2 Fully Understanding Costs

The weird world of costs

Why Bother?

Reduce cost of services

Answer recycling's critics

Generate more revenue

Costs seldom seem in short supply, and you may not have been looking to incur new ones. However, this chapter will introduce ways to analyze all kinds of costs, including some that are genuinely hard to identify, much less quantify. But why bother?

First, costs are notoriously devious. Understanding marginal costs, for example, can explain how a program that appears to reduce costs can actually increase them. Also, failing to understand capital and overhead costs has caused countless solid waste agencies around the country to underprice the full cost of landfill service.

Second, lots of other people are already doing the figuring, and you may not agree with their conclusions. When the Cato Institute called recycling in New Jersey an "inexcusable waste," it used many of the tools of cost analysis explained here. You need to understand the nature of costs to argue your point.

Third, you need to understand these costs if you ever consider sharing services with another department or organization or you want to recover money for work you have done. In shared service agreements, failing to understand your cost of service is a license to get soaked. Get your fair share by getting your numbers right. Ocean City does. This Cape May municipality prides itself on reimbursements it has received from insurance funds. When coastal storms hit this beachfront town, the public works department submits thoroughly and accurately documented bills for the emergency clean-up work it performs. The town would get less cash if its public works manager didn't understand costs so well.

Finally, privatization is a force to be reckoned with. Because they need not generate a profit, public agencies can compete dollar-for-dollar with private-sector service providers – if, and only if, they understand their cost of service.

Recycling coordinators may routinely encounter any of these kinds of costs, which are explained in this chapter:

- fixed
- direct
- operating
- controllable
- variable
- indirect
- overhead
- sunk
- semi-fixed
- capital
- marginal
- opportunity

With the right program design and a sharp eye on costs, many recycling programs can be reasonably competitive, if not more cost-effective, than simply carting everything to a landfill or incinerator. That remains true even after recent

declines in landfill and incinerator fees. Without these basic tools for cost-control, recycling programs can be – and should be – easy targets for anyone with a calculator and a dislike of mandatory recycling.

Cost control begins with understanding how and why costs change, and that can be best determined by asking a few basic questions about the nature of costs.

Question 1: Is the cost directly linked to the service provided?

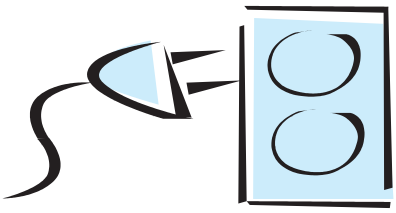
If a cost is directly linked to the service provided, it's a **direct cost**. Direct costs can be identified with a specific activity, product or service. Direct materials, direct equipment and direct labor are three main categories of direct costs.

A composting site, for example, may have direct wages of employees who staff the site, direct equipment for the composting operation and direct materials, including educational brochures and utility expenses that are billed for the composting site only. Even the fringe benefits of compost site employees are considered direct costs – because those costs can be linked to employees who work directly on that project. If a salaried employee splits her time equally between recycling and public health, 50% of her total salary and benefits would be a direct cost to the recycling program. If a recycling program is managed by a supervisor who oversees a total of five programs, recycling might be assigned one-fifth, or 20%, of her salary and benefits as a direct cost. However, if recycling is one-third, or 33%, of the supervisor's budget, then 33% may be a better approximation of the direct cost of this supervision expense.

If you can't link the cost directly to a product or service, it probably qualifies as an **indirect cost** or **overhead cost.** When you're costing out a service like recycling, many indirect costs may seem neither obvious nor fair because the list of indirect expenses is long, and often expensive.

Overhead costs have one thing in common: They are either too tedious or too time-consuming to link them to any one activity. A receptionist, for example, could track each phone call received and try to assign it to a specific department, but recording and tracking that information may take more time than the data is worth. And how about the time the receptionist is not on the phone? He or she may be opening mail that applies to many or all departments. Instead of trying to bill the receptionist's time as a direct cost, most organizations throw the receptionist costs into a pool of indirect costs that is split among all departments. How to split those costs is discussed in the *Full cost accounting* section of this chapter.

A few overhead costs...



- facility costs, including rent, utilities, office equipment – not just for your department or operation, but for headquarters as well
- management and supervisory salaries, human resources, and their associated direct costs
- oversight or advisory boards, or governing bodies for your organization
- legal costs for issues that affect the entire organization
- maintenance staff and facilities, custodial, grounds maintenance, security and associated costs
- receptionists who handle inquiries for the entire organization
- the phone system, internal mail distribution and messaging systems
- financial services, including billing, collection, payroll, purchasing and accounting
- management information systems personnel, hardware, software and supporting costs
- loading dock operations
- carpeting, curtains, and supplies, ranging from bathroom tissue to computer disks

The list goes on.

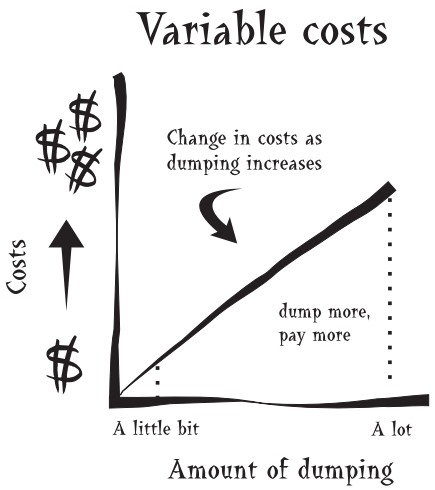
Question 2: How do my costs behave?

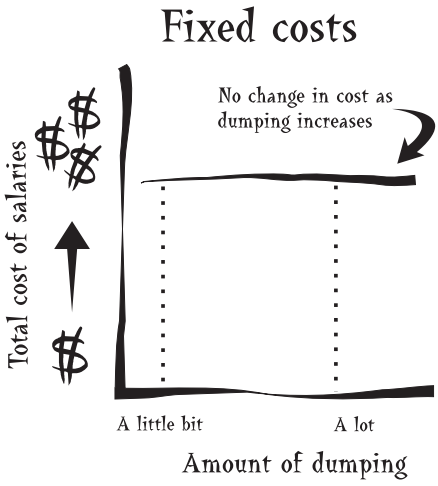
This is key because not all costs are created equal. You must understand when and how costs change – and when they don't change! – to make cost-benefit decisions.

Variable costs change as the volume or level of activity changes. Solid waste tipping fees are an example. You pay a fee for every ton dumped, so the more you dump, the more you pay. The same may be true for recyclables in down markets. If you pay a per-ton charge to "sell" recyclables, that becomes a variable cost. The more you collect, the higher your total costs.

Fixed costs remain constant regardless of the level of service or activity. Salaried employees who are not eligible for overtime are a good example. Their pay does not increase even if they work more hours in a week, nor does it increase if recycling tonnage increases. The depreciation expense of trucks and other equipment is another large fixed cost for many recycling programs; the cost of purchasing the equipment often does not change with the level of recycling.

Somewhere between fixed and variable costs lie **semi-variable costs.** These costs have both fixed and variable components. Telephone bills are often semi-variable: they have a flat monthly fee, plus per-minute charges. Some equipment rentals are similar: you pay a flat fee, plus a per-hour or per-mile charge for usage.





Fixed costs + variable costs = total costs

Costs and tonnage

Why does recycling cost more to collect per ton at the curb than garbage?

Weight is the difference. A household that recycles 1/3 of its waste is throwing out the other 2/3 as garbage, or twice as much by weight.

A household that recycles 1/4 of its waste is throwing out 3/4, or three times that amount, as garbage. It costs about the same to send a worker and truck to your house whether for recycling or garbage, so those collection costs are spread out over more pounds of garbage.

