Taking the rubbish out of recycling data

A DISCUSSION PAPER ABOUT AN OUTCOMES-BASED REPORTING APPROACH TO WASTE MANAGEMENT.

PREPARED FOR THE SYDNEY BETTER BUILDINGS PARTNERSHIP

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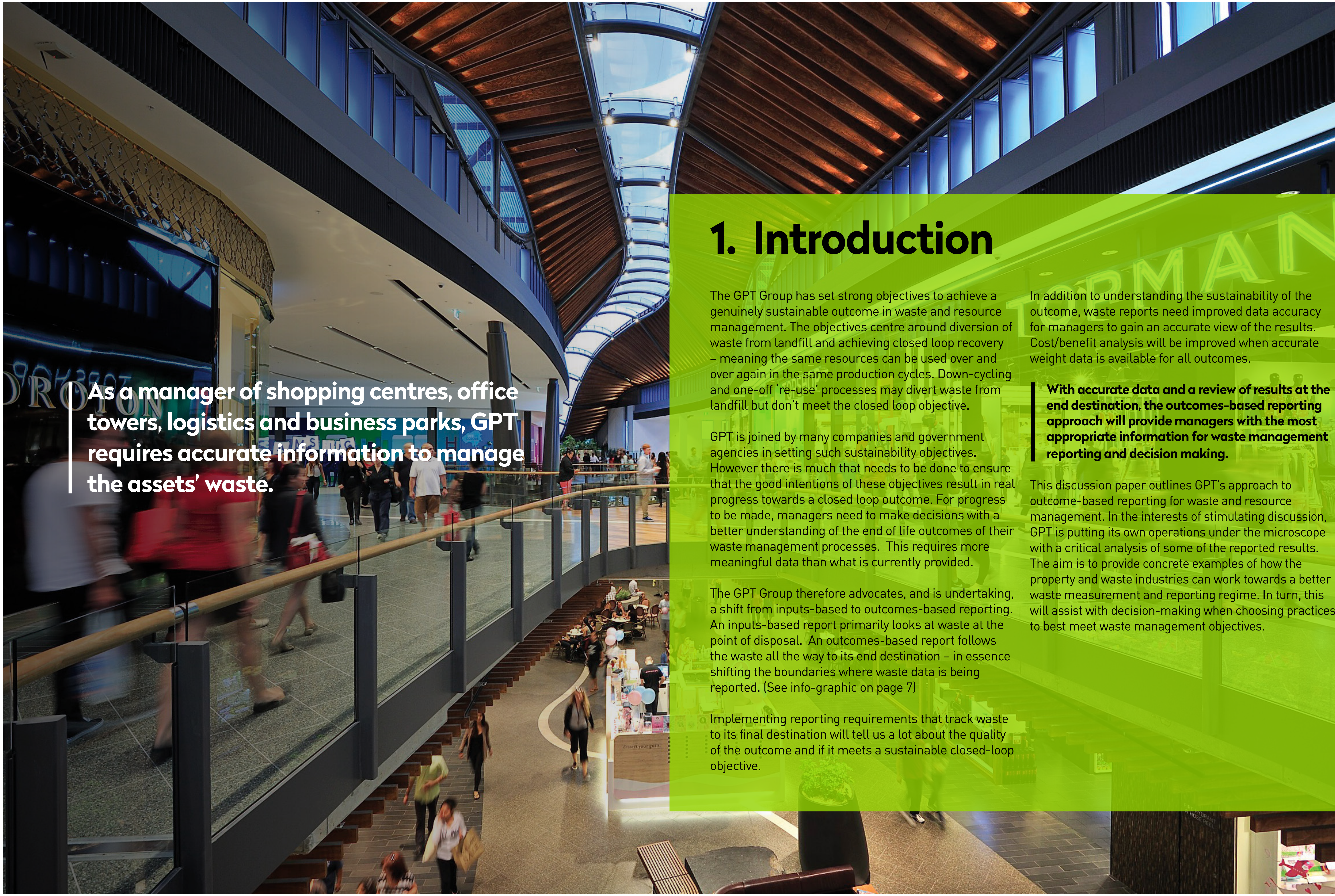


As a manager of shopping centres, office towers, logistics and business parks, GPT requires accurate information to manage the assets' waste.

1. Introduction

The GPT Group has set strong objectives to achieve a genuinely sustainable outcome in waste and resource management. The objectives centre around diversion of waste from landfill and achieving closed loop recovery – meaning the same resources can be used over and over again in the same production cycles. Down-cycling and one-off 're-use' processes may divert waste from landfill but don't meet the closed loop objective.

GPT is joined by many companies and government agencies in setting such sustainability objectives. However there is much that needs to be done to ensure that the good intentions of these objectives result in real progress towards a closed loop outcome. For progress to be made, managers need to make decisions with a better understanding of the end of life outcomes of their waste management processes. This requires more meaningful data than what is currently provided.

The GPT Group therefore advocates, and is undertaking, a shift from inputs-based to outcomes-based reporting. An inputs-based report primarily looks at waste at the point of disposal. An outcomes-based report follows the waste all the way to its end destination – in essence shifting the boundaries where waste data is being reported. (See info-graphic on page 7)

Implementing reporting requirements that track waste to its final destination will tell us a lot about the quality of the outcome and if it meets a sustainable closed-loop objective.

In addition to understanding the sustainability of the outcome, waste reports need improved data accuracy for managers to gain an accurate view of the results. Cost/benefit analysis will be improved when accurate weight data is available for all outcomes.

With accurate data and a review of results at the end destination, the outcomes-based reporting approach will provide managers with the most appropriate information for waste management reporting and decision making.

