ONTARIO ECOSCHOOLS WASTE COMPARISON STUDY

2016

Final Report

Contents

Glossary

Term	Definition
Landfill Waste	Waste typically disposed of in black bags; "garbage."
Combined Landfill Waste	Term used in this study to refer to the combination of landfill waste and organics waste. (Black bags + Green bins.)
Organics / Organics Waste	Compostable material that can be disposed of in Green Bins.
Diversion Rate	The percentage of total waste that is diverted from landfills through recycling, reuse or organics programs.
Standardized Diversion Rate	Term used in this study to refer to percentage of total waste diverted from landfills through recycling only.
All Waste	The combination of landfill, recycling and organics waste. (Black bags + Recycling bags + Green bins.)

EXECUTIVE SUMMARY

The Ontario EcoSchools Waste Comparison Study is an evaluation project conducted by Immacutec Systems Technologies Inc., an independent waste audit consultant, for Ontario EcoSchools.

Goals

The goals of this study were to:

1. Compile waste audit data from a large sample of schools across southern Ontario.

2. Gain insight into the trends of waste generation and composition among Ontario schools.

3. Determine if a statistically significant difference exists between the waste output of EcoSchools and Non-EcoSchools.

Methods

A total of 40 elementary and 9 secondary schools from 11 school boards participated in the study. School selection was limited to Gold and Platinum EcoSchools and Non-EcoSchools with no prior participation in the Ontario EcoSchools program.

Each school provided a 24 hour sample of all landfill, recycling and organics materials generated through daily activities. All material was weighed and divided by the student population. All materials from the organics streams were added to the landfill waste figures in order to control for the absence of organics programs in the majority of participating schools. A portion of the schools received comprehensive waste audits where individual materials were sorted from each waste stream.

Results

Data analysis yielded the following results:

1. A statistically significant difference exists between both the Combined Landfill and All Waste output per student of elementary Platinum and Non-EcoSchools. Platinum EcoSchool students on average produce 57% less combined landfill waste than Non-EcoSchool students.

2. Platinum and Gold secondary schools outperformed Non-EcoSchools secondary schools in terms of both Combined Landfill and All Waste per student.

Conclusions

Certification from Ontario EcoSchools is associated with lower landfill and total waste generation per student. The key factor to the success of waste reduction and diversion initiatives at the schools studied was consistent engagement and support from teachers, administrators and board level officials. Principals in particular had a great degree of influence over the mentality associated with waste diversion programs at the schools.

1 | INTRODUCTION

Landfills have significant negative impacts on the soil, water and air of the local environment. In an ongoing effort to reduce these harmful effects, diversion programs aimed at minimizing landfill waste are widely implemented and promoted across Canada. Schools are no exception; recycling bins are mandatory and many schools have green bin programs to capture their organic waste. Implementing and promoting these diversion programs in the schools is essential; the level of importance placed on responsible waste management can directly impact students' long-term attitudes in this regard.

Ontario EcoSchools is an environmental education and certification program that encourages schools to adopt a culture of environmental awareness and sustainability. Waste minimization is a key component of this multi-faceted program and schools receive recognition for their efforts to reduce waste materials and increase diversion. Based on their engagement of students and staff in environmental learning and action, schools are awarded certification at the Bronze, Silver, Gold, or Platinum levels on an annual basis.

The Ontario EcoSchools Waste Comparison Study (OEWCS) is an evaluation project conducted by Immacutec Systems Technologies Inc. for Ontario EcoSchools. The study measured the impact of the Ontario EcoSchools program on waste generation and management in schools by comparing the performance of Platinum and Gold EcoSchools to that of Non-EcoSchools. The study has compiled comprehensive waste data from 49 schools in 11 school boards across southern Ontario and produced valuable insight into the factors and trends of waste management within schools. This report summarizes the goals and methods of this study and provides an analysis of its results.

2 | STUDY GOALS

The goals of the OEWCS were the following:

I.   **Compile Waste Generation Data from a Large Sample of Schools**

   The primary objective of the study was to collect waste generation data from a wide selection of schools throughout southern Ontario in a consistent manner that would allow for further analysis.

II.   **Gain Insight into Waste Generation and Management Trends**

   The second goal was to use data analysis coupled with on-site observations to highlight trends in how waste is generated and managed at different schools. The study sought to document the impact of variables such as population size and standardized diversion rate on the landfill waste output per student.

III.   **Measure for Statistically Significant Difference Between EcoSchools and Non-EcoSchools**

   Anecdotal data has suggested that EcoSchools, particularly Platinum schools, generate far less waste than Non-EcoSchools. The third goal of this study was to quantitatively assess the performances of these schools to determine if a statistically significant difference exists between their waste outputs.

3 | METHODOLOGY

The value of any study hinges on the validity of its data. The number of participants in the study, the way they are selected, and how their data is collected are all important factors that influence the soundness and validity of a study's conclusions. The methodology of this study was designed to meet the standards of sampling and data collection required to show statistically significant results.

3.1 Sample Size

Data was collected from 25 EcoSchools and 24 Non-EcoSchools, for a total of 49 sample participants. This sample included a combination of elementary and secondary schools, and schools with and without organics programs. All schools had active blue-bin recycling programs.

3.2 Sample Selection

Participants were limited to schools within southern Ontario to maintain consistency in recycling program availability.

The auditors reached out to a number of school boards within this region known to have a mixture of EcoSchools and Non-EcoSchools to participate in the study. Once participation was confirmed, the boards' environmental representatives were asked to select a number of schools to provide waste data.

Spring 2016

The sample parameters for the Spring 2016 phase of the study included the following schools:

- Elementary and Secondary Schools
- Platinum and Gold EcoSchools
- Non-EcoSchools

The following conclusions were made following the Spring 2016 phase:

1. Waste reduction initiatives were less consistently implemented in Gold EcoSchools than in the Platinum EcoSchools.
2. Secondary schools were too varied in size, student population, curriculum and their adaptation of the EcoSchools program for useful comparisons to be made between the schools.

These observations led to an adjustment of the sample requirements for the Fall 2016 period.

Fall 2016

Sample collection in Fall 2016 was limited to the following schools:

- Elementary Platinum EcoSchools
- Elementary Non-EcoSchools with no prior certification

This tightening of sample parameters was done to ensure a comparison between two homogenous groups of schools and to demonstrate the full potential of the Ontario EcoSchools program. Bronze and Silver EcoSchools were excluded from the study based on observations made from previous site visits and waste audits. As newer members of the Ontario EcoSchools program, Bronze and Silver schools have often yet to establish regular, school-wide waste reduction initiatives and thus do not yet reflect the full impact of the program.

3.3   Data Collection

3.3.1 School Instructions

Data collection for all 49 schools was conducted on-site by Immacutec auditors.

All participating schools were asked to set aside a 24 hour sample of waste, including recycling and organic materials, for auditors to assess. Any waste from special events, after school or before school programs and maintenance activities was asked to be excluded from the sample.

3.3.2 Audit Types

In order to maximize the study's resources, each participating school received one of the following types of audits:

1. **General Spot Audits**

    Auditors weighed all garbage, recycling and organics bags. Recycling and organics bags were assessed to determine how much of the material in the bags was unacceptable in their Region's specific diversion programs (i.e. some Regions accept certain materials where others do not). The weight of contaminants from the recycling and organics bags was transferred from those streams to the landfill waste stream. The weights were then divided by the total number of students at the school.

    These audits provided the following types of data: landfill waste per student (kg), recycling per student (kg), organics per student (kg), and diversion rate (%).

    40 out of 49 schools received general spot audits.

2. **Comprehensive Waste Audits**

    Auditors sorted the contents of garbage, recycling and organics bags into material categories. Each material was then weighed. The weights of the unacceptable materials found in the recycling and organics streams were added to the landfill waste figures. Total weights were divided by the number of students at the school.

    These audits provided the following types of data: landfill waste per student (kg), recycling per student (kg), organics per student (kg), diversion rate (%), contamination rate (%), recovery rates for specific recyclable materials (%), as well as detailed information on the composition of each waste stream.

    9 out of 49 schools received comprehensive waste audits.

Note: Waste output was measured by weight (not volume) in order to ensure consistency and align with industry standards.

3.3.3 Observations

In addition to gathering empirical data auditors also spoke with teachers, administrators, custodians and students regarding their school's waste management practices. This shed light on the factors influencing the success of waste reduction and diversion programs.

3.4   Data Analysis

3.4.1 Types of Analysis

The purpose of data analysis is to draw conclusions or observations from the information gathered during a study. There are many methods used in data analysis; this study focused on the following three.

Visual Analysis: This type of analysis presents the data in the form of a chart or graph to make any trends in the data more easily apparent.

Correlation Analysis: This is an assessment of how different variables are related. Two variables are said to be correlated if a change in one causes a change in the other. This type of analysis can show the relationships between variables such as population, standardized diversion rate and waste per student.

Statistical Analysis: The study uses statistical analysis to determine if the differences in data between EcoSchools and Non-EcoSchools are *significant*. A significant finding is one that is unlikely to have occurred simply by chance.

3.4.2 Controlling for Organics Programs

Organics programs often produce a dramatic decline in landfill waste generation due to the high proportion of food in the waste stream and the relative weight of food waste compared to other materials. This posed a challenge to the accurate comparison of landfill waste generation among study participants, as not all had access to an organics program.