The result: recycling collection costs are usually substantially higher than garbage collection on a per pound, or per ton, basis.

Question 3: Which costs change when the program changes?

This is a big one for anyone interested in cost control. It is the question of **marginal costs**, and it's at the core of cost-benefit analysis. Which costs will change and which costs won't when you make changes to your solid waste management system? The question may seem obvious, but it is often anything but. It depends on the mix of direct, indirect, fixed and variable costs.

Consider a town that contracts with a hauler to collect five materials in its curbside program. Under this contract, the town is paying $90 per ton on average for collection – a reasonably good rate for New Jersey. Because markets for recyclables have been somewhat weak, the town must pay an average price of $5 per ton to "sell" its recyclables to a private processing facility. Its direct cost of recycling would be $95 per ton. Now, in this same town, solid waste collection costs an average of $40 per ton and disposal costs another $60, for a combined total of $100 per ton. These numbers show that recycling is more cost-effective than not recycling. Recycling wins the cost competition by $5 per ton.

Or does it?

Ask the **marginal cost** question. What would happen if recycling were discontinued? If recycling is more cost-effective than simply throwing garbage away, shouldn't total costs rise if the town stops recycling? That depends. We need to look more closely at which costs would change if recycling were disbanded.

Clearly, if the town pays the tipping fee, the solid waste disposal costs would change. Every ton that is currently recycled would now be disposed of at $60 per ton. We will simplify the case by assuming that all current recycling tonnage would be landfilled. Beyond that, the question gets complicated fast.

Marginal costs: the KEY to all cost decisionS

Marginal costs at the curb

The town's average cost of garbage collection is $40 per ton. But if recyclables suddenly get tossed into the garbage can, will garbage collection costs increase by $40 for each extra (or marginal) ton picked up? Not likely. That $40 figure includes plenty of fixed costs that won't change if garbage cans suddenly become more full of stuff that used to be in recycling bins. Yes, garbage trucks will take longer to complete their routes because more and heavier cans will be set out, and the trucks will fill up faster because each stop has more trash. But don't expect costs to increase anywhere near $40 per ton. In fact, some models predict that garbage collection costs would increase by less than 5%, or about $2 per ton, in a town with a 25% curbside recycling rate. Think about all the fixed costs that are not changing, such as:

- the cost of sending the truck to and from the route
- the time it takes driving between stops
- all overhead costs
- wages of salaried employees
- any other cost not affected by the amount of garbage collected

Think of this cost-benefit problem another way. The cost of bringing the garbage collection crew to your house has already been paid. So, in analyzing this decision, you may find only two additional, or **marginal costs,** for garbage collection:

- the extra time it takes to load more cans, bigger cans or heavier cans at each stop
- the time it takes to dump additional loads because trucks fill up faster

The final savings may depend on collection crew costs, truck size and configuration, travel time to and from the disposal facility, and additional wear on vehicles from increased tonnage. But as you can see, this is no simple equation.

Let's say that in this case, garbage collection costs would rise by $10 per ton if recycling were discontinued. We would also have to pay the $60 tipping fee for each ton we are currently recycling. That's a total additional, or marginal cost, of $70 per ton if recycling suddenly went away. But we would be saving the $95 per ton direct cost of recycling.

Recycling may indeed be cheaper per ton than solid waste ($95 vs. $100), but if recycling were discontinued, the town's total solid waste management costs would fall. Discontinuing the contract to collect recyclables would reduce costs by $95 per ton. That savings would be partially offset by a $60 per ton increase in disposal fees and a $10 per ton increase in garbage collection costs. Total solid waste management costs would be expected to fall by $25 per ton. Remember, this is all happening in a town where it costs less per ton to recycle a ton of material than to dump it. That is the paradox marginal costs can produce.

The numbers in this example are shown in "The paradox of marginal costs."

Marginal savings: Reducing frequency of garbage collection

Marginal costs and marginal savings work the other way as well. A school or office building might implement a new recycling program by directing custodial crews to empty garbage cans and recycling bins on alternate days rather than emptying garbage cans every night. In this case, the marginal labor cost of collection is zero, or very close to it.

This recycling program is simply displacing labor time spent collecting garbage with time spent collecting recyclables. Even though the company can calculate an average cost of collecting recyclables (hours spent on the task multiplied by the labor and benefits of the custodial staff), the marginal cost is zero because labor costs were reduced by an equal amount by reducing the frequency of emptying garbage cans.

A curbside recycling program plays the marginal cost game effectively, too. By reducing the frequency of garbage collection from twice per week to once per week and reassigning the crews and equipment to recycling, a recycling coordinator may be able to add curbside recycling at little or no marginal increase in total collection costs.

The obvious lessons of this cost story:

- you should identify the marginal costs and savings from your program options
- you should design a program that maximizes the savings you can capture

The paradox of marginal costs:

How recycling can be less expensive and more expensive than garbage disposal – at the same time!

Here are some average costs that a relatively low-cost New Jersey curbside recycling program might face during times of relatively weak markets for recyclables, when coordinators are paying an average of $5 per ton to "sell" their materials. The community contracts with a hauler that charges an average of $90 per ton to collect recyclables.

Average cost analysis:

Per ton recycling costs...

Collection	$90
Sales	$ 5
Total	$95

Per ton garbage costs...

Collection	$40
Disposal	$60
Total	$100

Note: This analysis assumes that recyclables are sold to a private materials recovery facility. Garbage disposal fees include any transfer station charges.

These average costs show recycling to be cheaper than garbage collection. So what might happen if recycling is discontinued? To answer that question, you need to determine how costs will change. Here is a possible scenario:

Marginal cost analysis:

Per ton savings from DISCONTINUING recycling...

Collection	$90
Sales	$ 5
Total	$95

Per ton additional costs of disposing of recyclables as garbage...

Collection	$10
Disposal	$60
Total	$70

Per-ton savings from discontinuing recycling: $25

The paradox: Is it cheaper to recycle than to throw everything away? Yes. And no! On an average cost basis, recycling is cheaper than garbage disposal. However, since trucks are already making house calls to collect garbage, the marginal, or additional, cost of picking up an extra 25% more garbage (the amount of household waste that is currently being recycled) is only $10 per ton. That means that total costs would drop in this scenario if recycling were discontinued, *even when recycling is less expensive on a per-ton basis.*

Question 4: Can I control these costs?

This is the question of **controllable costs** vs. **uncontrollable costs**. If you have authority to select the vehicles, routes, collection methods and staffing to collect curbside materials, collection can be considered a controllable cost. But, if your community has signed a multi-year agreement to contract for collection at a fixed yearly fee, that cost may be considered uncontrollable during the life of the contract.

When controlling costs, don't under-estimate the value of good management.

Most variable costs are considered controllable. Hourly labor, the largest cost component of most service operations, is usually a variable cost. You may not control the labor rate, but if labor rates rise, you can reduce staff time devoted to collection by changing collection vehicles, routes, methods, level of supervision, or some combination of all four. In fact, supervision is one of the largest factors explaining the difference between high-cost and low-cost solid waste collection programs, according to a nationwide study.[1]

Question 5: How long will these costs benefit my operation?

This is a key question that affects how you account for certain costs. This question and these costs are discussed in more detail in the *Full cost accounting* section of this chapter, but here's how the story turns out. Costs that are incurred on a regular basis during a short time period (usually less than a year) to support ongoing operations are classified as **operating costs** and are recorded in full as costs during that time period. Costs that are incurred for expensive items that are useful for long periods (usually more than one year) are classified as **capital costs.** Because their price tags substantially affect the cost of operation and because capital items are useful for more than a year, their costs are spread out over their useful life with an accounting method known as **depreciation,** which is explained with examples and more detail later in this chapter.