This discussion paper outlines GPT's approach to outcome-based reporting for waste and resource management. In the interests of stimulating discussion, GPT is putting its own operations under the microscope with a critical analysis of some of the reported results. The aim is to provide concrete examples of how the property and waste industries can work towards a better waste measurement and reporting regime. In turn, this will assist with decision-making when choosing practices to best meet waste management objectives.

2. Objectives – getting the right measures

The GPT Group is committed to a 'closed loop' approach to resource use and minimising waste to landfill in all areas that it has control over. This is stated in the GPT Waste and Resource Management Policy, along with related targets. GPT specifically targets the diversion of at least 98% of tenant operational waste from landfill.

GPT has undertaken internal reviews of all current practices and identified the attributes of the ideal processes for achieving its stated goals.

> **One very clear challenge arising from the reviews was the lack of good data to track the outcomes of practices.**

Without this, it is difficult to genuinely understand what progress was made towards the closed loop objective.

Much of the resource recovery data was inaccurate and failed to address the ultimate objectives. Essentially, the data lacked quality information about:

- How much resources were being recovered;
- Whether or not the recovered resources meet closed loop objectives, or;
- Whether the processes fit with GPT's defined attributes of leading practice.

When tracking the full chain of custody for various waste streams, many of the practices generally could not be considered to achieve a closed loop approach to waste and resource management. Yet there was little in the reported data that would indicate this.

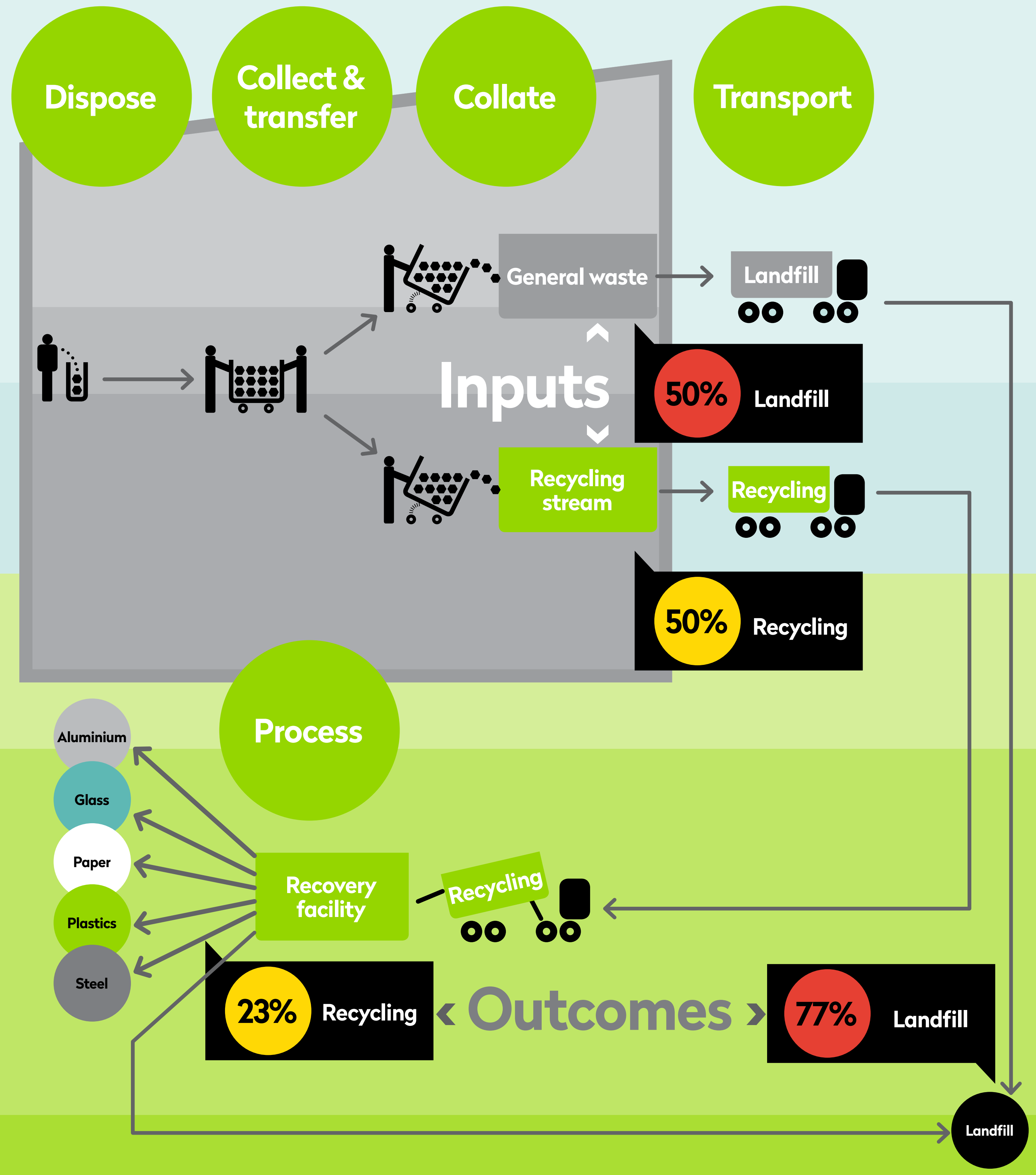
Most property managers undertake waste practices with the best of intentions. However they often unknowingly implement processes that result in future problems including:

- **Increased emissions**
- **Land or water contamination, or**
- **Unnecessary resource depletion.**

Even if the objective was stripped back to just diversion from landfill, much of the input-based data reporting does not give a true indication of results on this front either.
The simplest demonstration of this was the lack of contamination reporting or netting-off of contamination in recycling data. In all recoverable streams collected at GPT, there are some levels of contamination. This contaminated portion most likely ends up in landfill. Yet under input-based reporting regimes, when data was provided on recycling, it was reported on the assumption that 100% of the weight of the receptacle stream is recovered. Conversely, an outcomes-based reporting system would provide information about what happens to the contaminated portion and net it off from the recycling data.