In order to control for this influential variable, contents of organics bins where the program was available were treated as though the organics program did not exist. This meant that the weight of organic material was added to the weight of landfill waste, arriving at the Combined Landfill Waste figure analyzed in the study.

A similar approach was applied in calculating the Standardized Diversion Rate for the schools; this measure only accounts for materials diverted through recycling and not organics programs.

The purpose of these data modifications was to provide an accurate measurement of the behaviours of students assuming similar diversion opportunities.

4 | ELEMENTARY SCHOOLS

4.1   Data Overview

Table 1 on the following page shows all elementary school data collected through the spot audits and comprehensive waste audits. The schools are listed in ascending order by Combined Landfill Waste per Student. All weights are in daily figures and in kilograms.

Table 1 - Elementary School Data - Spring/Fall 2016

| School	EcoSchool Certification	Audit Type	Student Population	Landfill Waste (kg)	Landfill Waste / Student (kg)	Recycling (kg)	Recycling / Student (kg)	Organics (kg)	Organics / Student (kg)	Combined Landfill Waste (kg)	Combined Landfill Waste / Student (kg)	All Waste (kg)	All Waste / Student (kg)	Standardized Diversion Rate (%)
1	Platinum	Comp	467	2.55	0.01	11.42	0.02	2.41	0.01	4.96	0.0106	16.38	0.0351	69.72
2	Platinum	Spot	627	7.85	0.01	8.37	0.01	0.00	0.00	7.85	0.0125	16.22	0.0259	51.60
3	Platinum	Comp	515	12.24	0.02	4.40	0.01	0.00	0.00	12.24	0.0238	16.64	0.0323	26.44
4	Platinum	Spot	569	14.25	0.03	36.97	0.06	0.00	0.00	14.25	0.0250	51.22	0.0900	72.18
5	Platinum	Spot	820	21.73	0.03	25.95	0.03	3.91	0.00	25.64	0.0313	51.59	0.0629	50.30
6	Platinum	Comp	583	16.87	0.03	13.34	0.02	3.79	0.01	20.66	0.0354	34.00	0.0583	39.24
7	Platinum	Spot	636	15.79	0.02	14.24	0.02	8.55	0.01	24.34	0.0383	38.58	0.0607	36.91
8	Platinum	Spot	453	7.41	0.02	18.77	0.04	11.08	0.02	18.49	0.0408	37.26	0.0823	50.38
9	Platinum	Spot	800	8.74	0.01	36.14	0.05	23.98	0.03	32.72	0.0409	68.86	0.0861	52.48
10	Platinum	Spot	436	20.32	0.05	8.06	0.02	0.00	0.00	20.32	0.0466	28.38	0.0651	28.40
11	Gold	Spot	540	26.26	0.05	23.50	0.04	0.00	0.00	26.26	0.0486	49.76	0.0921	47.23
12	Never	Spot	307	16.09	0.05	5.62	0.02	0.00	0.00	16.09	0.0524	21.71	0.0707	25.89
13	Never	Spot	240	9.63	0.04	4.74	0.02	3.95	0.02	13.58	0.0566	18.32	0.0763	25.87
14	Gold	Spot	671	25.54	0.04	22.04	0.03	12.48	0.02	38.02	0.0567	60.06	0.0895	36.70
15	Never	Comp	84	4.77	0.06	3.66	0.04	0.00	0.00	4.77	0.0568	8.43	0.1004	43.42
16	Platinum	Comp	815	15.58	0.02	22.89	0.03	34.44	0.04	50.02	0.0614	72.91	0.0895	31.39
17	Platinum	Spot	412	5.58	0.01	4.22	0.01	19.75	0.05	25.33	0.0615	29.55	0.0717	14.28
18	Gold	Spot	417	19.17	0.05	13.37	0.03	6.60	0.02	25.77	0.0618	39.14	0.0939	34.16
19	Never	Comp	710	19.80	0.03	11.16	0.02	26.81	0.04	46.61	0.0656	57.77	0.0814	19.32
20	Platinum	Comp	640	9.08	0.01	31.10	0.05	34.97	0.05	44.05	0.0688	75.15	0.1174	41.38
21	Never	Comp	245	8.74	0.04	7.52	0.03	8.70	0.04	17.44	0.0712	24.96	0.1019	30.13
22	Never	Spot	400	8.55	0.02	14.51	0.04	20.46	0.05	29.01	0.0725	43.52	0.1088	33.34
23	Never	Comp	778	56.45	0.07	13.58	0.02	0.00	0.00	56.45	0.0726	70.03	0.0900	19.39
24	Never	Spot	473	35.74	0.08	12.73	0.03	0.00	0.00	35.74	0.0756	48.47	0.1025	26.26
25	Never	Spot	510	38.98	0.08	30.71	0.06	0.00	0.00	38.98	0.0764	69.69	0.1366	44.07
26	Never	Spot	373	28.87	0.08	10.56	0.03	0.00	0.00	28.87	0.0774	39.43	0.1057	26.78
27	Never	Spot	481	39.44	0.08	18.76	0.04	0.00	0.00	39.44	0.0820	58.20	0.1210	32.23
28	Gold	Spot	580	50.14	0.09	10.15	0.02	0.00	0.00	50.14	0.0864	60.29	0.1039	16.84
29	Gold	Spot	685	60.83	0.09	22.11	0.03	0.00	0.00	60.83	0.0888	82.94	0.1211	26.66
30	Never	Spot	620	55.17	0.09	16.83	0.03	0.00	0.00	55.17	0.0890	72.00	0.1161	23.38
31	Gold	Spot	980	91.85	0.09	49.52	0.05	0.00	0.00	91.85	0.0937	141.37	0.1443	35.03
32	Gold	Spot	226	21.20	0.09	8.36	0.04	0.00	0.00	21.20	0.0938	29.56	0.1308	28.28
33	Never	Spot	592	56.02	0.09	25.65	0.04	0.00	0.00	56.02	0.0946	81.67	0.1380	31.41
34	Never	Spot	320	32.48	0.10	27.66	0.09	0.00	0.00	32.48	0.1015	60.14	0.1879	45.99
35	Never	Spot	265	27.68	0.10	4.54	0.02	0.00	0.00	27.68	0.1045	32.22	0.1216	14.09
36	Never	Spot	212	10.21	0.05	19.73	0.09	13.62	0.06	23.83	0.1124	43.56	0.2055	45.29
37	Never	Spot	301	36.68	0.12	7.03	0.02	0.00	0.00	36.68	0.1219	43.71	0.1452	16.08
38	Never	Spot	441	55.72	0.13	8.55	0.02	0.00	0.00	55.72	0.1263	64.27	0.1457	13.30
39	Never	Spot	602	79.82	0.13	14.00	0.02	0.00	0.00	79.82	0.1326	93.82	0.1558	14.92
40	Never	Spot	322	45.45	0.14	7.50	0.02	0.00	0.00	45.45	0.1411	52.95	0.1644	14.16

4.2 Visual Analysis

4.2.1 Combined Landfill Waste per Student

Figure 1 displays the Combined Landfill Waste per Student of each elementary school listed in Table 1. Each column is colour-coded to show if the school is a Platinum, Gold or Non-EcoSchool.

We see from this graph that Platinum schools generate the lowest amount of combined landfill waste per student waste by a substantial margin.

Gold schools appear to perform slightly better than Non-EcoSchools, though the difference is minimal.

Further analysis of these figures is provided in Section 4.4: Statistical Analysis.