Question 6: Is the money already out the door?

Another way to ask this question is: When is a dollar not a dollar? *When you can't get it back!* If money has already been spent, it may be irrelevant to the financial decision you face today. Money that has been spent and can't be recovered is known as a **sunk cost**. And for the purpose of cost-benefit decision-making, sunk costs are valued at $0 because they will not change no matter which option you choose. No doubt the largest and most painful example of sunk costs are the hundreds of millions of dollars invested in siting and planning for New Jersey solid waste disposal facilities that have since been cancelled. The debate has raged over who should pay for those costs, but one economic fact is simple: Costs that cannot be recovered are irrelevant to cost-benefit decisions because no matter what option the state, county or municipality chooses to follow, the planning, engineering and legal costs already incurred, a.k.a the sunk costs, must still be paid.

Q When is a dollar not a dollar?

A When you can't get it back.

To examine sunk costs up close, let's look at some smaller numbers that don't stir the same passions as multi-million-dollar debts for cancelled incinerators. Let's say your county signs on as a sponsor of an Earth Day fundraising concert. Benefits will go to school recycling programs in the county. The fundraising committee spends $10,000 in advance to advertise the concert with flyers, newspaper ads, posters and radio spots. Its contract with the performer allows the committee to cancel with no penalty up to 90 days before the event. After that date, the committee must cough up the entire $20,000 performance fee. With the fundraiser 91 days away and ticket sales running below expectations, the committee meets to decide whether to risk it. In looking at the numbers, you realize that the $10,000 in advertising costs is irrelevant to making the go/no go decision. Why? Because no matter what you decide, that $10,000 is out the door. It is a sunk cost that will not change regardless of whether you run the concert or not. The relevant costs are the $20,000 performance fee and any **marginal** costs of deciding to present the concert, such as hiring security and staff for the event. Because the $10,000 in advertising is a sunk cost, your best move may be to run the concert even at a loss. When can choosing to lose money be the smart choice? When your only other option is to lose even more!

This fundraising example is intended to show on a small scale how large numbers may be costly, but irrelevant, to making the right cost-benefit decision. If tickets sell for $100, making the mistake of including the sunk costs in its cost-benefit calculation would cause the committee to overestimate by 100 ($10,000/100 = 100) the number of tickets needed to approve the contract with the performer.

Question 7: What's tomorrow's dollar worth today?

In finance, there is a time value of money, and that value is based on a simple rule: A dollar received tomorrow is worth less than a dollar in your pocket today.

It's easy to see why. Rather than using $1 to illustrate the point, let's raise the stakes and use $1 million instead. If you have $1 million today, you can earn some interest. At 5%, it earns $50,000 a year. That's $137 per day, every day. So, at a 5% interest rate, the **opportunity cost** of getting your $1 million tomorrow rather than today is $137. The higher the interest rate, the more you gain by grabbing your dollar today.

For any interest rate, you can calculate the value today of receiving a dollar in the future – whether that's tomorrow, next year, in three years, or in 30 years (the term of many public bonds). At 5%, $1 million received next year is worth only $952,380.95 today because at 5% interest you can put that $952,380.95 in the bank, and one year later it will be worth $1 million. At that interest rate, the value of receiving $1 million 30 years from now is worth only $231,000 today. When inflation was running around 10 to 12% in the late 1970s and early 1980s, 15% interest rates were common. At a 15% "cost of money," $1 million received in 30 years is worth only $15,000 today! So a dollar is only equal to a dollar if you can spend or invest it today. If you have to wait for your money, that dollar is worth less to you today.

Now think about the many cost-benefit decisions recycling coordinators are asked to consider. You decide to invest in something today – a truck, a baler, a tub grinder, computer software, an educational brochure or campaign – and the payoff flows in gradually over the next few years. If the up-front money comes out of your organization's budget (rather than borrowing it), you are paying out today's dollars and collecting payoffs in future dollars, which are worth less than today's dollars because of the time value of money. How much less they're worth depends on how far into the future you will receive them and how much interest you are forfeiting each year (the interest rate).

Question 8: What else could I do with this money?

This is the question of **opportunity costs**, and this answer, too, can get tricky. Opportunity costs are the things you can't do because your resources (money, staff, equipment, buildings, etc.) are committed to a given project.

Let's start with an easy one. You need to buy a $100,000 truck, and you are deciding whether to plunk the $100,000 up front or borrow the money. On paper, it might look cheaper to pay cash up front. If you borrow the money, you have to pay interest. At a 7% interest rate, it costs $7,000 a year to borrow $100,000. If you pay cash, there is no $7,000 payment. But you definitely lose something by spending the cash up front. As we saw with the time value of money, if you had the $100,000 in an account that pays interest, you would be earning money on that stash. That lost interest doesn't appear on any ledger, but it's an easy way to quantify an opportunity cost *even when there is no line item cost to your organization's budget*.

Many opportunity costs are harder to calculate. That $100,000 might have helped build a park or school. We elect representatives to make decisions about how public money should be spent, but a fundamental concept of economics is that all decisions involve trade-offs and recycling is no exception.

Opportunity costs in action: What's a warehouse worth?

The reality of opportunity costs helps explain why so few paper processors are willing to warehouse recycled paper until markets and prices for paper improve. If recycled commodity markets are volatile – and they are – why not simply wait out the down cycles and cash in when prices improve? The answer lies partly in opportunity costs. Warehouse space is valuable. In North Jersey, it can easily rent for $5 per square foot per year. For the owner of a 50,000-square-foot warehouse, that means forfeiting more than $20,000 every month waiting for prices to improve.

Then there's the risk factor in playing the markets. No one can guarantee when and where market prices will go, so renting the space may not only be more lucrative, but less risky as well.

Finally, there's the cash flow issue. Paper sitting in a warehouse does not pay the bills. Selling the paper today allows you to invest the proceeds and earn a return. Holding recycled paper, like holding any other asset, means forfeiting that return until you sell it. Inventory is expensive in many ways, and most of the expenses are related to opportunity costs.

Full cost accounting

Having identified all these different kinds of costs that behave in so many conflicting ways, how can you calculate the cost of a recycling program? Over the past decade, a rising number of voices have been answering that question with three words: full cost accounting, or FCA.

In truth, full cost accounting can really be reduced to one word – accounting. The principles and practices of FCA now being applied to solid waste management are essentially the tools accountants have used for decades to record and report costs. It's not the accounting that has changed – it's the people doing the accounting. The U.S. Environmental Protection Agency has been promoting a move to full cost accounting because many publicly-funded solid waste programs have been unintentionally underpricing their services. Their accounting systems did not reflect the full costs of providing solid waste management services. That means that recycling coordinators, solid waste planners, public works officials, custodians and even elected officials are being asked to learn the language and tools of accounting, so they can make more informed solid waste management decisions. In its succinct and useful guide, *Full Cost Accounting for Municipal Solid Waste Management: A Handbook* (cited in the reference section of this manual), the EPA defines FCA as a "systematic approach for identifying, summing and reporting the actual costs of solid waste management."[2]

FCA is based on some core principles that differ from the cash-based accounting systems that many public agencies use. A cash-based system is much like a checking account: revenues go in, costs come out, and what's left at the end of the month or year is a surplus or deficit. Pretty straightforward. It's also the way the world works. You can't pay bills without money in the account, so cash flow is the lifeblood of all organizations, and managing cash flow has to be a financial priority. It may not be the most accurate reflection of costs, however. Many big-ticket costs, such as buildings and equipment, may require a one-time payout, but are used over many years. In these cases, cash flow accounting poorly matches outlays of cash with actual costs.

