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Site-Level Rubbish Collection, Waste Patterns and the Implications for Company Practice

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Abstract

This paper details the data, observations, and lessons learned from rubbish removal on a 29-hectare site. The project commenced in 2024 following the observation of litter in waterways and fields. Over the subsequent two years, I undertook removal efforts and systematically collected relevant data. Although these efforts focus on a small site, they provide valuable lessons that can help shape how sustained eco-friendly practices and change can be implemented in different companies.

Keywords

Rubbish, New Zealand, Data, Plastics, Microplastics, Eco-Friendly Policy, Company Policy

1. Methods

1.1. Number of Collection Events

There was a total of 40 collection events from the 16th of April 2024 to the 21st of May 2026.

1.2. Collection Frequency

The number of collections varied from month to month due to related work factors that prevented me from collecting for longer or handling a greater volume of rubbish. As shown in Table 1, the frequency of collections decreased each year due to these exact factors.

1.3. How Were Individual Pieces Collected and Weighed

At the end of every collection, each bag was weighed on a large scale used for other items. Each bag could hold up to 10 kg of rubbish, compressed and placed inside.

Depending on whether there are larger pieces of rubbish or the water has increased in weight. With more lightweight pieces in the bag, like pots, this would decrease to 5 kg.

Table 1. Collection frequency per year.

2024	Number	2025	Number	2026	Number
Apr.	2	Feb.	2	Jan.	1
May	2	Mar.	2	Apr.	4
Jun.	5	Apr.	2	May	2
Jul.	3	Jun.	1	**Total**	**7**
Aug.	2	Jul.	1		
Sep.	2	Sep.	2		
Oct.	1	Oct.	3		
Nov.	1	Nov.	1		
Dec.	1	**Total**	**14**		
Total	**19**				

This is sourced from [1].

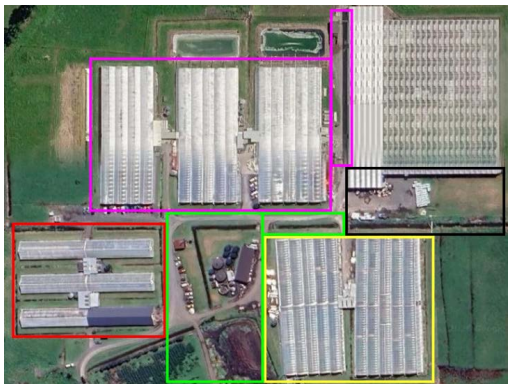
1.4. How Many Individual Pieces Were Collected

Although no exact piece count was available, on average, 250 to 500 pieces were collected per collection, rising to more than 1000 for the larger cleanups. Much of the rubbish, including pots, small plastic items, and plastic sleeves, is smaller than 30 cm in both diameter and length. This leads to a greater number collected despite a smaller increase in weight. The total number ranges from 10,000 to 20,000.

1.5. Area Covered in Each Cleanup

The map below breaks down the site and the different zones that helped to track where the rubbish in these collections was removed more accurately..

As shown in Figure 1, this is a screenshot from Google Maps showing the site location and the designated highlighted zones.



Key: Red: Zone 1, Purple: Zone 2, Green: Zone 3, Yellow: Zone 4, Black: Zone 5.

Figure 1. Screenshot from Google Maps showing the site location and highlighted zones.

1.6. Dates, Zones and the Amount Collected Each Time

See Table 2.

Table 2. List of every collection to date, its location and weight.

Date (2024)	Zone	Amount (Kg)
19/04	4	75
23/04	1, 3	50
02/05	2, 3	50
14/05	1, 2, 3	15
17/05	3, 5	15
31/05	1, 2, 5	35
04/06	2, 5	40
06/06	5	20
18/06	2, 3, 4	50
28/06	1, 3	60
02/07	2, 5	35
08/07	5	20
16/07	5	10
01/08	1, 4, 5	50
20/08	3, 5	10
03/09	5	15
06/09	1, 2, 3, 5	30
03/10	1, 2, 5	140
22/11	2, 5	70
06/12	2, 3, 5	55
Total	--	**845 kg**
Date (2025)	**Zone**	**Amount (Kg)**
20/02	5	30
24/02	5	45
27/03	3, 5	55
30/03	1, 3	20
16/06	3	100
06/07	3	5
19/09	4, 5	70
27/09	5	40
05/10	5	5

Continued

24/10	5	45
31/10	3, 5	20
22/11	5	15
28/11	3, 5	20
Total	--	**470 kg**
Date (2026)	**Zone**	**Amount (Kg)**
09/01	3	35
09/04	3	65
10/04	3	35
17/04	3	55
30/04	4, 5	20
02/05	5	10
21/05	5	5
Total	**--**	**225 kg**

This is sourced from [1].