Figure 1 - Combined Landfill Waste / Student - Elementary Schools
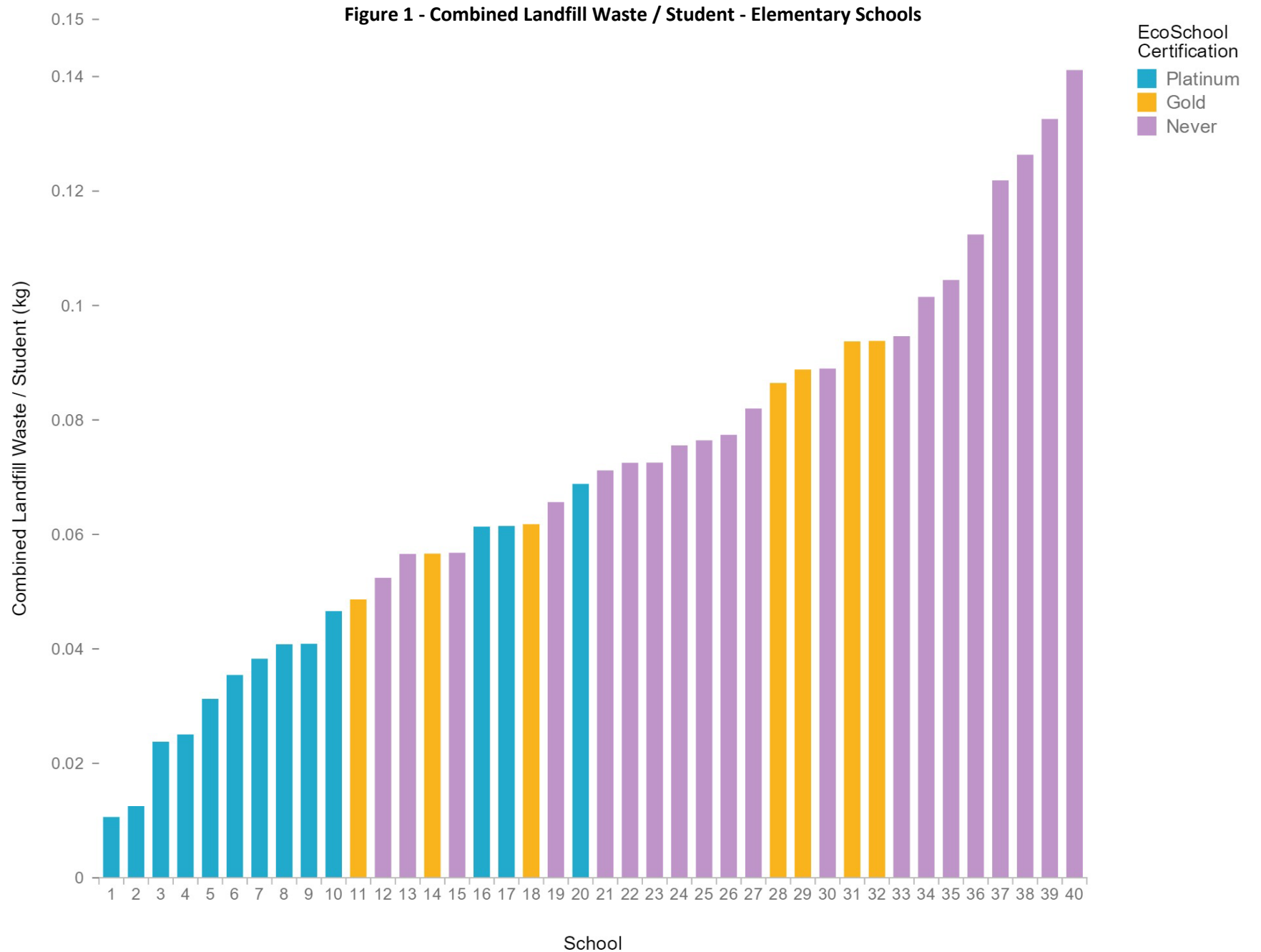
4.2.2 Combined Landfill Waste – Platinum vs. Non-EcoSchools

Figure 2 highlights the difference in Combined Landfill Waste output between Platinum and Non-EcoSchools. As shown in Section 4, this difference is statistically significant.

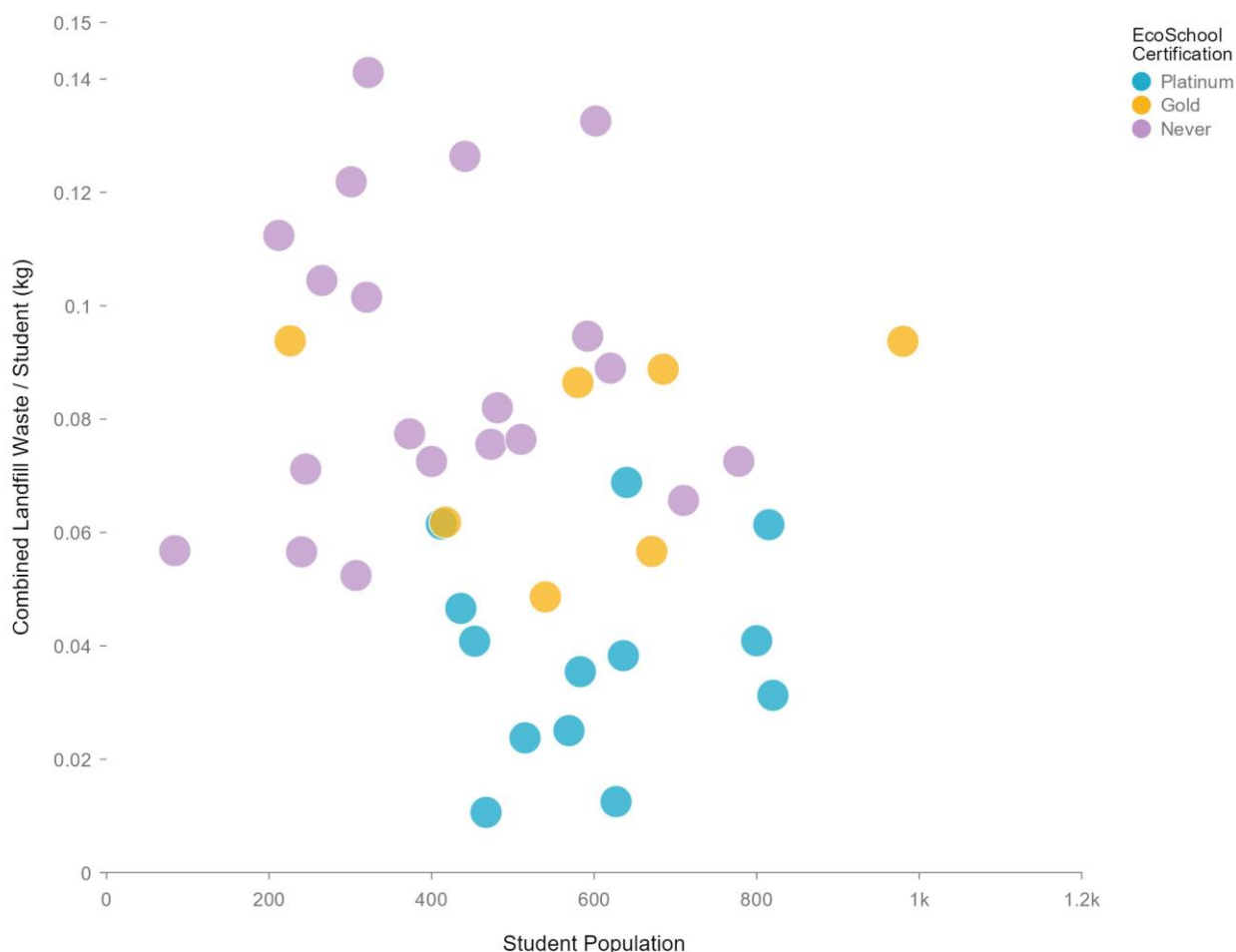**Figure 2 - Combined Landfill Waste / Student – Platinum & Non-EcoSchools**
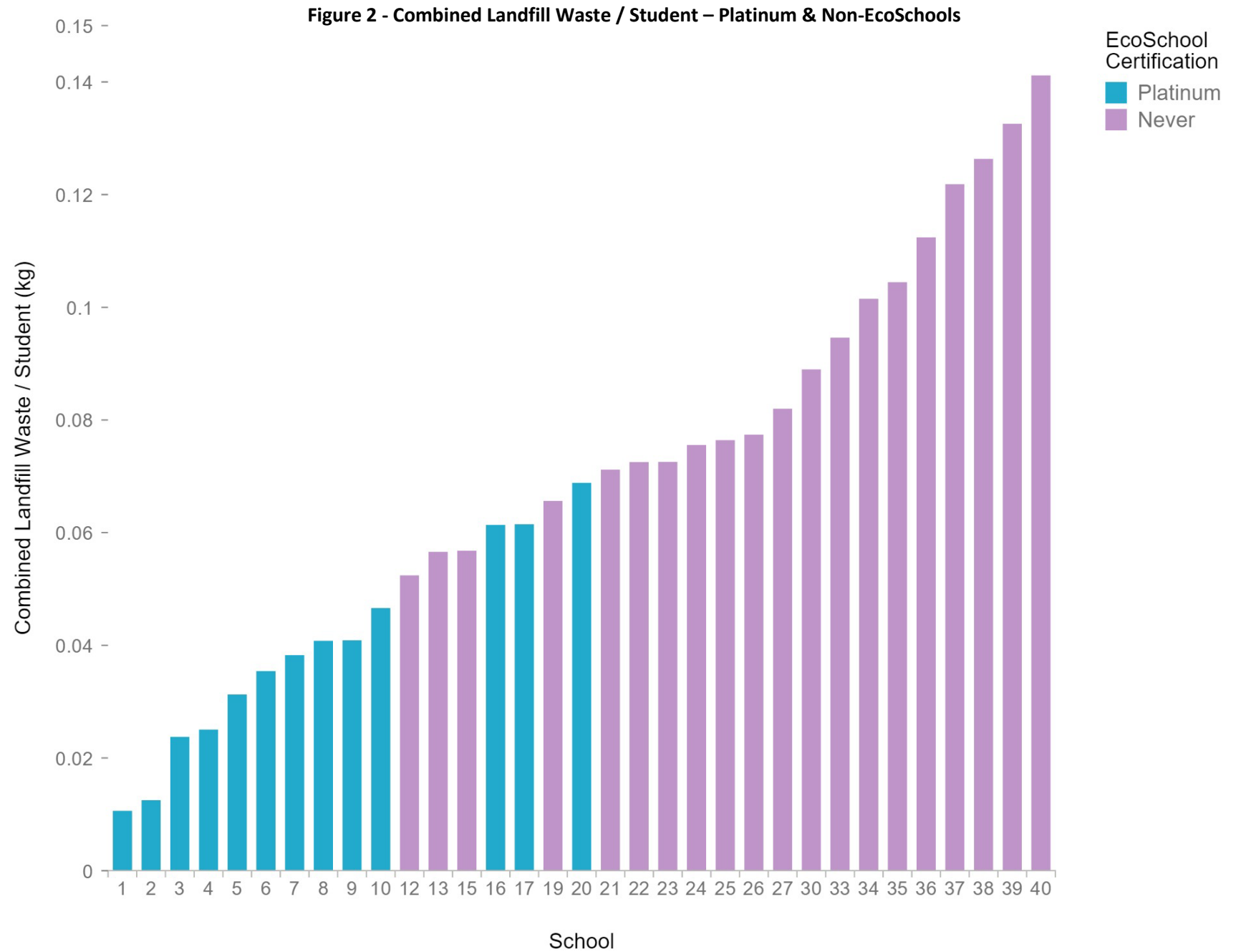
4.3   Correlations

Correlation analysis looks at how closely two sets of variables are related.   A correlation does not mean that one variable *causes* a change in the other; it simply means that we can *predict* the value of one variable based on the value of the other variable.