In summary, the inputs-based waste reporting does not accurately inform GPT about progress towards the target of a 98% diversion rate nor if the diverted waste meets the closed loop objective.

> **By shifting the reporting to an outcomes-based approach that records the final destinations of waste, this lack of clarity should be resolved.**



> **The boundaries of measurement are shifted from the point where waste is input into its streams, to the final outcome of the process. In this example, reported recycling drops from 50% to 23%.**

3. GPT's Data

Table 1 shows the published summary for GPT's waste management results for 2012, which was the last full year for which only input-based data was used. The data is audited and subject to limited assurance by Ernst and Young to ensure it is an accurate reflection of best available data.

There are three problems with this report. The first two problems relate to the measured amounts. Firstly, the accuracy of the recovery data is low because it does not account for non-recoverable contamination within each waste stream. Secondly, the data it is often based on incorrect density assumptions.

Table 1:
GPT's waste management results for 2012.

Waste type	Tons
Primary recycling (various)	7,687.9
*Paper/cardboard	6,900.0
Organic	1,121.2
Co-mingled	1,172.6
*Glass	387.6
Grease traps	0.0
*Cooking oil	260.0
*Fish waste	164.7
Polystyrene	14.7
*Meat waste	57.4
Bread waste	73.2
E-waste	49.5
*Green waste	2.7
Soft plastics	37.1
Hard plastics	45.3
Toner cartridge recycling	22.4
*Food recovery	9.6
Fluorescent tube recycling	7.6
Coat hangers	15.5
Other recycled	1,083.4
*Steel skip	9.4
Uncompacted paper towel	0.0
*Aluminium	1.0
Total Primary	**19,122.8**
Secondary recovery	**1,138.8**
Total waste diverted	**20,261.6**
General Waste (landfill)	**26,126.2**

The third problem relates to the waste type (see Table 1 column heading). It often doesn't describe the outcome of the process and so progress against a close loop objective is not reported.

Take for example the first line in Table 1, "Primary recycling (various)". The category 'primary recycling' tells us that there has been some separation at the site and that the waste is going to a recycling facility. There is little useful information about the outcome and whether it met the 'closed loop' objective.

Even if the weights were accurate and not based on density estimates, the data does not take into account the contamination that is likely to end up in landfill. Nor does the data tell us anything about the performance capability of the processing plant to recover different resources from a mixed or contaminated waste stream.

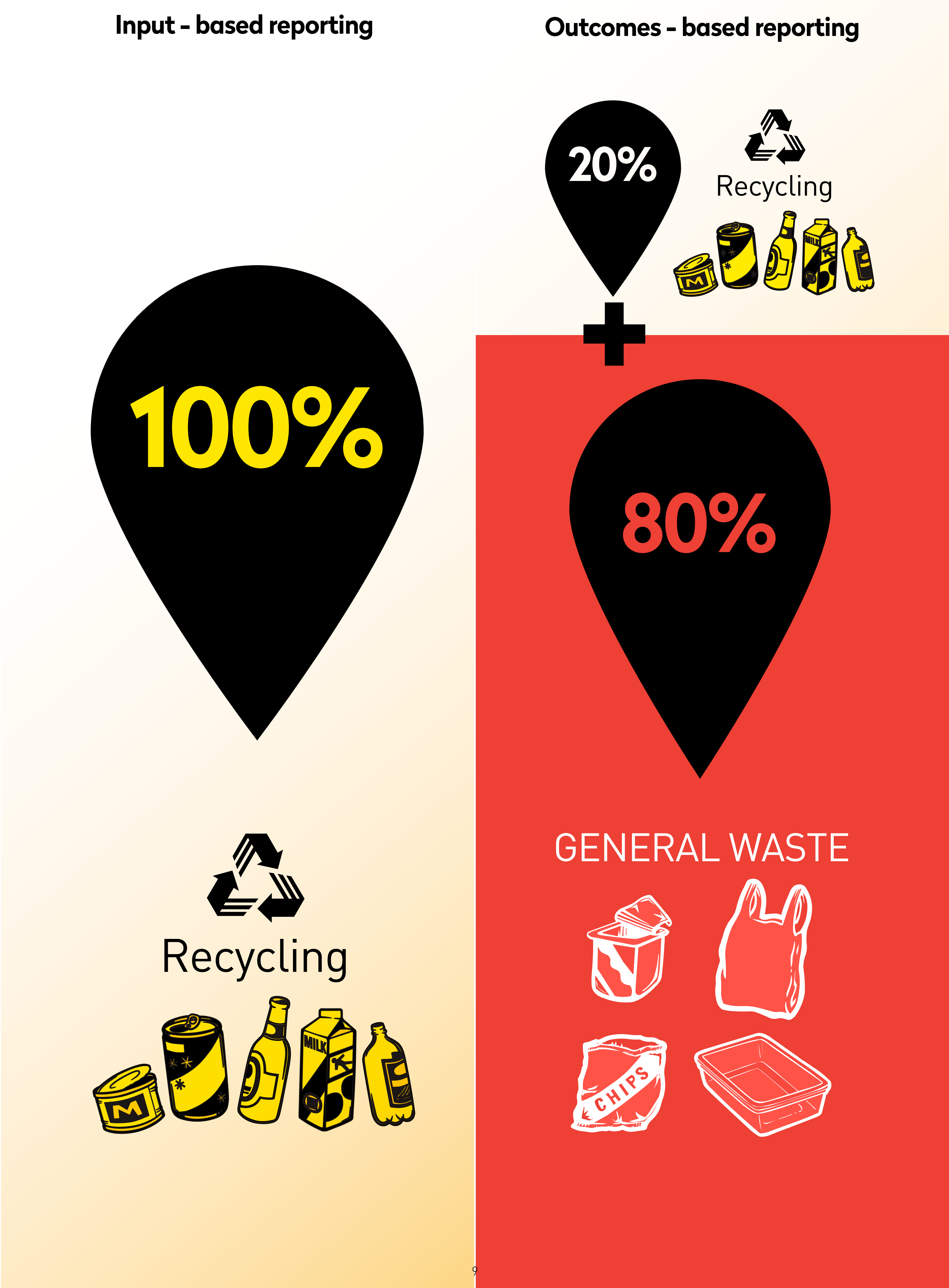
The provided data is simply a reference to the input weights for a given receptacle. It does not describe the outcome.