2. Statistical Data

- The uncertainty measure for this total value of 1.54 tonnes is **0.05 tonnes**.

The absolute uncertainty measure is the margin of error in a measurement expressed in the same units as the measurement itself. Since my example is 1.5, the uncertainty lies in the last decimal place. The standard convention is typically ±0.1 tonnes. Half this, gives ±0.05 tonnes.

- The calculated confidence interval is 38.7 ± 0.0434.

(38.7 ± 1.9600 × 27.5 divided by 1,540,000 = 38.7 ± 0.0434) [2].

- The standard deviation is $\sigma = 27.5$.

(Count, N: 40, Sum, Σx: 1540, Mean, μ: 38.5, Variance σ^2: 756.5) [3]. The square root of 756.5 is 27.5.

- The standard error of the mean is 4.3481.

(SE) is 27.5 divided by the square root of 40 (6.324) = 4.3481 [4].

Due to not setting the significance level (α) before starting this, I cannot determine the p-value.

3. Relevant Data about the Type of Land

All these cleanups have taken place on a 29-hectare piece of land, consisting mostly of fields, greenhouses, and small streams that run through the highlighted areas, operated by one of the largest agricultural companies in the country. As a result, the rubbish at this site reflects the products used.

Features of the Land

Located in West Auckland, it has little variation in height, with most fields flat

and little tree cover or natural barriers to break the wind and shift rubbish across the land. A series of connected streams running through the site swell in size during heavy flooding. Rubbish gets picked up, then scattered or embedded into the sides of the stream. Sleeves, especially, have become discoloured, proving they have been there for months at a time if not removed right away.

4. Frequency in the Type of Rubbish Collected

All collected rubbish can be organised into specific categories (see Table 3).

Table 3. Frequency of each category of rubbish collected.

Type	Amount	Percentage
Pots	40	100%
Sleeves	31	77.5%
Polystyrene	18	45%
Bags	9	22.5%
Drink Cans	1	2.5%
Tags	7	17.5%
Cardboard	13	32.5%
Straps	3	7.5%
PVC Pipes	2	5%
Plastics	39	97.5%

This is sourced from [1].

5. Trends and Limitations with This Data

Undoubtedly, because the cleanup was undertaken by a single person (me) the entire time, the amount collected and how often it was collected were never standardised as they should have been. Data collection was established when the collection began, but I missed collecting additional information.

- Specifically, once the wrapping plastic broke down enough into near microplastics, it became impossible to remove it with the tools I had. Leaving behind the worst form of plastic that animals could have ingested, been carried downstream or buried beneath the grass.
- The site layout had a clear impact on moving the lighter pieces out of the bins, from the grass or along the road, and into the water.

6. What Steps the Business Took to Improve Rubbish Pollution

The business reviewed the rubbish processes onsite, reduced reliance on the open 9m skip bins, and moved to covered 3-metre skip bins stored inside and across the site.

This was an important step to prevent rubbish from being removed from the exposed larger skip bins via wind and stormy weather. Thus, reducing the total number of pieces and total weight of rubbish that could be collected.

The business moved away from extra plastic "infinity" bins to reduce the volume of plastic used and going into landfill and the environment.

Reduction in the volume of plastic was a positive step to prevent the worst type of rubbish, plastic, entering both the streams and land, which easily broke down into smaller pieces, making it harder to collect.

The business has introduced processes in waste disposal to record plastic waste in the packing facility to look at the volume of plastic being disposed of and has seen a significant drop in the level of plastic waste as a result.

Having the ability to collect data and validate it in every part of the business, including this, ensures there is a complete picture from beginning to end, allowing for a more precise and accurate response. For this example, seeing exactly where it all went paved the way for the next steps to enable the difference to be made.

The business introduced the recycling of the plastic chemical containers, which otherwise would have gone straight to landfill.

Examples include chemical containers like Wuxal Calcium, Eco-oil, and Wuxal Magnesium containers, which were taken to Helensville Community Recycling Centre, enabling them to be reused and reducing the total volume sent to landfill.

The business supported a "rubbish quiz" at the end-of-year function to reinforce the value and importance of the work completed while undertaking this research, as well as the positive environment and business outcome.

This helped make employees aware of and familiar with the steps Superbherb was taking to reduce the negative impacts of rubbish on the environment.

