been explained, there are several other components of the total cost that have also been considered in the process of determining the total costs of the depots or the materials. This, at the end, makes a significant difference between costing a material through estimates of labour hours and equipment usage when the real data is not available, and costing with real expense values (operational, administrative and capital) and allocating them through a methodology to the materials. One is an estimate based on subjective values, while the second one provides a more realistic and fair cost, based on real expenses and market values.
- It is important to highlight that due to the way this service is provided to residents, the operation must be always available and ready to provide the service. Some peak times have been identified, but as an operation that provides service to the public there are also significant amounts of time when the flow of residents is much lower, and the whole operation must still be in place. There is inevitable idle capacity due to the fluctuation in the flow of public but to provide the service expected, it must be assumed as part of the total cost and distributed between the materials. A whole structure must be in place in order to be able to provide the service of accepting recyclable, non-recyclable and hazardous materials from residents.
- The Recycling Depots have a significant proportion of operational costs, which is around 65% of the total costs in average between the two depots. The remaining 35% corresponds to land and infrastructure (approximately 22%) and administrative and managerial costs (13% in average). The cost of land has been updated to real market values, since it has to account for an opportunity cost of running a recycling operation and leaving aside other revenue-generating opportunities. The value assigned to land will always be related to market values, so it has to be taken into close consideration anytime a decision over the depots have to be evaluated.

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