> **For example, a yellow-lidded bin filled with takeaway food containers may contain 20% plastics by weight, with the rest comprising of residual food and liquid.**

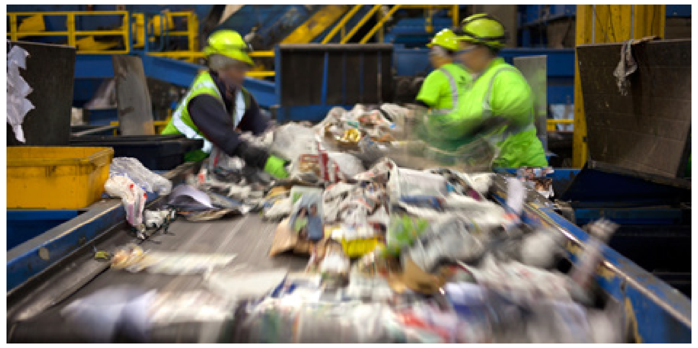
Only the plastics might be recovered at the processing facility. The other 80% of putrescible mass will likely end up in landfill. Yet currently all of the weight of the yellow bin would be reported as diverted from landfill. See comparison on page 9.

It is difficult to understand the true outcome of a waste stream if it is mixed with a variety of items. For example, co-mingled waste stream with plastic, metal and glass items put in the same bin will have multiple outcomes achieved as each item has different recycling options.

However, an input-based reporting system for homogeneous recyclable waste streams does provide useful insights into the outcomes for specific materials. For example, when streams such as cardboard (and * streams) are recovered at sites with low contamination levels, the reported data provides a useful insight into the actual outcomes.



4. What is outcomes – based reporting?



Outcomes-based reporting in waste and resource management accurately tracks and categorises information about the destination of disposed items. In regards to the commonly used phrases of 'cradle-to-cradle' or 'cradle-to-grave', an outcomes-based report will provide both qualitative and quantitative information about the 'cradles' and 'graves'.

> **At GPT, an outcomes-based reporting method has been designed to provide better measures for assessing performance against its sustainability objectives for waste and resource management.**

The principal performance measures at GPT will be:

- Waste intensity – a measure of waste generation rates per m^2 at assets
- Percentage diversion from landfill – a measure of recovery rates
- Percentage A-grade recovery – a measure of meeting the closed loop objective.

This reporting method indicates both the quantity and quality of the results of our waste and resource management processes.

There are three main elements of an outcomes-based report that drive improvement:

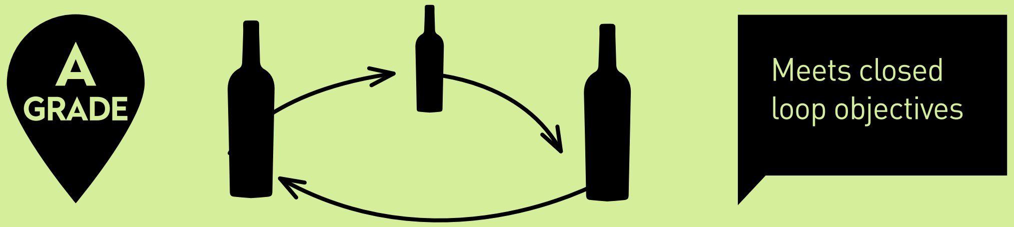
1. Accurate weights. The first preference is actual weights. If these are not available, verified site densities are to be applied to volume measures to derive weights. Industry average densities are undesirable.
2. Deducting contamination. Processes should be implemented to net off any contamination within recycling streams so that only the recoverable items are reported in recovery figures.
3. Grading the outcome. GPT has defined recovery outcomes as A-grade, B-grade and C-grade. These grades are defined explained in the next section. By adding this grading information to reports, the information improves from simply reporting the input weights to a recycling bin to assessing what happens to the contents of the receptacle at their final destination.

The Better Buildings Partnership release of the 'Guidelines for Operational Waste:

Procurement, management and reporting' consultation paper has prompted the update of this discussion paper. As one of many property companies and managers involved in the development of the guidelines, GPT is aligning our processes with them. Greater detail on elements 1 and 2 above is available in the guidelines. The focus of this paper is therefore to provide greater insights into the grading principles. It also includes a case study to demonstrate how all three key elements of an outcomes-based reporting approach can be applied and how the waste reporting landscape will change.

5. How do the recovery grades work?

GPT is implementing the recovery grading system so that the quality of the recovered material can be considered alongside its quantity. Each grade is explained below.