Correlation analysis is very useful in highlighting trends within a data set. This section examines the correlations between several variables examined in the study.

4.3.1 Population vs. Combined Landfill Waste per Student

Figure 3 plots the elementary schools' Student Populations and their Combined Landfill Waste per Student figures. We see that relative to Non-EcoSchools, the Platinum schools in the study tend to have larger populations yet far smaller waste figures. Regardless of size, Platinum schools generate less waste.

Figure 3 - Population vs. Combined Landfill Waste/Student – Elementary

4.3.2 EcoSchool Certification vs. Combined Landfill Waste per Student

Figure 4 plots Combined Landfill Waste per Student by EcoSchool Certification. Each dot represents one elementary school; its colour corresponds to its EcoSchool certification. We see a clear distinction between certification level (Platinum, Gold, Never) and waste output.

Figure 4 - EcoSchool Certification vs. Combined Landfill Waste/Student
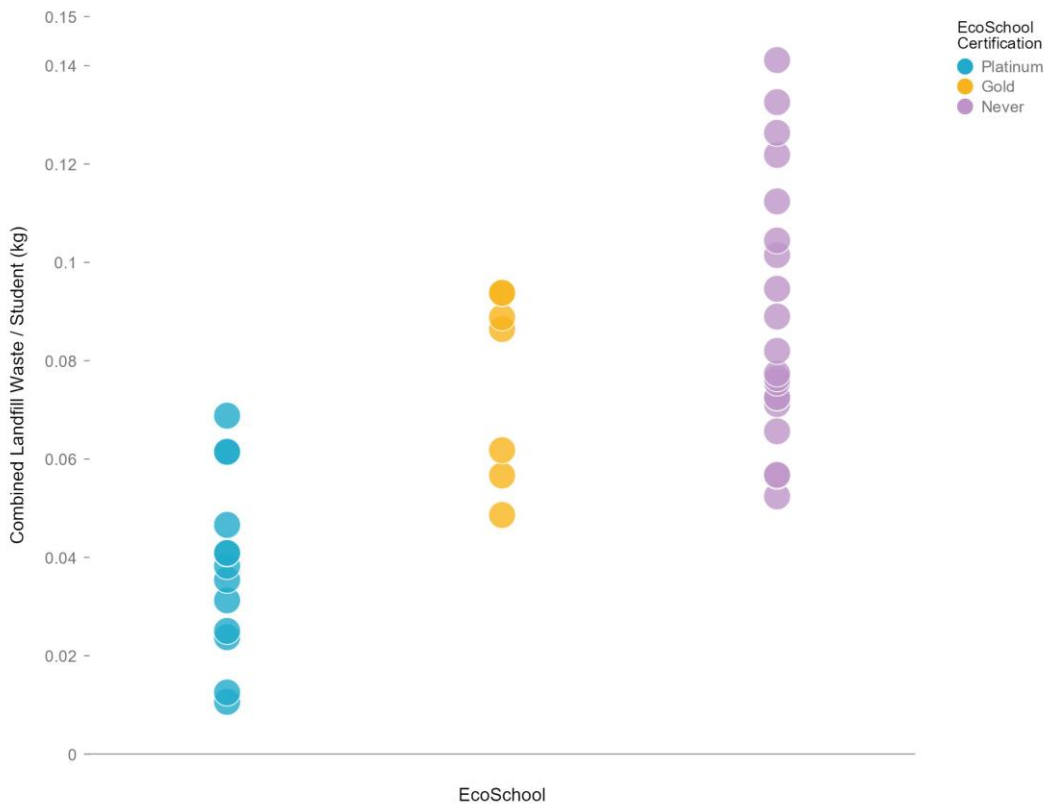
4.3.3 EcoSchool Certification vs. Standardized Diversion Rate

Figure 5 shows the Standardized Diversion Rate for each elementary school. The standardized diversion rate does not take into account any material diverted through "green bins" as not all participants had access to an organics program. We see that standardized diversion rates are fairly similar regardless of EcoSchool certification, meaning that students recycle similar portions of their waste. This suggests that Platinum schools are not generating less landfill waste because of increased recycling; they are simply generating less waste material overall.

Figure 5 - EcoSchool Certification vs. Standardized Diversion Rate - Elementary
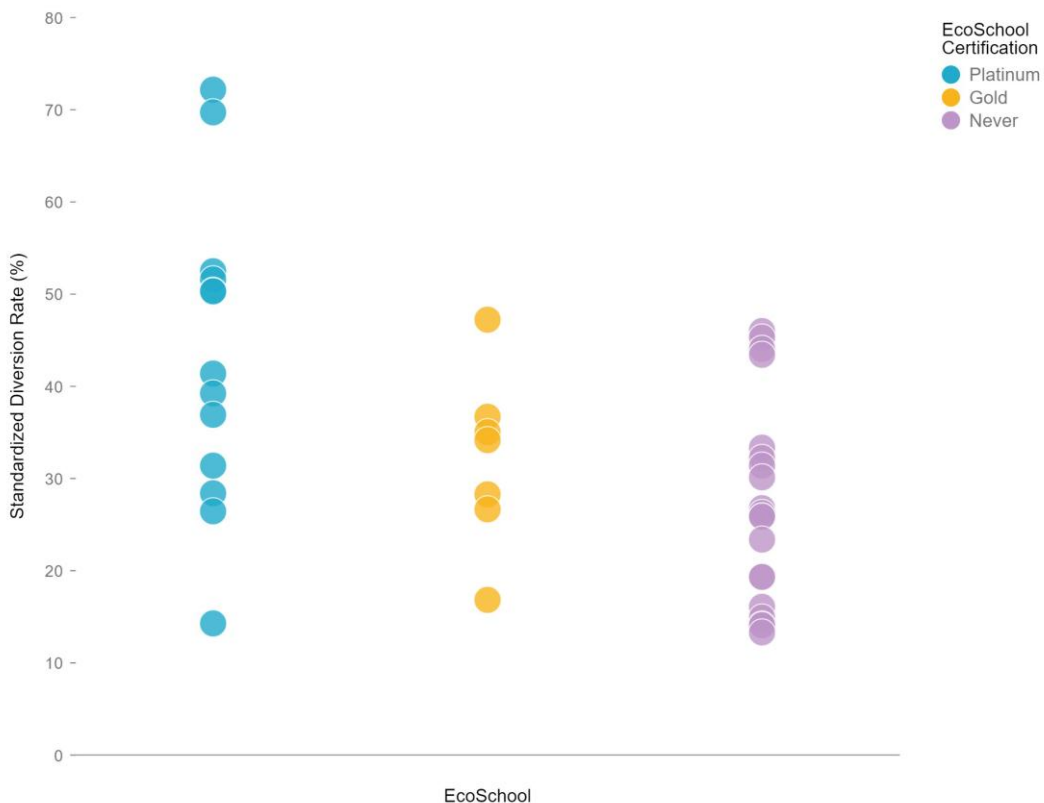
4.3.4 All Waste per Student

As shown previously in Figure 5, Platinum EcoSchools do not have significantly higher standardized diversion rates than other elementary schools. Their success in minimizing their Combined Landfill Waste per Student stems from generating fewer waste materials overall. Figure 6 below shows the All Waste per Student figures.