FCA, on the other hand, does not focus on when money comes in or comes out. Instead, it tries to assign revenues when they are earned and costs when they are incurred – regardless of when the money actually changes hands. That simple change can translate to some substantial changes in reported costs. Rather than using cash-flow accounting, FCA relies on "accrual accounting," which assigns costs to the time period in which their benefits accumulate, or "accrue." Converting from cash-flow accounting to accrual accounting requires converting outlays (the money that comes out of your account) into costs.

Costs versus outlays

What is the difference between a cost and an outlay? It depends on the kind of cost. And for the purpose of full cost accounting, let's revisit a few costs: operating costs, capital costs and overhead costs – and introduce a new one, hidden costs.

Operating costs

Operating costs are regularly recurring costs that are consumed or used over a short period, usually less than one year, and are routinely incurred for ongoing operations. For most service operations, salaries, wages and benefits are usually the largest component of operating costs. Other operating costs include rent or lease payments, routine maintenance costs, utilities, fuel, supplies and interest payments. All these expenses have one thing in common: They are paid for (with an outlay) in the same period they are consumed. The monthly payroll outlay gives you the services of your staff for the month. The outlay for an annual lease payment provides access to that space for the year. The outlay for an interest payment each month allows you to "use" that principal for another 30 days. For full cost accounting purposes, therefore, outlays are the same as operating costs because the outlay and the cost occur in the same period.

Capital costs

That story changes with big-ticket items, such as equipment and buildings, that have an expected life span of several years, or even several decades. In these cases, you might spend $120,000 to buy a truck in one year, but you expect to "use up" that asset over seven years, or more. In this case, outlays no longer equal expenses. A cash accounting system will record that truck expense as $120,000 in the first year and $0 for each of the next six. FCA instead tries to match the cost with its actual use by employing **depreciation,** a method of allocating costs over the useful life of a long-term asset. Depreciation uses three variables – purchase price of the asset, expected useful life of the asset, and estimated salvage value at the end of its useful life – to calculate an annual depreciation cost. There are several different depreciation methods, but the most common and simple method is straight-line depreciation. The formula for straight-line depreciation is:

$$\frac{\text{Purchase price} - \text{salvage value}}{\text{Useful life}} = \text{Annual depreciation cost of asset}$$

For our truck, which has a projected useful life of seven years and an estimated salvage value of $15,000, the annual depreciation cost would be:

$$\frac{\$120{,}000 - \$15{,}000}{7 \text{ years}} = \$15{,}000 \text{ per year truck expense}$$

Capital costs include more than buildings and equipment. Up-front development and design costs, such as graphic arts and signs for recycling programs or the cost of purchasing recycling containers, can be depreciated as well. There are some notable exceptions to the depreciation rule. First, to be depreciated, an asset must have a "material" cost to the program it serves. This rule saves us from depreciating low-cost items like hammers and nails, which may have a useful life of more than one year, but are simply too small to make a "material" difference in our annual costs. Second, land is not depreciated because, unlike a truck or even a building, the value of land is not "used up," according to the principles of FCA.

Overhead costs

Overhead costs are indirect costs required to run any kind of organization, and they are quite often underestimated by the people who rely on them. They are costs that cannot be directly related to any one product or service, yet without the support of these indirect costs, most operations would break down immediately.

As demonstrated in *What's the big deal about overhead costs?*, working without overhead support is no way to do business. These services can and do

What's the big deal about overhead costs?

To understand how and why overhead costs need to be included in cost calculations, try starting your day this way.

Get rid of your phone. No one is paying for the monthly service anymore. You'll have to take all your messages – and complaints! – in person. Turn off the heat and lights in your building. In fact, leave the building and stand out in the street. If you have any mechanics, tell them to leave, too, because your organization no longer owns or rents any property. Don't worry, there won't be any maintenance department anymore. Lose the ability to write checks to anybody, including paychecks for you and your staff. And if you want cash to buy anything, raise it or collect it yourself because there won't be any billing or collection department anymore. Be sure to pick up after yourself and consider learning a martial art because the grounds, custodial and security staff are gone.

Now – do your job just as well as you do it now!

add to the cost of delivering services, and to ignore them is to seriously underestimate the full cost of service. And, as was demonstrated on page 20 with *A few overhead costs*, these can add up. In some service organizations, the indirect cost rate can run as high as 70% of the direct cost of service (which translates to about 40% of total costs), although several studies have estimated the rate near 20% for solid waste management organizations.

Slicing the overhead pie

Once all overhead costs have been identified, they must be allocated to the different departments or activities within an organization. These costs can be allocated many ways, but they all boil down to the same basic question: How big is your slice of the organizational pie? You can answer that question using many variables, but here are three common ones.

- People – how many in your department compared to the whole organization?
- Money – how big is your budget compared to the whole organization?
- Space – how many square feet do you occupy compared to the whole organization?

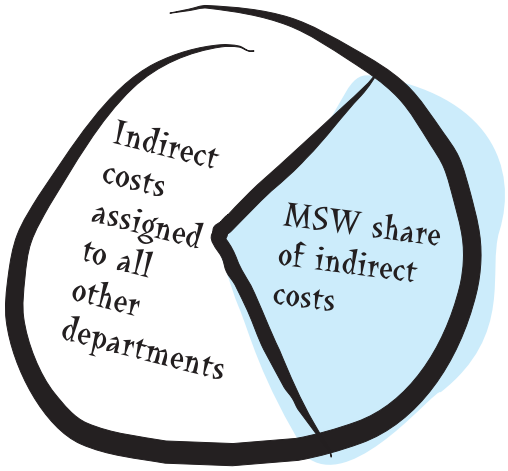
Using budget totals as the basis for allocation, the following formula can be used to calculate a recycling program's share of indirect costs:

$$\text{Percentage of indirect costs to be allocated to recycling program} = \frac{\text{Annual recycling budget}}{\text{Total budget} - \text{indirect costs}}$$

$$\text{Using personnel, the calculation would be} = \frac{\text{Number of recycling personnel}}{\text{Total personnel} - \text{staff from indirect costs units}}$$

$$\text{Using space allocation, the calculation would be} = \frac{\text{Space allocated to recycling program}}{\text{Total office space} - \text{space allocated to support units}}$$

All three methods start with the total organization costs and subtract the resources used by the support units. That leaves the direct costs, personnel or space used by all programs, and the percentage simply reflects the recycling program's share of those direct costs. That percentage is multiplied by the total indirect costs to arrive at the indirect cost dollars to be assigned to the solid waste management unit.



Calculating your share of overhead costs

This example uses numbers from a Union County municipality.

The recycling unit reported direct costs of $331,045. That was 4.94% of the town's direct program expenses of $6,696,145. The town's overhead costs were $1,538,769. (Overhead units were identified as Administrative & Executive, Building & Grounds, plus three financial units – Treasury, Tax Collection and Tax Assessor – that provide and collect the revenue for the entire organization.)

So, recycling's share of the town's indirect costs is 4.94% of $1,538,769 or $76,074.

The total recycling budget for this program was:

$76,074 = 4.94% of $1,538,769 = recycling's share of indirect costs

$331,045 = recycling department's direct expenses

$407,119 = total cost of recycling

Future costs

With recycling programs under scrutiny all over the country, it seems untimely, if not cruel, to begin asking them to include overhead costs in their cost of service. Untimely, perhaps, but accurate. Failing to include overhead costs understates the cost of any operation, not just recycling. In fact, the EPA drive towards full cost accounting was motivated in part because many communities were seriously underpricing their landfill space by focusing on the cash outlays during the operating life of the landfill. This pricing looks fine during the short-run while the landfill is accepting garbage, but ignores the substantial up-front costs of siting, designing and building the landfill, and the costly functions of capping, closure and post-closure maintenance and monitoring.