A-grade Recovery

A-grade recovered products:

- **Meets the closed loop objectives;**
- **May be used over and over again, constantly being returned to the same production cycle, and;**
- **Can be recovered without any consequent hazardous material build-up in the environment.**

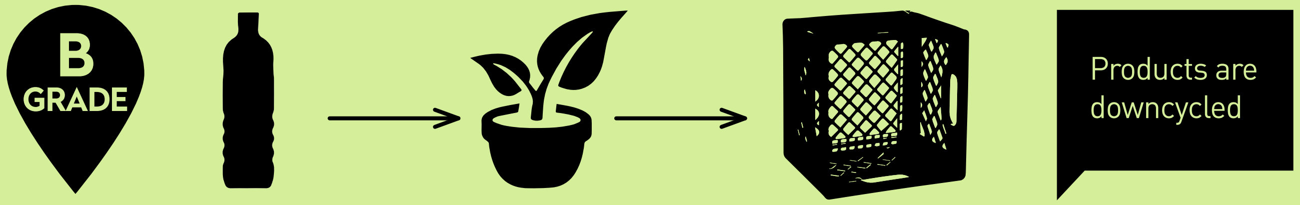
At GPT, the recovered A-grade product consists mostly of cardboard and paper, some organics and robust recoverable materials such a glass and metals.

GPT acknowledges that some A-grade recovery may not maintain the exact quality standards as when it entered the recovery stream. However, if the material can reasonably be expected to cycle through similar recovery and production processes over and over, then it is identified as meeting the closed loop objectives and therefore fairly categorised as A-grade.

For example, cardboard and paper fibres cannot be indefinitely recycled as they shorten during processing. However the production process does not separate out fibres of smaller size and generates a new product from all the recovered fibres that is similar to what was disposed. This new product can then be fed back into the same process. Virgin resources are continuously replaced by recycled resources for use in production, therefore fibre recovery processes are categorised as A-grade.

Another example of large scale A-grade recovery is food waste / organics recovery when the recovered material goes through a process that feeds back into the production of food. For example, source separate organics recovery that is composted and then used as an unrestricted fertiliser to enhance soils for growing food is considered A-grade recovery.

However, where the recovered resource cannot return to the same or a similar production loop, it is not considered A-grade. Cases where a recovery process results in a downward shift in the value retained in the resource are considered B-grade or C-grade recovery.



B-grade recovery

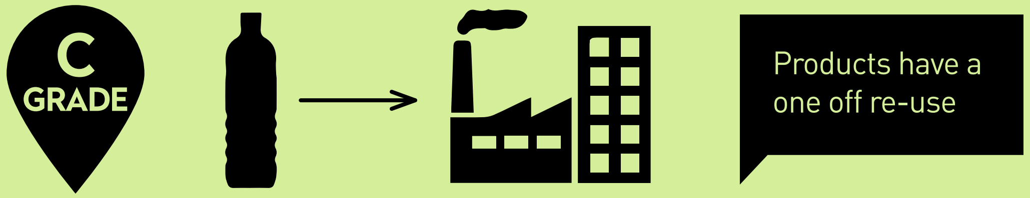
B-grade recovered products are:

- **Downcycled to a lower value product;**
- **Have a limited number of recovery cycles, and;**
- **Produce valueless by-products after several recycling cycles.**

Generally, plastic products are downcycled in Australia. This waste stream makes up the bulk of the B-grade recovered products in GPT's waste management processes. Some plastics may be recovered and processed back into a similar product if they are separated at the point of disposal. For example, plastic from milk bottles disposed in a separate bin can be processed back into milk bottles. The plastic in this example would be categorised as A-grade, however source separation at disposal is currently not a common outcome compared to the use of co-mingled processes where plastics are often processed together and into lower value plastics.

An additional driver for the categorisation of plastic recovery as B-grade is that many of the recovery processes involve baling and exporting plastics for recycling. In these cases it is often not possible to obtain a verifiable outcome so a conservative approach to reporting dictates that these processes should be considered the lower of the likely outcomes, i.e. B-grade.

A final argument to consider is the so called 'upcycling' of plastics, such as plastic drink bottles, be recycled into filter casings. GPT's approach to grading is to compare the quality of the resource required for production to the quality of the recovered product used in production. In the case above, a filter casing clearly has long term value. However, the quality of the plastics required in manufacturing the casing is non-food quality whereas the drink bottles are food quality. Therefore, the process is not closed-loop as the plastics are downcycled and cannot be returned to their original production loop.

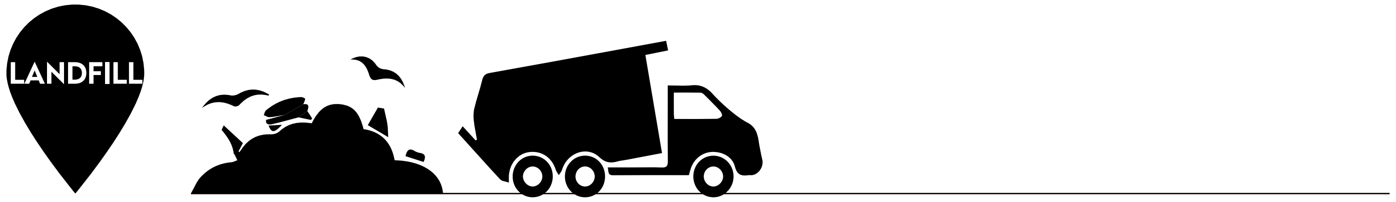


C-grade recovery

C-grade recovered products are those which are produced in a waste diversion process but are only available for a single additional application.