Figure 6 - All Waste / Student - Elementary
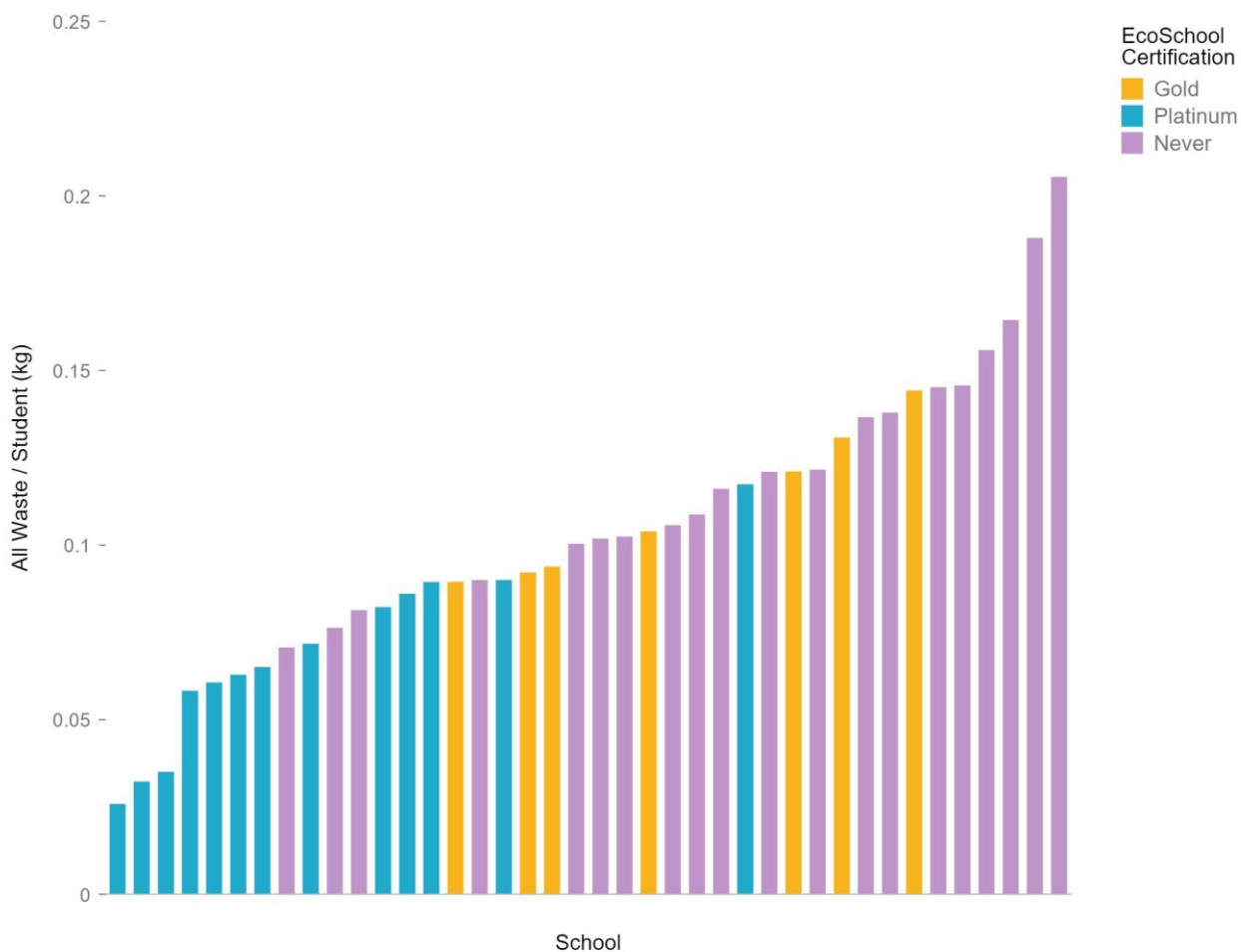
Spotlight: St. Marguerite d'Youville Catholic Elementary School

St. Marguerite d'Youville Catholic Elementary School has been a Platinum EcoSchool for 4 years. The school has 467 students yet generates just 2.5 kg of landfill waste per day!

The school places an emphasis overall waste reduction, seeking to eliminate materials in addition to diverting them. Initiatives taken toward this goal include a campaign to reduce the number of beverage containers brought to school, banning disposable water bottles and encouraging parents to pack lunches in reusable containers. The school also provides a snacks program for students consisting of waste-free foods such as cubes of cheese, baby carrots or crackers.

The school ensures that all students are included in waste management initiatives and learning opportunities. Students are taught proper recycling and waste reduction practices beginning in kindergarten and all students are involved in school wide photos with environmental themes.


Waste reduction has brought many benefits, from decreased waste handling required of facility staff to being named "Greenest School in Canada" by the Canadian Green Building Council in 2015.

4.3.4 Combined Landfill Waste per Student vs. Standardized Diversion Rate

Figure 7 plots each elementary school's Combined Landfill Waste per Student and Standardized Diversion Rate. The size of each plot corresponds to the student population and the colour represents the EcoSchool Certification. We see that Platinum schools generally have lower Combined Landfill Waste numbers and slightly higher Standardized Diversion Rates, meaning they tend to produce less waste and recycle more.

Figure 7 - Combined Landfill Waste / Student vs. Standardized Diversion Rate - Elementary
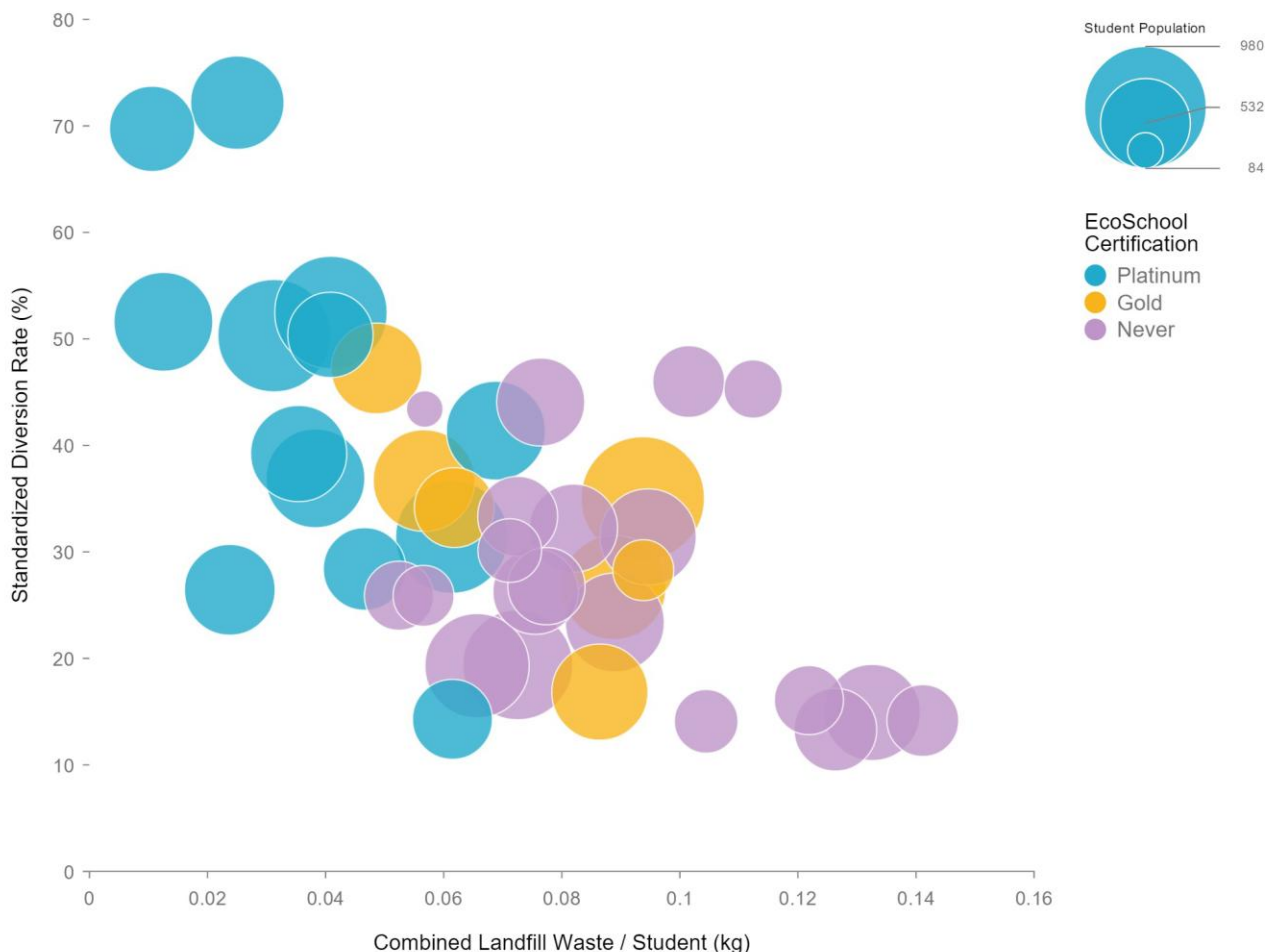
4.4 Statistical Analysis

Statistics is an incredibly useful form of analysis used in research. One of the most commonly used applications of statistics is determining the *significance* of a result.

Once data has been collected and the results calculated, statistical analysis tells us how confident we can be in saying these results did not simply happen by chance.   The particular methodology used to test the significance of this study's results is called the T-test for Equality of Means.

This test will determine if the differences observed in the waste outputs between elementary EcoSchools and elementary Non-EcoSchools are representative of an actual difference in waste generation and not merely a result of chance.

 The most important figure in the results of the T-tests shown below is the Two-Tailed Significance value (Sig. 2-Tail). If this value is less than 0.05, then the results are considered significant and not likely a result of chance.

4.4.1 Combined Landfill Waste per Student – Platinum vs. Non-EcoSchools

The results of this T-test show a significance value of less than 0.05, meaning that there is a statistically significant difference between the means of the elementary Platinum and Non-EcoSchools. Platinum EcoSchool students on average produce 57% less combined landfill waste than Non-EcoSchool students.

Table 2 - Combined Landfill Waste per Student - Platinum vs Non-EcoSchools

	Mean	*sd*	*N*	*t*	*df*	*Sig.(2-Tail)*
Platinum	0.0382	0.0182	13	-6.037	31	0.000001
Non-EcoSchools	0.0891	0.0266	20			

4.4.2 All Waste per Student – Platinum vs. Non-EcoSchools

Similar to the results above, this result shows that there is a statistically significant difference between the mean All Waste per Student output of elementary Platinum and Non-EcoSchools.