Because this manual is designed for recycling coordinators, it does not discuss the issue of allocated future costs associated with solid waste disposal facilities, such as post-closure costs. However, the EPA's *Full Cost Accounting for Solid Waste Management: A Handbook* addresses this issue.

Hidden costs

Full cost accounting includes one more cost category that many recycling managers are happy to leave uncovered: hidden costs. Hidden costs are rarely ever really hidden – they're just camping out in someone else's ledger. Grants, gifts, donations and subsidies are prime examples of hidden costs that may serve to understate the total cost of a program. For example, a recycling coordinator under pressure to demonstrate the cost-effectiveness of his or her program may be understandably reluctant to include equipment bought from grant funds or the difference between a low-interest loan and the market interest rate. The rationale for including these costs, however, is to accurately reflect the cost of service, and to avoid making future decisions based on numbers that are skewed by hidden costs.

Full cost accounting for recycling crews

Estimated cost for one-person recycling crew		Annual cost	
Operating costs			
Labor			
Direct labor @ $15/hour		$31,200	
Backup labor for 30 days (11.5% of work year)		$3,588	
Crew leader @ $20/hour — 10% of leader's time per crew		$4,160	
Mechanic @ $17/hour — 20% of mechanic's time per crew		$7,072	
Recycling coordinator @ $17/hour — 20% of time per crew		$7,072	
Labor Subtotal			*$53,092*
Fringe benefits @ 35% of labor subtotal		$18,582	
Fringe benefits subtotal			*$18,582*
Vehicle operation & maintenance			
Replacement parts		$5,000	
Fuel & fluids		$6,500	
Insurance		$5,000	
Licenses & taxes		$1,000	
O&M for backup vehicle		$1,750	
Vehicle operation & maintenance subtotal			*$19,250*
Other operating expenses			
Employee training		$1,000	
Direct supplies	$3,800		
Promotion/education @ $2.50 per household		$12,500	
Other operating expenses subtotal			*$17,300*
Operating expenses subtotal			*$108,224*

This cost breakdown can be replicated with the worksheet in Appendix E.

Full cost accounting for recycling crews, cont.

	Annual Cost
Capital costs	
Item: collection vehicle	
Purchase price — $120,000	
Useful life — 7	
Annual depreciation — collection	$17,143
Item: backup vehicle — 1 for every 10 crews	$1,714
Item: pick-up truck — 1 for every 10 crews	
Purchase price — $21,000	
Useful life — 3	
Annual depreciation — pick-up truck	$700
Item: containers — 1 per household	
Purchase price — $10	
Useful life — 10	
Annual depreciation — containers[1]	$5,000
Capital costs subtotal	*$24,557*
Direct costs subtotal	*$132,781*
Overhead costs	
Indirect & overhead costs @ 25% of direct expenses[2]	$33,195
Overhead costs subtotal	*$33,195*
Grand total	**$165,977**
Cost per day	**$638**
Cost per hour	**$80**

[1]Crew serves 5000 households (500 per day) with biweekly collection.

[2]Overhead costs are based on published estimates from the Solid Waste Association of North America and National Solid Wastes Management Association. Costs included are building, utility, furniture, management, financial and custodial.

Even honest attempts at quantifying externalities can produce

Exactly how full is full cost accounting?

It is not entirely clear just how full full cost accounting should be. Both this manual and the EPA guide for solid waste managers include the operating, capital, future, overhead and hidden costs already discussed. They do not include larger social and environmental costs.

The EPA's *Full Cost Accounting For Municipal Solid Waste Management: A Handbook* defines environmental costs as "the cost of environmental degradation that cannot be easily measured or remedied, are difficult to value, and are not subject to legal liability." Environmental costs include issues such as depletion of non-renewable resources, energy use, and upstream and downstream environmental impacts (for example, impacts incurred in the manufacturing and decommissioning of solid waste equipment, or in the potential for groundwater contamination 100 years from now).

In 1998, for example, the EPA published estimates for recycling's role in reducing greenhouse gas emissions. The study noted that recycling reduces greenhouse gas emissions by consuming less energy than manufacturing products from virgin materials, producing less methane than landfilling waste, and by permitting carbon to remain stored in trees for longer periods. Increased recycling and source reduction "can make a significant contribution to U.S. greenhouse gas emission reduction," the study found.[4]

Economists often refer to these issues as "externalities" because their costs are not included, or "internalized," in market prices. Accounting methodologies for these costs have not been standardized, and even honest attempts at quantifying them can produce widely different results. These costs may be hard to count, but New Jersey's solid waste policies do recognize that recycling provides larger economic and environmental benefits than landfilling or incineration.

Social costs produce similar quantification problems. For example, what price do you place on odors by disposal facilities? What is the dollar impact on property values, on community image or pride? How do those costs compare with increased investment and job opportunities generated by those facilities? And how do you account for costs of a solid waste management system that fall most heavily on certain groups, such as those immediately surrounding a facility (or at least within nose-shot of it), while its benefits are widely distributed around a region? Host-community taxes, in which a community is compensated for agreeing to site a solid waste facility, begin to address only a few of these questions.

Like some of the larger environmental costs, these social costs are challenging to identify and quantify. They are often included under the term True cost accounting, which seeks to place a dollar value on these externalities that are not reflected in market prices. However, unlike traditional accounting, which is governed by rule-making bodies, true cost accounting has no standard methodology for putting a price on these wider cost questions.

Finally, full cost accounting, as defined in this manual, does not examine the issue of economic impact or economic multipliers for recycling or other solid waste management options. Several studies have quantified the economic development benefits of recycling.[5] Burying and burning garbage generally require fewer employees than processing and upgrading recyclables, so diverting each ton to a processing facility or end-user helps create jobs, according to a study of the economic impact of recyclables in the Northeast. However, if recycling also increases the cost of solid waste management, this cost – and its multipliers – must be weighed against the benefit of increased employment.

The only sure way to capture the full extent of these larger benefits is to design a system that reduces the total cost of solid waste management. That is why this manual focuses on reducing the cost of delivering those services.

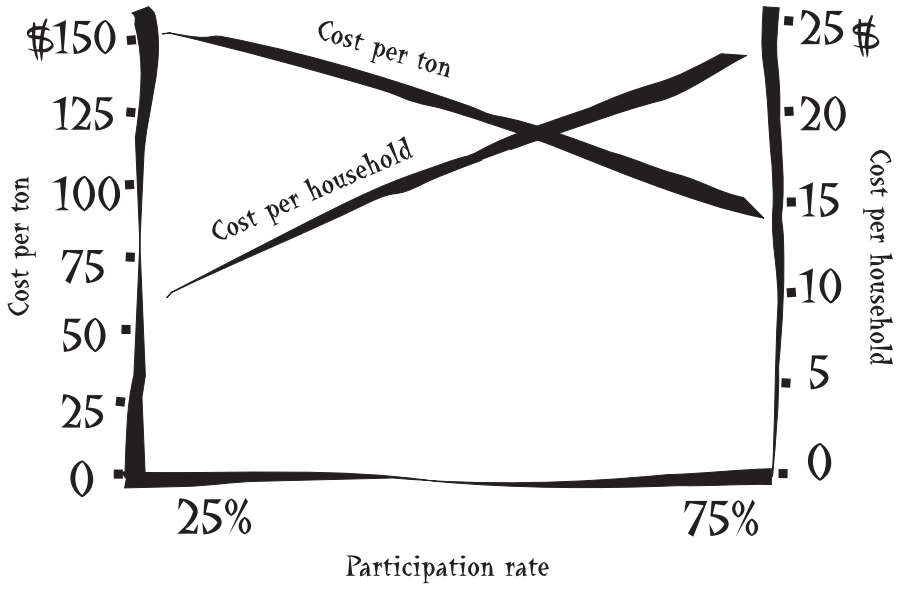
The way you measure costs can tell seemingly different stories about program performance.