The business moved to producing several crops (Basil, Coriander, etc.) in long-life trays over short-life pots with plans to expand as crops allow.

Pots have been recorded as one of the most common items found within the work site streams and land, so this alternative prevents larger volumes of pots entering the environment both onsite and in landfills.

Outcome

The changes Superbherb have made demonstrate that, through a focus on and support for how our business impacts the environment, changes can lead to a positive environment and business outcome.

Progress has been made since these changes were implemented throughout the business. Data, understanding, and validating each process, the resources it takes and where they go provided are invaluable.

7. Lessons Learned That Can Be Introduced into Other Companies

Clearly defined, site-wide targets and achievable goals related to eco-friendly practices, cleanup efforts, or reductions in harmful impacts on the surrounding environment.

To be effective, the company must, in the beginning, discuss, outline, and write into its policy achievable goals that can lessen its immediate impact on the site it occupies. For example, this might involve initiating weekly site-wide cleanups across the team or achieving a complete reduction in waste sent to landfill (by investing in alternatives that recycle or prevent long-term environmental harm). Often, they can vary in cost, time, and implementation difficulty, but if this can be put in place, it creates a foundation for implementing the rest of these points as well. Effort without an endpoint can create change, but it is not a sustainable way to operate in the long term.

Clearly defined implementation of environmental regulations

Firstly, environmental regulations within the company should strike a balance between maintaining process efficiency and actively preventing and protecting the on-site ecosystem. Prevention in the form of investing in plastic alternatives, clean energy and more sustainable raw materials, if possible. Any redundancy within current frameworks could lead to missed opportunities or further environmental harm, simply because it is not fully fleshed out for every scenario.

Eco-friendly policy

Perhaps the most vital for sustained difference is the company's actual policy and view on the importance of their actions and their impact on their site and in the local community. An example is Spark NZ with its environmental policy. This includes committing to complying with regulations, reduce greenhouse gas emissions, use natural resources efficiently, engage employees to empower environmentally responsible choices, and adapt technological models to ad-dress environmental issues [5]. At the same time, policy without implementation is essentially pointless, so strict enforcement across the entire company is essential.

Eco-friendly infrastructure

Such infrastructure can include company-funded transport services to shuttle employees to and from designated areas. Standardising recycling stations, bins and drop-off locations across the site. Ensuring carbon emissions are reduced or eliminated through greener energy generation, transport (trucks, cars, etc.), and/or resource processing/extraction, and consistently maintaining green spaces, with the possibility of adding new ones to the job site, and investing in feasible, long-term, eco-friendly infrastructure, such as switching energy generation and transport to fully renewable sources. All of these and more can benefit not only the company's growth but also employee health and safety, work culture, and productivity.

Standardise data collection across all company activities

Data collection allows the company to evaluate the bigger picture of its operations, impact, and outlook. It removes the need for to guess and implement changes without understanding the consequences. Data drives better decisions, more accurate timelines, a complete picture of current practices, and highlights potential areas for improvement. Rapidly expanding technology gives every company the tool to capture and process this data like never before—a completely sustainable and eco-friendly future hinges on the essential understanding of the world around us.

Combine data collection with more efficient practices

Now that you have the data, implementation must occur using the most efficient practices without introducing risks or harm to the company, employees, or environment for which you are responsible. Data is the secret superpower that many companies are not aware of or actively using in their structure. Perhaps the best example is WaterForce, which uses remote IoT sensors to relay soil moisture, water conditions, and local weather data to inform its decisions. This helped transform the New Zealand agriculture industry into a more collective, automated and efficient industry that reduces natural resource wastage, specifically when irrigating [6].

Collaborate with local community groups and organisations

Collaborating amplifies impact by pooling resources, deepening community trust, and ensuring culturally relevant solutions [7]. Local input, effort and organisation enable a more practical solution to be implemented and support long-lasting environmental stewardship. The more interest there is, the more people become self-aware of their impact and power to help drive change, which further advances environmentally sustainable efforts. Companies and communities cannot be at odds with each other's best interests; they should work together.

8. Conclusions

It is evident that with the company's support, active changes and my effort with each rubbish removal, a positive difference was not only documented but became sustainable without sacrificing the business's productivity.

This collective effort between myself and Superbherb shows that implementing collective understanding, collaboration and striving to reduce harmful environmental impacts can be achieved.

Companies must continue to evolve their environmental and resource management policies. Individual effort creates impact, but community, company, and government effort can leave a legacy and change the way we live for a protected, strengthened, and abundant world free of harm, damage, and destruction.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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