Table 3 - All Waste per Student - Platinum vs Non-EcoSchools

	Mean	*sd*	*N*	*t*	*df*	*Sig.(2-Tail)*
Platinum	0.0675	0.0262	13	-4.834	31	0.00003
Non-EcoSchools	0.1238	0.0362	20			

4.4.3 Gold vs. Non-EcoSchools

No statistically significant differences were found between the mean Combined Landfill Waste per Student or the mean All Waste per Student of elementary Gold and Non-EcoSchools.

Table 4 - Combined Landfill Waste per Student - Gold vs Non-EcoSchools

	Mean	*sd*	*N*	*t*	*df*	*Sig.(2-Tail)*
Gold	0.0757	0.0193	7	-1.224	25	0.232
Non-EcoSchools	0.0891	0.0266	20			

Table 5 - All Waste per Student - Gold vs. Non-EcoSchools

	Mean	*sd*	*N*	*t*	*df*	*Sig.(2-Tail)*
Gold	0.1108	0.0214	7	-0.889	25	0.383
Non-EcoSchools	0.1238	0.0362	20			

4.5 Waste Composition Data

Nine of the elementary schools received comprehensive waste audits where all materials were sorted, categorized and weighed. This section shows the composition of the landfill and recycling waste streams of these schools.

4.5.1 Combined Landfill Waste Composition

Figure 8 shows the combined landfill waste generated by each school and separates its components into Organic, Recyclable and Non-Divertible materials. We see that organic materials such as food waste make up a large portion of the combined landfill waste stream in all schools.

Table 6 shows the percentages of the percentages of the three types of material in the Combined Landfill Waste Stream.

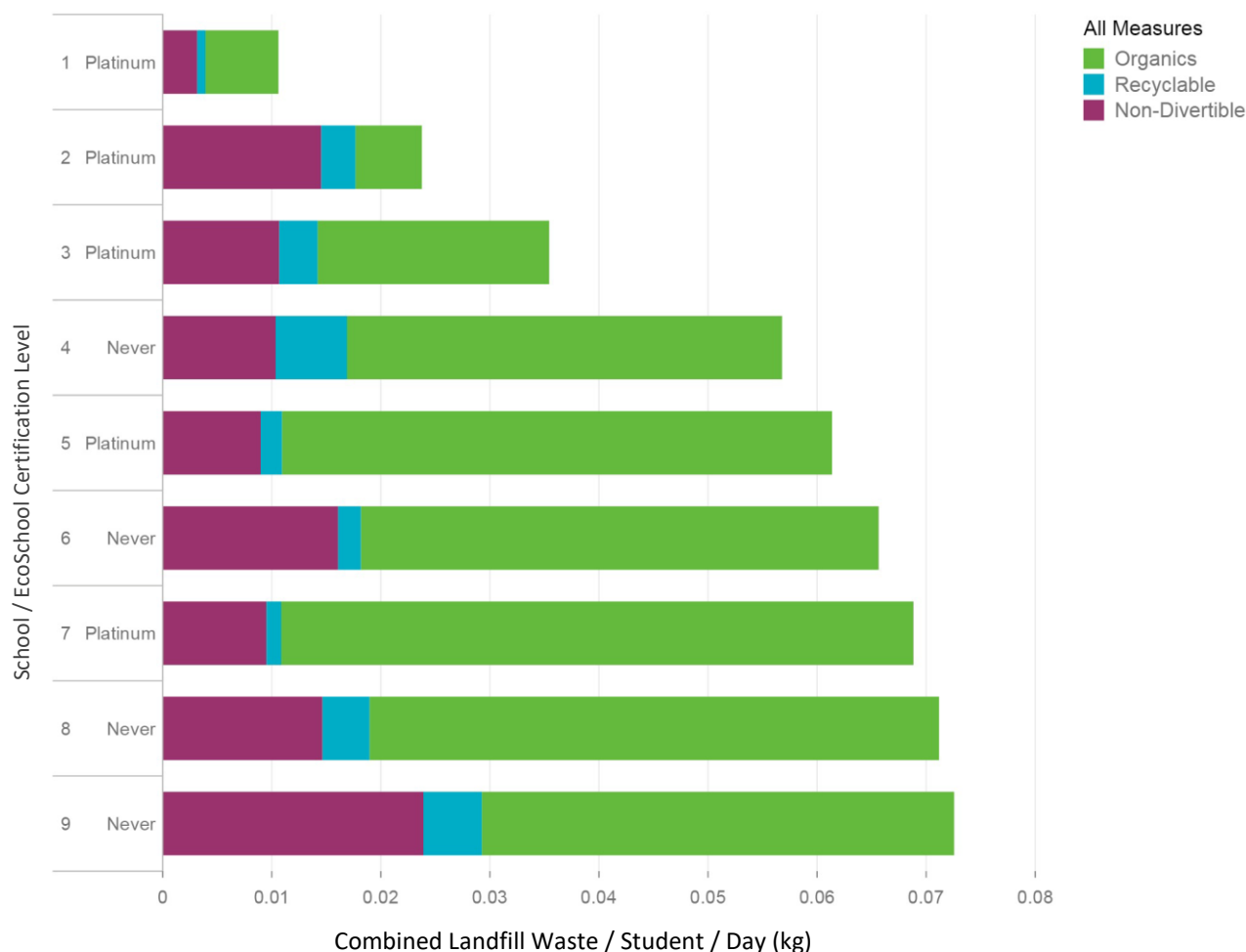**Figure 8 – Combined Landfill Waste Composition - Elementary**

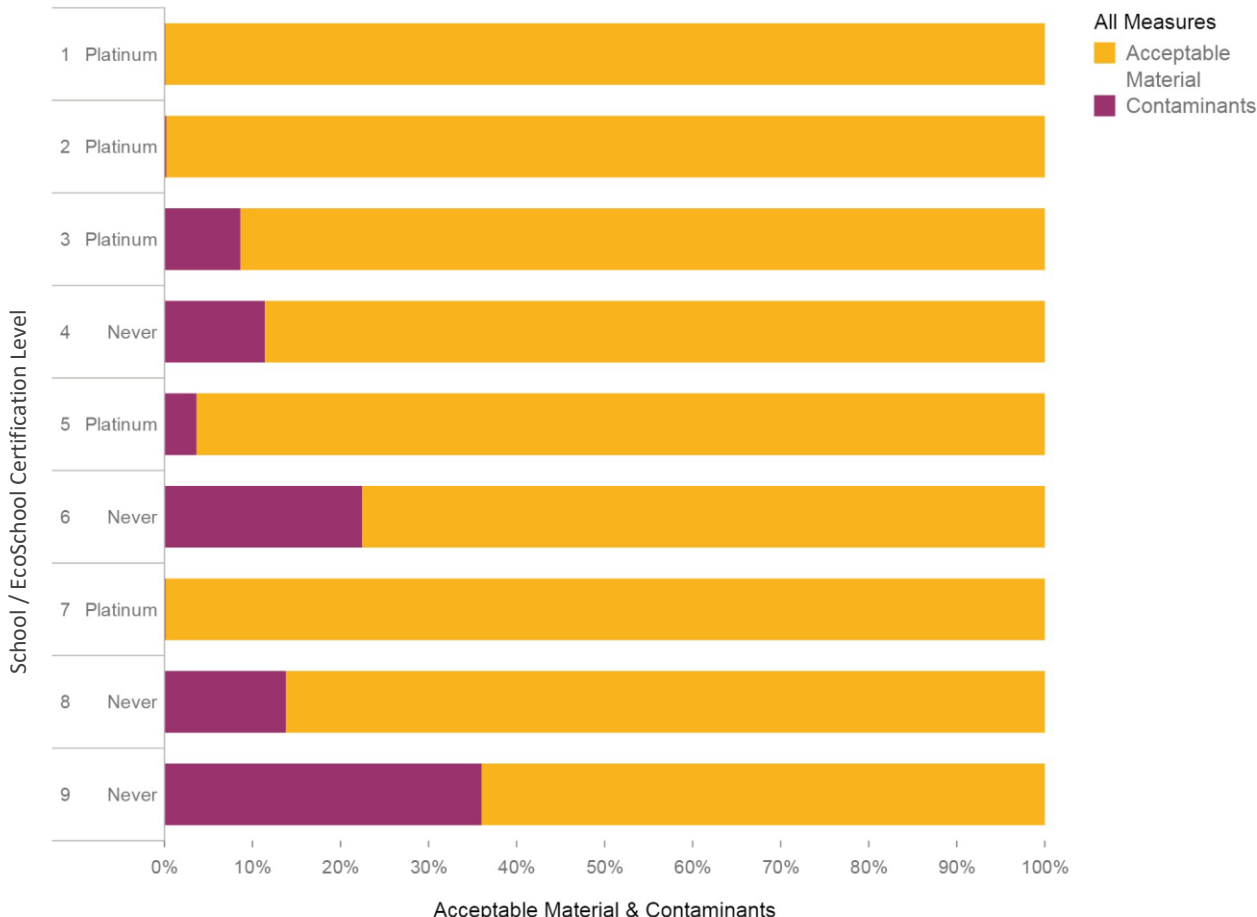**Table 6 - Combined Landfill Waste Composition**

School	EcoSchool Certification	Population	Combined Landfill Waste (kg)	Combined Landfill Waste / Student (kg)	% Recyclable	% Organic	% Non-Divertible
1	Platinum	467	4.96	0.0106	7.06	63.10	29.84
2	Platinum	515	12.24	0.0238	13.24	25.57	61.19
3	Platinum	583	20.66	0.0354	9.97	59.87	30.15
4	Never	84	4.77	0.0568	11.53	70.23	18.24
5	Platinum	815	50.02	0.0614	3.20	82.15	14.66
6	Never	710	46.61	0.0656	3.18	72.30	24.52
7	Platinum	640	44.05	0.0688	1.98	84.20	13.83
8	Never	245	17.44	0.0712	6.08	73.34	20.58
9	Never	778	56.45	0.0726	7.40	59.65	32.95

4.5.2 Recycling Stream Composition

The recycling stream of the elementary schools was assessed for levels of contamination. Contaminants are materials that are not acceptable in the recycling program and commonly consist of food waste and its packaging. Figure 9 shows the level of contamination in the recycling streams of all nine elementary schools.