At GPT, this generally refers to mixed source waste products made up of a composted mix of organics and other residual waste. This is the bulk of the outcome for general wet waste Alternative Waste Treatment type facilities. The main advantages of these products include carbon stabilisation and a level of soil conditioning for degraded land. However, restrictions exist on where and how these products can be used. In some cases, only one application is allowable before site contaminations limits have been reached.

Energy recovery from mixed or non-renewable resources, such as the use of mixed source waste as fuel in a production process or gasification of plastics for energy generation, is also be consider a C-grade outcome. These are currently rare processes although possible upcoming regulatory changes may result in growth in their use.



Landfill

This is the non-recovered waste. Sources include:

- **General waste processes**
- **Contamination within a recycling stream, or;**
- **Losses from recovery processes.**

Landfills use a range of different impact mitigating processes. For example, some landfills operate flaring or energy recovery from extracted methane, which is clearly a better outcome than not managing these emissions. While it is useful to compare the impacts of different landfill operations, more favourable operations should not be categorised as recovery or recycling as many waste reports tend to do.

Further, GPT does not accept that the portion of AWT's output that is known as alternate daily cover (ADC) can reasonably be categorised as recovery of any kind. As the name suggests, ADC is used for capping landfills on a daily basis. Capping landfills is a regulatory requirement and calling something recovered or recycled because it is spread as the daily top layer on a landfill is a distorted definition of what most reasonable people would accept as recycling.

Put simply, if it starts in a bin and ends up in a hole in the ground, this should reasonably be considered landfill and GPT will report it that way where it is identified.

6. A case study of input-based vs outcomes-based reporting

The following example demonstrates the differences between an inputs-based reporting system and an outcomes-based reporting system for waste and resource management. The inputs data is taken from a waste services provider's bills and monthly reports. The data in the case study is for a mixed co-mingled container recovery service at a shopping centre in Sydney.

To avoid singling out any waste operators, the asset and service provider information has been excluded. Similar results have been found at multiple assets so the finger cannot be pointed at a supposed rogue operator. This simply illustrates the need to reform the waste reporting processes.

Other information in Table 2 is actual data from the service provider and billing costs. There is nothing exceptional with this asset or service provider, so the data demonstrates the general weakness of input-based reporting for assessing progress and decision making, rather than weaknesses in the practices of just one operator.

Table 2: Data extracted from a typical co-mingled recycling monthly report, compared with an outcomes-based approach to reporting it.

	Input-based reporting	Outcome-based reporting
Monthly Bill	$673	$673
Receptacle	660L	660L
No. of collections	31 collections	31 collections
Weight / bin	53.5kg / bin (derived from data)	18kg / bin (av. measured weights)
Weights	1.66 tons	0.558 tons (calculated)
Cost/ton for service	$405 / ton (calculated)	$1,206 / ton (calculated)

6.1 Density data

The first point of interest is the difference between the current reported weight and the measured weight per bin. The reported weight per bin, based on incorrect density assumptions, is around three times higher than the actual weight per bin. So the simple bottom line for the above co-mingle container service is that it costs nearly three times as much per ton than is reported.

There is no doubt that the lower reported cost will distort decision making processes towards using this service.

The density assumptions are very simple to test and have been acknowledged as a source of low data integrity across the industry. From a reporting point of view, the use of these assumptions is poor practice whether the existing input-based reporting continues to be used or not.

In the proposed outcomes-based reporting, the use of accurate density data or actual weights for each site is imperative. The aim is to understand the outcomes for each and every site, so waste industry density averages are a poor substitute for site density averages or actual weights. To improve current processes, a simple regime of verifying densities or weights must be implemented at the site level.

6.2 Contamination

The second point to consider is that contamination is not taken into account with the 'recycling' result – reported as 1.66 tons in Table 2. Effectively, everything that goes into those yellow-lidded bins is reported as 'Primary Recycling – Co-mingled Containers'. Yet even the quickest of visual inspections highlights that a certain percentage of the contents is not recoverable.

Contamination, such as food waste and bags of 'rubbish', is incorporated in the recovery figures, whereas they should be deducted. It is most likely that the contamination ends up in landfill or as a form of liquid waste. Yet all of the input weight of everything in the bin is reported as a recovered line item.

Complete composition profiling of this waste source was not conducted. However visual inspections reveal that contamination rates are between 10% and 25%. When these contamination levels are taken into account, the actual recovery rates drop further and the cost per ton rises further. In effect, the reported 1.66 tons for resource recovery is actually closer to 500kg when accounting for realistic densities and contamination.

An effective outcomes-based reporting system takes into account contamination levels and deducts these from recovery figures.

The outcome of the disposal of the contamination to landfill or via liquid trade waste would also need to be reported elsewhere. This process is always simpler when the waste stream is not mixed. However, even when recovery is occurring at a mixed source waste facility, it is possible to determine reasonable assumptions by using either site or facility contamination data.