Cost benchmarks

Debates over the cost-effectiveness of recycling often escalate into philosophical questions about free markets versus government intervention. In reality, the economics of recycling can boil down to some pretty mundane issues, such as how long an employee takes to load a recycling bin or how many extra stops a garbage crew can squeeze into a work day. In New Jersey, recycling can be, but is not guaranteed to be, more cost-effective than landfilling or incineration. It requires an integrated solid waste management that captures savings in garbage collection and disposal wherever they are created by increased recycling.

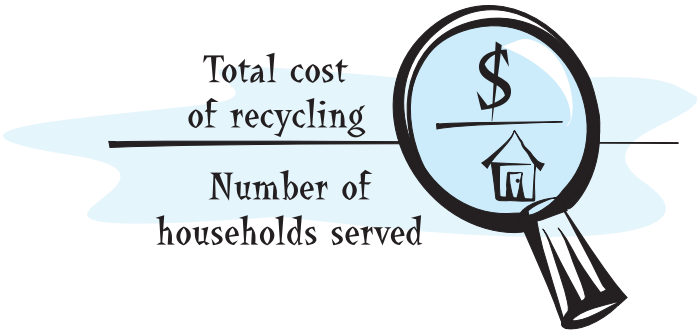
Residential recycling programs also face a frustrating cost paradox: The way you measure costs can tell seemingly different stories about program performance. For example, increasing the amount of material collected from each household is a proven strategy to reduce the per-ton cost of recycling. That makes sense: Spreading fixed costs over more tons reduces your cost per ton. However, adding new materials to increase tonnage per household also tends to increase the per-household cost of recycling. As more households set out more material, collection crews may require more loading time at each stop and additional trips to the processing facility as trucks fill up more quickly. That means more labor time is required for each household on the route – and labor is usually the largest cost category in service operations like recycling. So the same strategy that drives down a program's cost per ton may increase total costs and cost per household.

Costs and participation



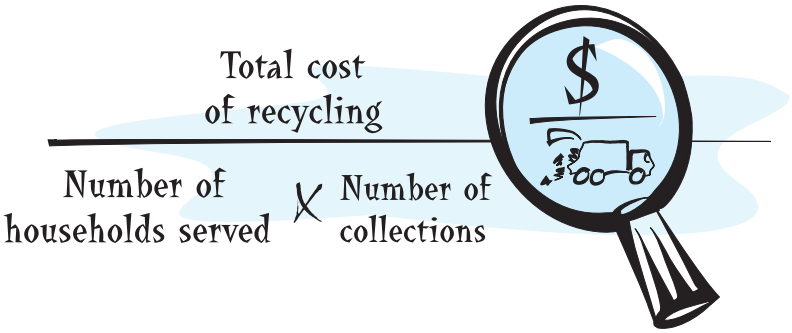
Source: NSWMA

This is just one example of the behavior of recycling and solid waste costs. That's why it's useful to gauge recycling program performance with more than one benchmark. The following seven cost benchmarks reveal important information about the efficiency of a recycling program.



1. Cost per household

Public sector recycling coordinators like this benchmark for two reasons. First, it gives taxpayers a rough measure of how much it costs to be served. Knowing the cost per ton, in contrast, has little meaning to the average consumer. Second, cost per household for recycling collection is often cheaper than cost per household for garbage collection. It should be, because recycling collection is often less frequent than garbage collection, and recycling programs almost certainly collect fewer tons. When the frequency of collection is different for recycling and garbage collection, a more accurate measure might be cost per household per collection. This number essentially is the cost of a house call made by a collection crew and truck. It is calculated as follows:



Cost per household has its drawbacks. Costs can appear to be lowest when a program is operating at horrendous levels of inefficiency. The *Costs and participation* graph, based upon a national recycling cost study, showed that cost per household increased from $11 at a 25% participation rate to more than $23 at a 75% participation rate. Taken to its ridiculous extreme, this means a recycling program would achieve its lowest cost per household if no one participated! Crews would never have to leave the truck; they would simply drive by each household. Successful programs may show steadily increasing per household costs precisely because they are attracting more households to

recycling and recovering more material from each household. For most operations, rising per-unit costs are a sign of concern. In the case of recycling, however, rising per-household costs could mean your program is more cost-effective than ever.

2. Cost per ton

The cost-per-ton benchmark is often cited in reports on recycling costs, particularly in comparison with garbage collection and disposal. Although the math is straightforward, you do have options in calculating the figure. The basic formula is:

Total cost of recycling could be reported with or without revenue from recyclables. Your best move is probably to calculate both numbers. Because recycling markets are notoriously volatile, wild price swings can hide the basic costs of collection and processing. For comparison with garbage collection and disposal, the more accurate number should include revenues (or costs paid to "market" recyclables). However, to compare year-to-year progress of your own program, cost per ton without revenues is a better yardstick for cost efficiency.

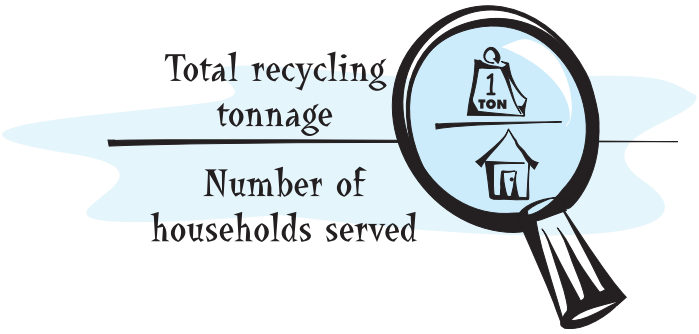
Because garbage tipping fees are usually based on tonnage, cost per ton provides a rough measure to compare the costs of yard waste or recycling with garbage collection and disposal. Slavishly following cost per ton, however, has serious drawbacks.

First, cost per ton is a weight-based measure in a volume-based solid waste world. Landfill space, truck capacity, dumpster sizes, and household garbage and recycling bins are measured in cubic yards or gallons, both measures of volume. Because cost per ton is a measure of weight, it can be difficult to compare to these volume-based standards.

Second, cost per ton is an average cost, so it tells you little about the nature of your costs. Analyzing program options requires information about marginal costs, the costs that will change as your operation changes – they are buried in average cost calculations, such as cost per ton. In fact, making decisions based on average cost per ton numbers could cause you to cut programs that are cost-effective (see *The paradox of marginal costs* in the first part of this chapter).

3. Tonnage per household

This is one of the core measures of how much you're really recovering with your recycling program. It is calculated by:



The math on this one is easy. The hard part is ensuring that the recycling tonnage in the top of the fraction (the numerator) is matched correctly with the people in the bottom of the fraction (the denominator). Including tonnage not generated by the people served by your program distorts the number, making it meaningless for any useful analysis. One example is including tonnage from a road construction project in calculating tonnage per household. How much road asphalt does the average resident generate? Including recyclables that are not generated by households served by a recycling program can produce impressive, but absurdly inaccurate, numbers.

To avoid this problem, do some simple, and not particularly scientific, sampling of your recycling and garbage trucks. You should weigh trucks or dumpsters only after they have served a homogenous customer group. For example, if your curbside collection program also collects from local restaurants and bars, their tonnage may badly skew your average for glass. Instead, periodically have your crew count the number of households (both the total on route and the number with set outs) and stop to weigh their loads before collecting from businesses.