Note: The schools are in the same order as in Figure 8 on the previous page.

Figure 9 - Recycling Stream Composition - Elementary

5| SECONDARY SCHOOLS

5.1 Data Overview

Table 7 on the following page shows the data collected from nine secondary schools. Only one Platinum secondary school participated in this study as the number of these schools in southern Ontario is limited.

Table 7 - Secondary School Data - Spring/Fall 2016

| School	EcoSchool Certification	Audit Type	Student Population	Landfill Waste (kg)	Landfill Waste / Student (kg)	Recycling (kg)	Recycling / Student (kg)	Organics (kg)	Organics / Student (kg)	Combined Landfill Waste (kg)	Combined Landfill Waste / Student (kg)	All Waste (kg)	All Waste / Student (kg)	Standardized Diversion Rate (%)
1	Platinum	Comp	914	23.95	0.0262	13.65	0.0149	10.54	0.0115	34.49	0.0377	48.14	0.0527	28.36
2	Gold	Spot	400	24.04	0.0601	10.96	0.0274	0	0	24.04	0.0601	35.00	0.0875	31.32
3	Gold	Spot	689	44.89	0.0652	13.87	0.0201	0	0	44.89	0.0652	58.76	0.0853	23.60
4	Gold	Spot	1500	100.72	0.0671	67.15	0.0448	0	0	100.72	0.0671	167.87	0.1119	40.00
5	Gold	Spot	1558	109.11	0.0700	23.13	0.0148	0	0	109.11	0.0700	132.24	0.0849	17.49
6	Never	Spot	728	53.81	0.0739	45.04	0.0619	0	0	53.81	0.0739	98.85	0.1358	45.57
7	Never	Spot	1032	81.29	0.0788	14.42	0.0140	0	0	81.29	0.0788	95.72	0.0927	15.07
8	Never	Spot	600	77.34	0.1289	11.80	0.0197	0	0	77.34	0.1289	89.14	0.1486	13.24
9	Never	Spot	801	108.75	0.1358	11.54	0.0144	0	0	108.75	0.1358	120.30	0.1502	9.60

5.2   Analysis

This section provides visual and correlation analysis of the secondary school data presented in Table 6. While statistical significance wasn't observed, the visual analysis shown in these graphs suggests that Platinum and Gold EcoSchools outperform Non-EcoSchools in terms of Combined Landfill and All Waste output.

5.2.1   Combined Landfill Waste / Student

Figure 10 shows the Combined Landfill Waste per Student and EcoSchool certification of each secondary school. The Gold and Platinum schools outperform the Non-EcoSchools.

Figure 10 - Combined Landfill Waste per Student - Secondary
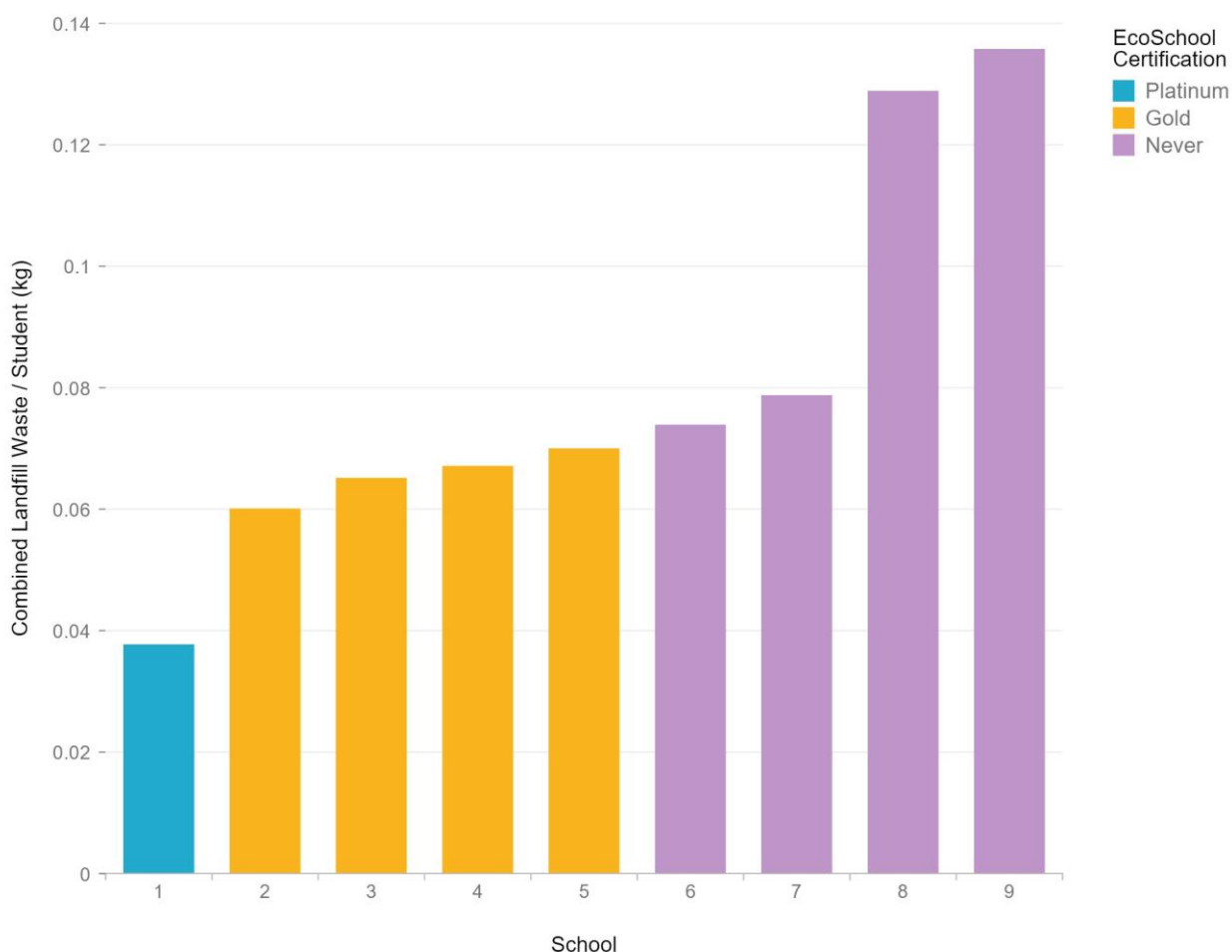
Spotlight: Francis Libermann Catholic High School

Francis Liebermann Catholic High School is a Platinum EcoSchool and the highest performing secondary school in this study. The school has an active student-run EcoTeam that hosts waste reduction and diversion initiatives among its other projects.

Contamination rates of recycling and organics bins in particular were targeted using "Put Waste in its Place" program, aimed at increasing awareness of proper waste disposal practices. The EcoTeam promoted this campaign using school announcements, bulletin boards and social media, and student leaders stood next to waste containers to ensure waste items were disposed of correctly.

The effect of such education initiatives can be seen in Francis Libermann's impressively low contamination rates for both its recycling and organics streams.

Crucial to the school's success has been the active support of teaching and administrative staff who celebrate students' environmental achievements and promote EcoTeam initiatives.

5.2.2 All Waste / Student

Figure 11 shows the total waste per student generated at each secondary school. Platinum and Gold schools generally produced less All Waste per Student than the Non-EcoSchools.