6.3 The outcome of the material flows

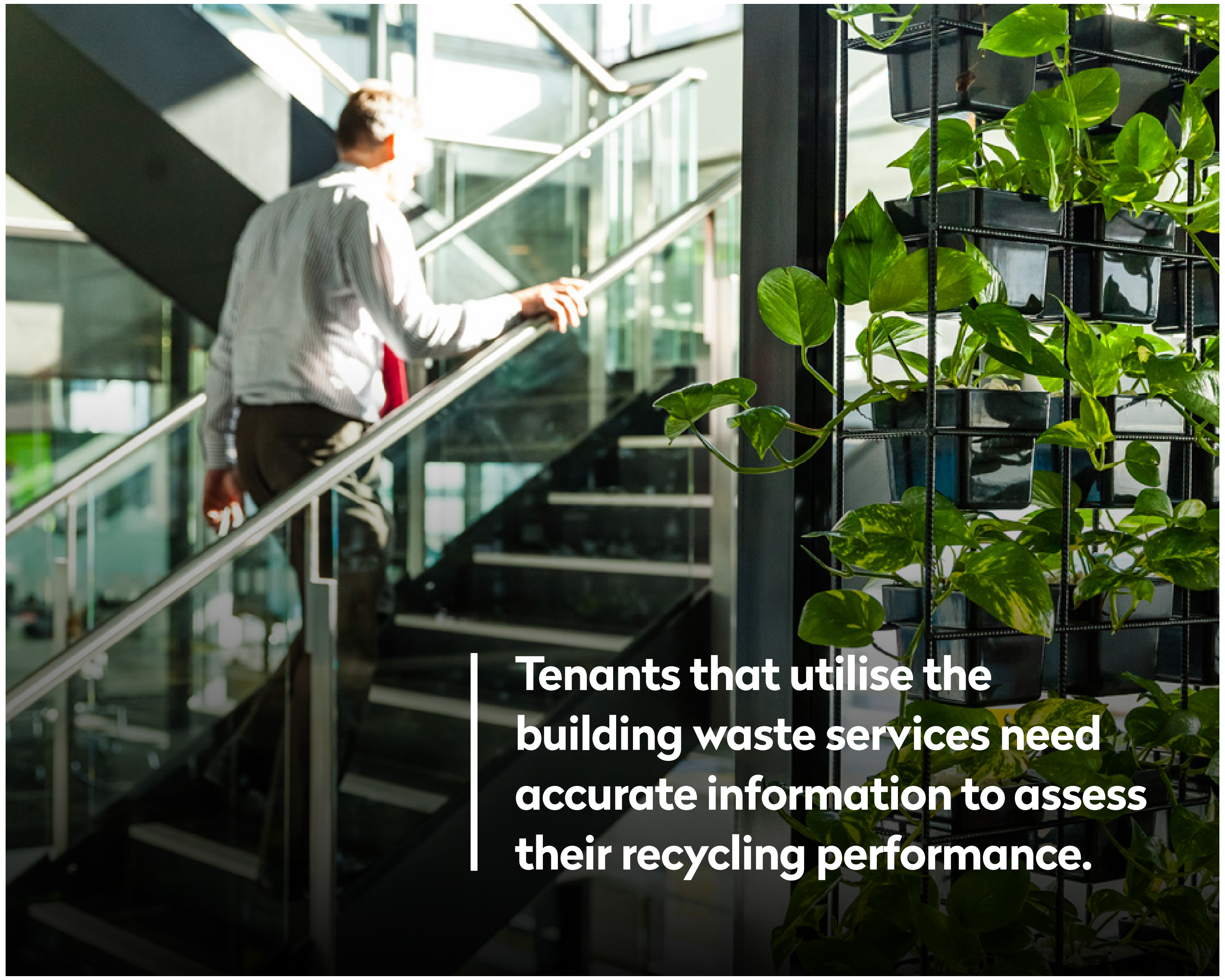
Once we have reasonable integrity for the recovery weights, the final point to consider for an outcomes-based reporting system is what actually gets recovered and how this compares to the objective. A cradle-to-cradle analysis is required here. To achieve this, the report should include information on material flows through to their end destination. When following all material flows, the outcome is the recovery of a range of commodities for reuse in the production processes or the return of value to the earth.

Consider the input-based data in the example in Table 1 which is reported as 'Co-mingled'. This is not an outcome that can be assessed against a closed loop objective. In this case, a range of glasses, plastics and metals are recovered and traded as inputs to another process. There is no such thing as a recycling a 'co-mingle'.

> **The term 'co-mingled' is simply a description of the receptacle used to achieve the outcomes.**

With an outcomes-based reporting approach, the notion of Primary vs. Secondary recycling targets becomes irrelevant. 'Primary' and 'Secondary' only refer to the location of the separation processes, not the actual outcome of these processes. The separation processes are unimportant compared to attributes such as retained value, waste miles, ethical stewardship, processing energy, etc. These attributes should be considered more important than whether the waste is recovered through a facility that deals with yellow-lidded bins or red-lidded bins.

There are greater challenges for a processor in separating a wider mix of waste. However if the processor can achieve a good outcome, then whether the process is 'Primary' or 'Secondary' is irrelevant. GPT therefore advocates moving away from these early attempts to place a qualitative overlay on waste reports.



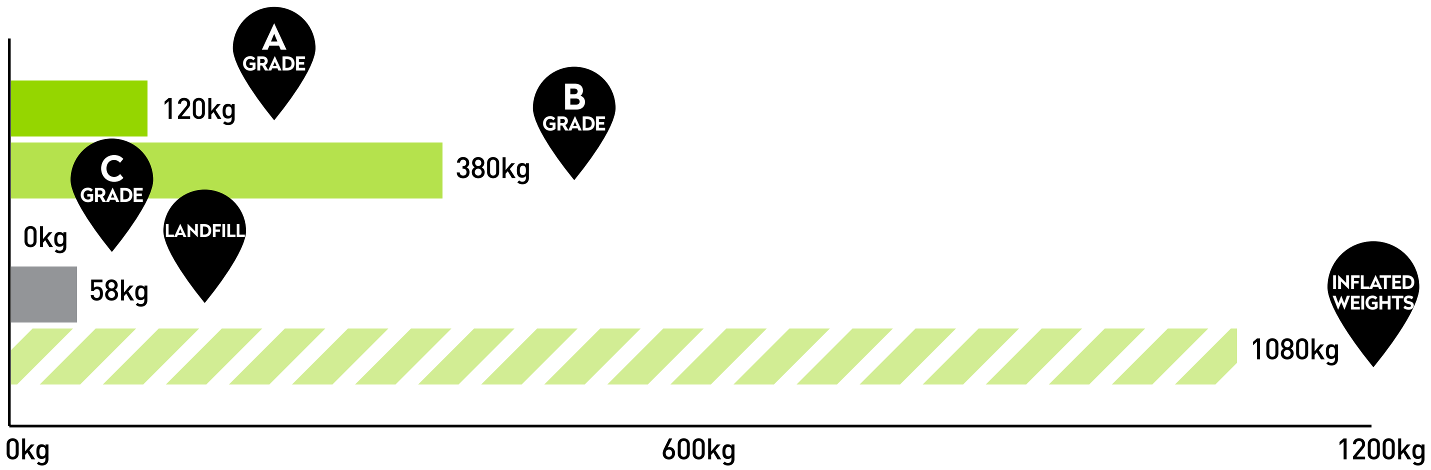
7. What would an outcomes-based report look like?