Measuring multi-family recycling costs

The U.S. Conference of Mayors conducted an extensive survey of multi-family housing recycling, and its 1998 report found the same relationship between costs and diversion that most curbside programs experience. As diversion rates rise, a program's cost per ton falls and its cost per household increases.

The average per ton cost of collection was $251 in communities with diversion rates of less than 10%. That figure dropped to $113, or more than 55%, in communities with recycling programs that diverted more than 20% of the waste stream.

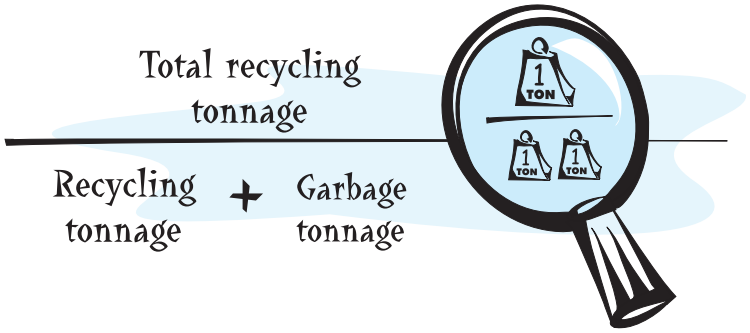
Per household recycling collection costs, meanwhile, were more than 31% higher in communities with recycling programs diverting more than 20% of waste compared to those diverting less than 10%.

Tonnage per household can help compare a program to itself. On average, are you recovering more material from each household compared to prior years? Did adding a new material to your program or introducing a new educational campaign have a marked impact on how much was recovered from each household? Did your total tonnage increase simply because your program served more people or because you recovered more material per customer served?

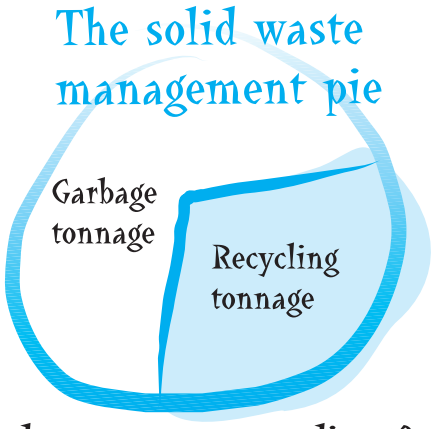
4. Recovery rates, also known as diversion rates

This calculation is probably the most accurate measure of your recycling rate. It answers the question: how big a slice is my recycling program cutting out of the whole solid waste management pie? It is calculated as follows:

The critical question here is: exactly which pie is being sliced? The easiest way to report high recycling rates is to include heavy materials, such as construction and demolition waste, or scrapped autos or exceptional items, such as soil recovered from a site remediation project. Some of the heavy materials may never have been headed to a landfill in the first place.



From a cost perspective, the more important number, however, measures how much waste your recycling program is actually diverting from a disposal facility. For most curbside programs, diverting 35% of a household's weight without including yard waste, or 45% including yard waste, is a truly impressive feat simply because of the composition of waste produced by the average household.



How much does your program divert?

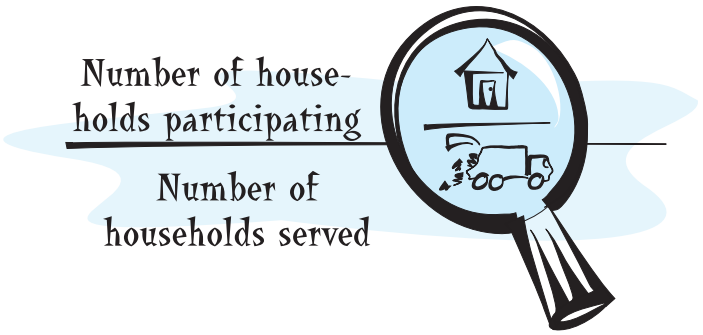
In contrast, an office building recycling program might routinely reach rates above 70% simply because paper and cardboard account for two-thirds to three-fourths of the waste produced by the average office worker. New Jersey has set a goal of recycling 50% of the municipal solid waste stream and 65% of the total solid waste stream by 2001.

For a residential program, the recovery rate may be the most accurate estimate of the percentage of total solid waste being recycled. For large, multi-family buildings, it may be the only reliable way to estimate a recycling rate.

5. Participation rates

This could be the most widely quoted and least accurate statistic on the market. It is almost impossible to measure reliably.

The math, of course, is easy. For a community program, divide the number of households participating in a recycling program by the number of households served. No problem there.



To calculate this rate, you'll need to count households. As crews run through their collection routes, someone must record the number of households with set-outs. That number, however, tells nothing about *how much* these people are participating. For instance, a curbside program might collect six materials that combined should equal about 35% of household solid waste by weight. Yet, a household would be counted as participating even if it only set out bottles and cans totaling less than 10% of its weekly garbage generation.

Estimating participation rates for large multi-family units, or for depot sites, is even more sketchy, unless you maintain a reliable log of users, which is difficult for unstaffed sites. Because the participation rate reveals no information about the level of participation, you need tonnage per household as well to generate meaningful information.

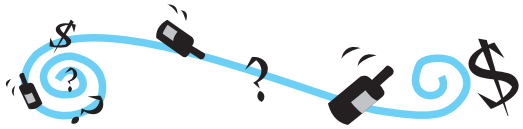
6. Compliance rates

Compliance rates are the flip side of participation rates. If participation rates ask "Who is playing by the recycling rules?," compliance rates tell who isn't. That answer is best found in the garbage can. Compliance rates estimate what percentage of customers are throwing recyclables away as trash. And like participation rates, this number requires you to define "compliance." If a spot check reveals junk mail throughout a household's garbage, is that "non-compliance" even though no other recyclables are found in that garbage can? Here's a larger question: "Why bother to compile this statistic?" Perhaps it is useful only if recycling tonnage is consistently running below projections or estimated rates. This might help you identify neighborhoods that are out of compliance, but spot checking garbage is a relatively labor-intensive process. Comparing tonnage per household rates for the under-performing areas might instead be the path of least resistance.

7. Stops per crew or stops per crew member

A "route audit" is the only reliable way to calculate this key measure of productivity. Here's why: As your recycling program collects more and more material, you are gradually creating opportunities to reduce garbage collection costs. As households divert more tonnage from the garbage can to the recycling bin, garbage collection crews should be spending less time at the curb (as they pick up fewer and lighter garbage cans) and less time driving to and from disposal facilities (because trucks are filling up more slowly). The flip side, of course, is that recycling crews may be taking more time at the curb and more trips to the processing facility because residents are setting out more material.

As solid waste disposal fees have dropped drastically (in some counties by more than 50%), recycling programs need to capture savings in garbage collection costs to make recycling cost-effective. Capturing those savings means serving more households per crew and per crew member on each garbage route. If you have not audited your routes by having an observer on each route as it is collected, how and where can you find those savings? The steps and information needed to perform a route audit are described in *The route audit* section at the end of this chapter.



The real cost story: On the whole, I'd rather recycle in New Jersey

So each of these seven numbers tells you something about your costs, but what's the bottom line? Is your recycling program cost-effective? Does recycling truly pay in today's markets with today's dollars? The answer is a definitive…maybe. Or put more optimistically, it can be. But it's crucial to ask the right question to arrive at the correct answer. And the right question is: Does recycling raise or lower the total cost of solid waste management? It's a simple question, but it's easy to forget. You are comparing the cost of solid waste management with and without recycling. If you can design and operate a recycling program that honestly reduces the total cost of solid waste management, you win. At that point, recycling is cost-effective in today's dollars and today's markets, and you can argue that recycling is not only the better environmental and social option, it's cheaper than landfilling or incinerating everything we discard.