Figure 11 - All Waste / Student - Secondary Schools
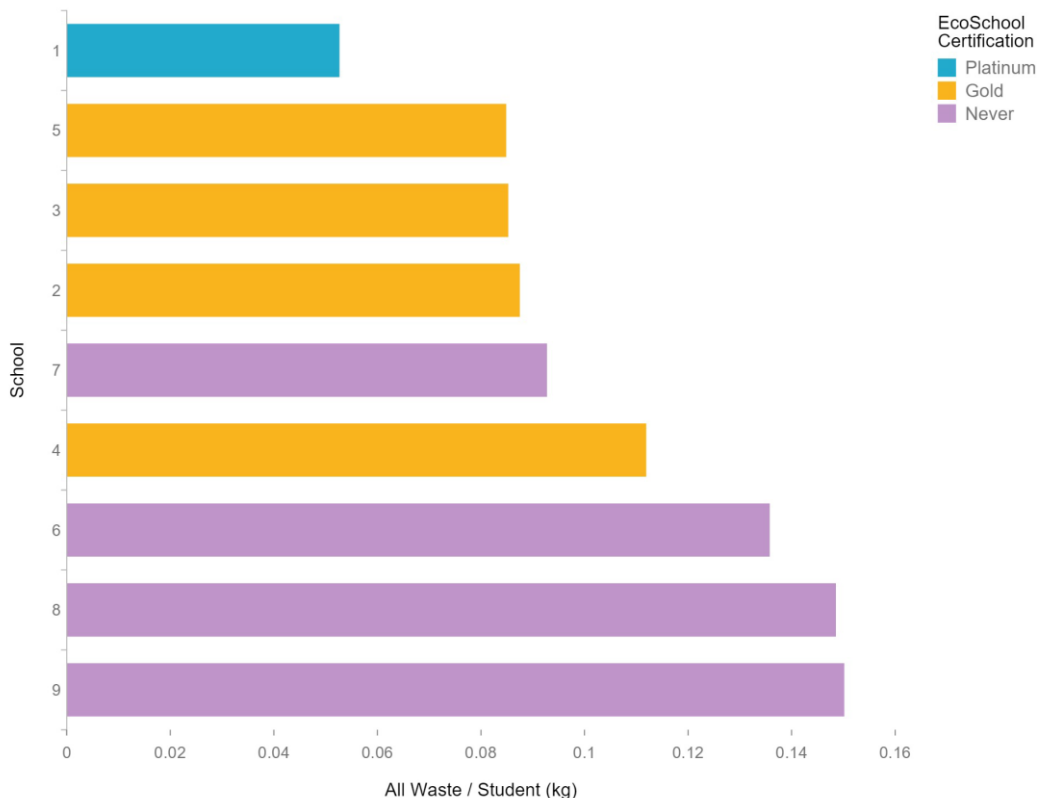
5.2.3 Combined Landfill Waste per Student vs. Standardized Diversion Rate

Figure 12 plots each secondary school's Combined Landfill Waste per Student and its Standardize Diversion Rate while showing its population and EcoSchool Certification. The Platinum and Gold Schools appear to have higher diversion rates than the Non-EcoSchools.

Figure 12 - Combined Landfill Waste / Student vs. Standardized Diversion Rate - Secondary
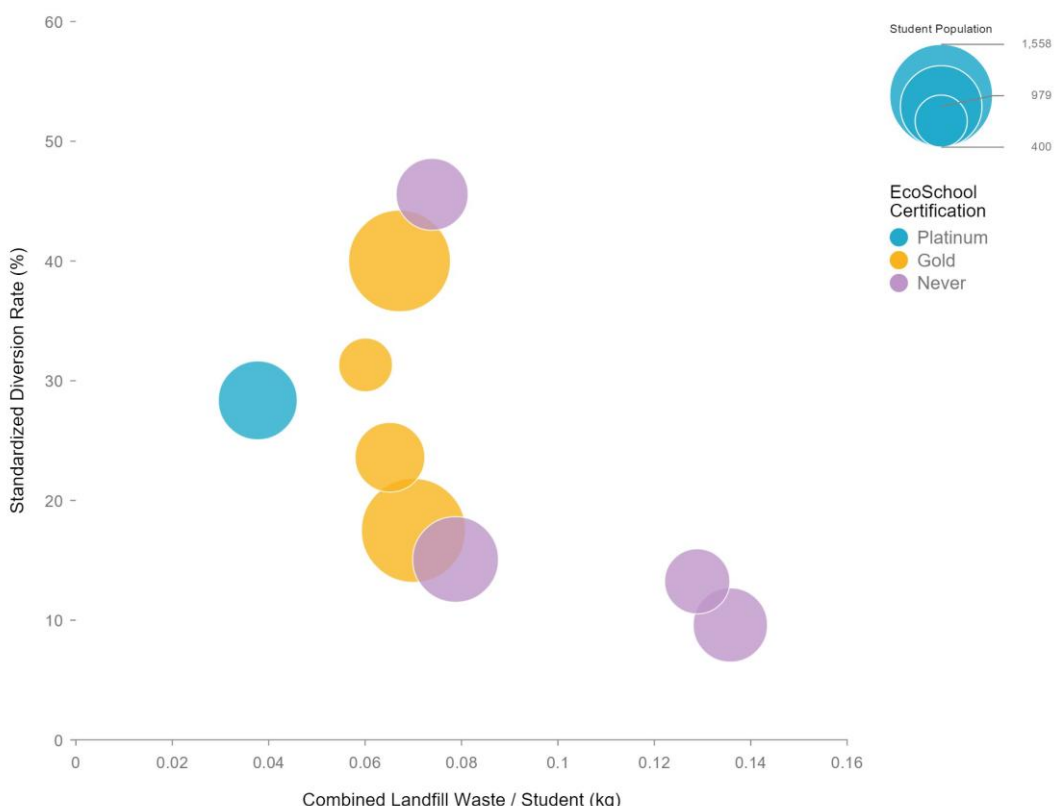
6 | SUMMARY & DISCUSSION

6.1 Data Findings

The major findings gathered through the study are:

1. There is a statistically significant difference between the Combined Landfill and All Waste output per student of elementary Platinum and Non-EcoSchools.

2. Secondary Gold and Platinum EcoSchools outperformed secondary Non-EcoSchools in terms of Combined Landfill and All Waste per student.

6.2 Influential Factors

Observations made during the study identified the following factors as key to the success of waste minimization and diversion programs.

Teacher Involvement

The Platinum EcoSchools had at least one teacher who took a leadership role in establishing a culture of environmental awareness at their school. These teachers were often the leaders of their EcoTeams and invested time and energy into the team's environmental projects and campaigns.

Administrative Support

Key to the implementation and success of the EcoSchool Program was active support from the school's principal. Administrators had a great degree of influence over whether staff and students were afforded the resources and flexibility to actively promote waste reduction and diversion initiatives.

Board Level Engagement

Certain school boards outperformed others. The high performing boards often conducted regular waste audits and had engaged environmental coordinators employed at the board level. The level of priority for waste management established at the board level directly informed the level of priority set by the individual schools.

7 | CONCLUSION

The Ontario EcoSchools Waste Comparison Study has compiled detailed waste information from various schools across southern Ontario. This data has yielded valuable data, observations and insights on waste generation and composition trends and the factors that contribute to effective waste management strategies.

The study has statistically shown that Platinum EcoSchools generate significantly less Combined Landfill Waste per Student and All Waste per Student than Non-EcoSchools. Platinum and Gold EcoSchools also outperformed Non-EcoSchools among the secondary schools in this study. We see a clear relationship between dedicated participation in the Ontario EcoSchools program and a consistent improvement in waste management metrics. We hope the information provided in this report inspires schools to strive for continued improvements in their waste reduction and diversion programs, such as through certification with Ontario EcoSchools.

8 | ACKNOWLEDGEMENTS

Ontario EcoSchools and Immacutec Systems Technologies Inc. would like to sincerely thank the following school boards for their help and participation in this study:

<div align="center">

District School Board of Niagara (DSBN)   Near North District School Board (NNDSB)

Durham District School Board (DDSB)   Peel District School Board (PDSB)

Halton Catholic District School Board (HCDSB)   Simcoe County District School Board (SCDSB)

Halton District School Board (HDSB)   Thames Valley District School Board (TVDSB)

Hamilton-Wentworth Catholic District School Board (HWCDSB)   Toronto Catholic District School Board (TCDSB)

York Catholic District School Board (YCDSB)

</div>

We would like to further thank the following schools for their participation in the study:

Elementary Schools	McCaskill's Mills PS (DDSB)	St. Marguerite d'Youville CES (HWCDSB)
Allendale Heights PS (SCDSB)	Michaelle Jean PS (DDSB)	St. Mary ES (HCDSB)
Briarwood PS (PDSB)	Montclair PS (HDSB)	Tom Thomson PS (HDSB)
Britannia PS (PDSB)	Our Lady of Fatima ES (HCDSB)	Twenty Valley PS (DSBN)
Connaught PS (DSBN)	Our Lady of Peace ES (HCDSB)	Westfield PS (TVDSB)
Credit View PS (PDSB)	Parry Sound PS (NNDSB)	Woodcrest PS (DDSB)
David Bouchard PS (DDSB)	River Oaks PS (HDSB)	Woodland Heights PS (TVDSB)
Derry West Village PS (PDSB)	Ross Drive PS (PDSB)	**Secondary Schools**
East Oxford PS (TVDSB)	Ryerson PS (TVDSB)	Francis Libermann CHS (TCDSB)
Elgin Court PS (TVDSB)	Sacred Heart CS (TCDSB)	Gordon Graydon Memorial SS (PDSB)
Emily Carr PS (HDSB)	SouthFields Village PS (PDSB)	Huron Park SS (TVDSB)
Heritage Glen PS (HDSB)	St. Cecilia CES (YCDSB)	Parry Sound HS (NNDSB)
Immaculate Conception CES (YCDSB)	St. Cecilia CS (TCDSB)	Ridgeway HS (DSBN)
Jack Miner PS (DDSB)	St. Edmund Campion CS (TCDSB)	Saunders SS (TVDSB)
John Wise PS (TVDSB)	St. Richard CS (TCDSB)	Sir Wilfred Laurier SS (TVDSB)
Lakewoods PS (DDSB)	St. Wilfrid CS (TCDSB)	St. Catharine's Collegiate (DSBN)
Maple Ridge PS (DDSB)	St. James ES (HCDSB)	St. Maximilian Kolbe CHS (YCDSB)
Mapleview Heights (SCDSB)	St. John Paul II ES (HCDSB)	

For more information, please contact:

Tania Cheng
Associate Director, Ontario EcoSchools
tcheng@ontarioecoschools.org
416-642-5774 x5