Outcomes-based reporting should tell a story of what has been achieved and what challenges and opportunities still exist. Table 3 compares the results from input-based reporting with those from outcomes-based reporting.

Table 3: Overlay of qualitative grading criteria for the typical co-mingled data from Table 2.

Inputs-based report	Outcomes-based report
1.66 tons of 'Primary Recycling – Co-mingled Containers'	380 kg of PET plastics were recovered to be pelletized and sold to manufacturers to produce lower grade plastic products (Grade B recovery)
	40 kg of aluminium was recovered and sold as a commodity (Grade A recovery)
	80 kg of glass was recovered, crushed and used as an input to glass manufacturing (Grade A recovery)
	58 kg of mixed residual waste (contamination) was dumped in landfill
REPORTING SUMMARY 1.66 tons primary recycling	REPORTING SUMMARY A-Grade: 120 kg B-Grade: 380 kg C-Grade: 0 kg Landfill: 58 kg

The inputs-based report for this co-mingled stream presents a picture that suggests there is three times more 'recycling' than actual occurs and nearly 15 times what would be reported as meeting the GPT closed loop objective (A-grade only).



8. Data integrity

Similar to Table 3, GPT aims to gather quantitative information on the outcomes and their grading, and a plain English qualitative description of the outcomes. The description of the outcomes informs the profiling process so that during assessments it is clear which items can be recovered and which ones should be netted off as contamination or non-recoverable items. Only once this is reported in a verifiable manner will people truly be able to trust that we are making progress toward our stated objectives. The Better Buildings Partnership Guidelines for Operational Waste provides a framework in which data integrity can be assessed.

9. Broader waste considerations

This discussion paper is focussed on outcomes-based reporting, which provides a more accurate and useful set of information from which management decisions and can be made and progress towards objectives measured. However it must be noted that this data is not the only assessment used at GPT. As previously mentioned, GPT is also guided by a set of principles when choosing resource management practices. The seven attributes below could be considered the yardstick to compare any management practice against. They are designed to meet The GPT Group's Waste and Resource Management Policy.

GPT's definition of leading practice in resource management is to maximise resource recovery whilst:

1. **Adhering to all compliance requirements**
2. **Maximising retained value**
3. **Maximising verifiability**
4. **Maximising ethical stewardship**
5. **Minimising risk**
6. **Minimising processing energy / emissions**
7. **Minimising waste miles**

In some cases, the attributes do not always work hand-in-hand. For example, some high recovery practices may have low retained value or high risk. In these cases, managers need to make a call as to how much they are prepared to trade off gains in one attribute at the expense of other attributes. There are no hard rules on this and it will vary from site to site depending on available options.

The seven attributes were a prelude to concluding that an outcome-based reporting system was essential. In fact, to address these fundamental principles and the company objectives, GPT arrived at the requirement for outcomes-based reporting. Without knowing the outcomes of our waste are resource management processes or the grading of waste outcomes, it would simply be impossible assess where we stood on the yardstick of leading practices.

10. Summary

Outcomes-based data reporting is a significant shift for the waste industry. Waste services providers will be required to provide a greater level of transparency and a willingness to explain the disadvantages as well as the advantages of their services.

However, outcomes-based reporting is going to require an equally large shift for the waste service recipient. Firstly, in nearly every case there will need to be an acknowledgement that publicly reported recycling results have been exaggerated and possibly misinterpreted in the past. Data verification may only be achievable in some cases through on-site management processes. Therefore managers can no longer completely pass on responsibility for reporting integrity to waste industry vendors.

However, most of all, industry will need to take up the challenge of achieving the best quality outcomes from 'recycling', not only the highest rates of 'recycling'.

11. Recommendations

GPT has adopted a policy position whereby our resource recovery objectives are benchmarked against a closed loop approach. Therefore, progress toward these objectives can only be assessed once we start reporting our results in terms of their outcomes, not in terms of inputs-based data.

GPT recommends the application of an outcomes-based reporting approach for waste companies and government agencies that share a similar closed loop objective.

GPT proposes that resource recovery should be reported with processes that are outlined in this paper and the Better Buildings Partnership Guidelines to Operational Waste, achieving:

- **Greater understanding of the outcomes across the full chain of custody in waste management;**
- **Higher integrity data, and;**
- **Grading of recovery outcomes.**

GPT offers this discussion paper to describe its outcomes-based reporting approach. We outline the main advantages in understanding the full life cycle of material flows when compared to the current reporting approach. Through outcomes-based reporting, GPT can understand its progress towards its closed-loop objectives and will take the rubbish out of its recycling data.