And it is still plenty possible in New Jersey. Reduced landfill and incinerator prices definitely make it harder to work the numbers in recycling's favor. Disposal fees in New Jersey have fallen from highs in the range of $120 to $130 per ton to $50 to $60 per ton. But New Jersey still has some of the nation's most favorable economics for recycling, including the following factors.

The most densely populated state in the nation

That means high land costs, which drive up disposal costs. Our garbage disposal costs are still among the highest in the country, even after the declines of the late 1990s. Our population density also means lots of buyers and sellers right in our backyards, so we have a large supply of recyclables and some of the best access to recycling markets in the country.

Well-developed recycling infrastructure

Since implementing mandatory recycling, the NJDEP has cultivated the growth of recycling processors and end-users with a mix of grants, loans and directed research. As a result, recycling is a powerful industry in the state, ranking 13th in total employment when all recycling-related jobs are counted. That translates to more buyers vying for the recyclables collected by New Jersey coordinators.

A business and residential population that supports recycling

New Jersey's recycling rates are already among the highest in the nation. That's great news for the cost-effectiveness of recycling. Maximizing the amount of recyclable material collected per person is a proven strategy for reducing the per-ton cost of recycling, and it creates opportunities for reducing both garbage collection and disposal costs.

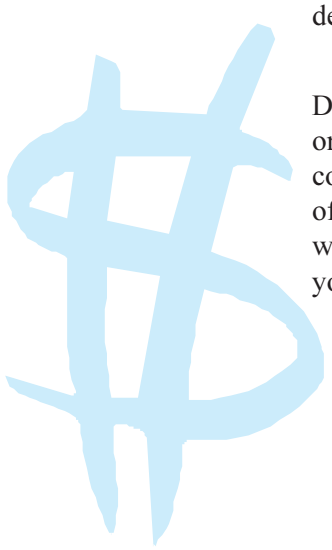
High labor costs

That sounds like a disadvantage, but high labor costs provide a greater opportunity for savings gained by reducing garbage collection costs. Those savings might come from reducing the frequency of garbage collection, or by redesigning garbage collection routes because recycling has reduced the amount of garbage set out each week. For example, a program that replaces twice-a-week garbage collection with once-a-week garbage collection and biweekly recycling collection reduces the number of monthly collection visits from eight to six. Where labor costs are high, that reduction saves more money.

The route audit: The numbers you need to reduce costs

What separates a high-cost collection program from a low-cost one? Lots of things – some you can control and many you can't. Some communities simply cost more to serve. In a rural area, where drive time between stops may be measured in minutes rather than seconds, drivers spend a lot of time just to reach the house. In a compact suburb that's long on small multi-family housing units, your crews may be able to scoop up recyclables from 10 families without moving the truck. Wage rates, too, are a major cost factor over which you may have no control. So given the hand you're dealt – local wage rates, community demographics, the materials you're required to collect – how do you measure whether your collection routes and crews are operating efficiently?

A route audit is the answer. It reveals where and how your crew's time is being spent – and where they might be able to spend less of it. Start by asking your crew; they are the experts on their routes. Where do they see the greatest delays and inefficiencies? What do they recommend to overcome them?



Next, send an observer to ride with collection crews on each route. Depending on your program, those observations should be made at two, three or four different times of the year. Obviously, New Jersey winters can affect collection times, but so can the purchasing, driving, school and vacation patterns of your residents. Just ask any recycling coordinator from a shore community, where summer populations can dwarf the number of year-round residents. Use your judgment as to how often your program needs an audit.

Data to collect in a route audit lists information to collect for each route.

Data to collect in a route audit

Truck and route information

Model and year of truck: _____

Truck ID or license number: _____

Capacity: _____

Number of compartments: _____

Material collected and capacity per compartment:

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

Contents of vehicle at start of shift: _____

Crew size: _____

Frequency of collection: _____

Total length of route: _____

Odometer at first stop: _____

Odometer at last stop of first load, if one load: _____

Odometer at MRF: _____

Odometer at return to route (for second load): _____

Odometer at last stop of second load: _____

Odometer at return to route: _____

Odometer at return to garage: _____

Observed route statistics

Total number of stops on route: _____

Single family: _____

Multi-family: _____

Commercial/non-profit: _____

Total number of stops with set outs: _____

Single family: _____

Multi-family: _____

Commercial/non-profit: _____

Total number of items collected: _____

Single family: _____

Multi-family: _____

Commercial/non-profit: _____

Number of stops served first load:

Single family:

Multi-family:

Commercial/non-profit:

Number of stops served second load, if more than one:

Single family:

Multi-family:

Commercial/non-profit:

Tonnage for first load:

Tonnage for second load:

Key time statistics (in minutes)

Length of work day:

From start of work day to leaving for route:

Drive time to first stop on route:

Drive time to marketing facility:

First load:

Second load:

Total unloading, weighing and turnaround time at market facility:

First load:

Second load:

Lunch and break time:

Compaction or compartment adjustment:

Refueling:

Breakdowns or unscheduled delays:

Other (clean up of spillage or breakage, customer interaction, etc.):

At garage at end of work day:

Time available for collection:

Calculations

Average collection seconds per stop:

Single family:

Multi-family:

Commercial/non-profit:

Average number of items per set out:

Single family:

Multi-family:

Commercial/non-profit:

How to analyze and use route audit information

Armed with the results of your audit, how do you identify cost savings? The audit tells a minute-by-minute story of how your crew spends its day. Turning spare minutes into saved dollars is the goal.

Maximize a crew's collection time

This requires minimizing time spent on all other uses of a crew's time. Start with the beginning of the work day. How quickly is the crew out of the yard and on the route? How much time is spent on travel to the MRF? At the MRF? How many times does the truck fill up and which compartments are filling up first? Can extra truck capacity reduce a second or third load, and how much time will that save? How much time is spent traveling between stops? Can it be reduced with new routes that better match local traffic and street patterns? How much time is spent at your facility at the end of the work day?

Alone, each of these items may not account for much time, but taken together, these lost minutes quickly can add up to unproductive hours in a work week. But they are hard to find without the specific, accurate information a route audit provides. The payoff can be huge: one county recycling program identified more than $240,000 in annual labor savings by getting crews out more quickly to their routes.

Maximize the number of households collected per crew member

In high-wage areas, low-cost programs tend to maximize labor productivity by minimizing the amount of time each crew member spends collecting from each customer. At the curb, the economics of recycling is all about seconds per stop. For example, one New Jersey county estimated it could save more than $30,000 per year simply by reducing average collection time by 1.6 seconds per stop.

Improving crew productivity has been the primary driver for improvements in vehicle design and capacity. Productivity is not all about trucks, however. Management can be a more important factor. In fact, a comparison of high and low-cost solid waste collection programs around the country found that organizational structure and management "accounted for the majority of the differences between highest and lowest cost service providers."[7] The same study found that low-cost programs invested the time and money required to keep collection crews well-trained.

Increase participation and amount of material collected per stop

You have already invested equipment, staff and organizational support to collect recyclables. One way to increase the return on that investment is to collect more recycled materials. That happens as your fixed costs are spread out over more tons of recyclables. As noted in the *Cost benchmarks* section of this chapter, increasing the amount of recyclables collected should reduce the cost per ton of recycling, but it also has the nagging tendency to increase the cost per household. Remember too – and this is key – that as you collect more recyclables from each household, you should be collecting less garbage. And if you're collecting less garbage, you should be looking for ways to reduce garbage collection costs (by serving more customers with the same crew, for example.)

As you can see, the strategies for reducing recycling collection costs are hardly earth shattering. They are:

- minimize unproductive time
- collect materials as quickly as possible
- if you're going to the trouble to make house calls, increase the amount you collect at each stop

Notes: