

US EPA ARCHIVE DOCUMENT



Full Cost Accounting for Municipal Solid Waste Management: A Handbook





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About This Handbook

EPA developed this *Handbook* to help you implement full cost accounting (FCA) in your community. The *Handbook* will help you better understand the costs of the municipal solid waste (MSW) services you provide, answer key questions you might have about FCA, and guide you through the implementation process. You'll learn how to assemble necessary data, calculate full cost information from the available data, and report the results of your FCA analysis to government officials and residents. Case studies, presented in boxes throughout the *Handbook*, provide snapshots of how other communities across the country have implemented FCA and are reaping its rewards. Key terms and concepts are italicized on first reference, and their definitions are included in the Glossary.

This *Handbook* can answer only some questions about FCA. Because of the diversity of accounting practices and rules and differences in the size and nature of local government MSW programs, there is no single recipe for success. Rather, the goals of this *Handbook* are to introduce key FCA terms and concepts and to prepare readers for the types of issues that will likely arise in conducting FCA. The *Handbook* does not try to present step-by-step "how-to directions" on initiating an FCA system. It also does not provide detailed instructions for handling all issues that are likely to arise or recommend particular forms to use in compiling and reporting FCA for MSW. While economic concepts, such as fixed and variable costs, are illustrated in Chapter 5, the *Handbook* does not attempt to demonstrate how to apply economics to integrated solid waste management system decisions.

This *Handbook* focuses on costs that are relatively easy to value in the marketplace. Other important costs that decision-makers and planners might want to consider include potential liability costs for property damage or personal injury, costs of remediating potential future releases, social costs, environmental externalities, and upstream and downstream life-cycle costs. This *Handbook* defines and describes these costs, but does not explain how to value them or incorporate them into decision-making. Consideration of the full spectrum of costs can be called "true cost accounting," which is beyond the scope of this *Handbook*.

This *Handbook* is a first step toward helping you understand the costs of MSW management in your community. It builds on local government experience with FCA and reflects input EPA has solicited from a diverse national peer review group. EPA welcomes comments on the *Handbook*, as well as information about how using FCA has helped your community. Comments should be submitted to the RCRA Hotline at 800 424-9346 or TDD 800 553-7672. In the Washington, DC, area, call 703 412-9810 or TDD 703 412-3323. The Hotline is open Monday through Friday, 9:00 a.m. to 6:00 p.m., Eastern Standard Time.



Introduction

Full cost accounting (FCA) is a systematic approach for identifying, summing, and reporting the actual costs of solid waste management. It takes into account past and future *outlays*, *overhead (oversight and support service) costs*, and *operating costs*. Knowing the full costs of municipal solid waste (MSW) management can help you make better decisions about your solid waste program, improve the efficiency of services, and better plan for the future. FCA can help you compile the detailed cost information you need to understand what MSW management costs and to communicate these costs to the public.

As of July 1997, four states (Florida, Georgia, Indiana, and North Carolina) require local governments to use FCA in reporting MSW costs to citizens. In addition, the Texas Natural Resource Conservation Commission developed an FCA workbook to help municipalities determine rates that reflect the full cost of providing solid waste services. Many localities in other states are also applying FCA concepts and are finding them important and useful tools to help manage their solid waste programs.

FCA can be a new way of thinking about MSW management for some communities. For others, it can be simply an extension of current management practices. Understanding the benefits of FCA can help ease its implementation in your community. FCA can help you:

- **Identify What MSW Management Costs.** When municipalities handle MSW services through general tax funds, the costs of MSW management can get lost among other expenditures. Even if an effort is made to identify solid waste costs, it is easy to overlook some of them. You can have more control over MSW costs when you learn what those costs are.
- **See Through the Peaks and Valleys in MSW Cash Expenditures.** Using techniques such as depreciation and amortization, FCA produces a more accurate picture of the costs of MSW programs, without the distortions that can result from focusing solely on a given year's cash expenditures.
- **Explain MSW Costs to Citizens More Clearly.** FCA helps you collect and compile the information needed to explain to citizens what solid waste management actually costs. Although some people might think that MSW management is free (because they are not billed specifically for MSW services), others might overestimate its cost. FCA can result in "bottom line" numbers that speak directly to residents. In addition, you can use FCA results to respond to specific public concerns.
- **Adopt a Businesslike Approach to MSW Management.** By focusing attention on costs, FCA fosters a more businesslike approach to MSW management. Consumers of goods and services increasingly expect value, which

FCA Helps You Meet Your Goals

FCA supports your:

- **Informational goals** by determining and reporting how much MSW management costs.
- **Management goals** by identifying potential cost savings and providing a sound basis for management decisions such as privatizing services.
- **Planning goals** by documenting current benchmarks that can be used when making or evaluating projections.

means an appropriate balance between quality and cost of service. FCA can help identify opportunities for streamlining services, eliminating inefficiencies, and facilitating cost-saving efforts through informed planning and decision-making.

- **Develop a Stronger Position in Negotiating with Vendors.** When considering privatization of MSW services, you can use FCA to learn what it costs (or would cost) to do the work. As a result, FCA better positions public agencies for negotiations and decision-making. FCA also can help communities with publicly run operations determine whether their costs are competitive with the private sector.
- **Evaluate the Appropriate Mix of MSW Services.** FCA gives you the ability to evaluate the net cost of each element of your solid waste system: recycling, composting, waste-to-energy, and landfilling. FCA can help you avoid common mistakes in thinking about solid waste management, notably the error of treating avoided costs as revenues.
- **Fine-Tune MSW Programs.** As more communities use FCA and report the results, you might be able to “benchmark” your operation to similar cases or norms. This comparison can suggest options for “re-engineering” your current operation. Further, when cities, counties, and towns know what it costs to manage MSW independently, they can better identify any savings that might come from working together.

Case in Point Indianapolis, Indiana

Indianapolis has an excellent credit rating and a solid reputation for having its financial house in order. Yet when the new mayor took office in 1992, he was amazed at what city officials did not know about their budgets. They knew that the city took in more money than it spent but did not know how much any single activity cost. While city officials could detail how much the various department budgets increased annually, they did not know how much it cost to fill one pothole or install a traffic signal.

When city officials started calculating how much it cost to pick up a ton of trash, they uncovered surprising information. They found that there were separate budgets for the garage, trucks, gas, and drivers. As a result, no one knew the full costs of providing the trash collection service.¹

FCA can complement two other practices: *unit-based pricing* (or pay-as-you-throw) programs and *enterprise funds*. Unit-based pricing programs charge solid waste generators based on how much they throw away. They can be an equitable means of recovering the full costs of solid waste management. FCA can help identify a unit pricing rate structure that will generate the revenues needed to cover the costs of providing the service. Enterprise funds are mechanisms used by local governments for activities that can be financed and operated like a private business. FCA is inherent in the concept and operation of enterprise funds, which are intended to cover program costs through a dedicated source of user fees.

FCA is not a substitute for management analysis and decision-making; it is simply a tool to use in gaining information on and reporting the costs of your solid waste program. It can help you answer questions about what certain MSW services cost and why changes to some services don't automatically result in savings on your bottom line. For example, many residents or government officials might think that an increase in your community's recycling rate should translate into a decrease in the costs of solid waste management. Depending on the costs of running your recycling program, as well as fluctuations in the market for recyclables and fixed costs of landfill disposal and waste-to-energy, recycling might or might not be saving your community money. FCA can help identify the costs of recycling, land disposal, and other solid waste services, helping you gain a better picture of the costs of MSW management in your community.



Chapter 1

Introducing Full Cost Accounting

Historically, local governments have tended to use *cash flow accounting* (also called general fund accounting) to track the flow of current *financial resources* (dollars). This accounting system records outlays when cash is actually paid for goods and services. It helps government agencies account for the expenditure of tax dollars and other public funds.

While FCA is consistent with generally accepted accounting principles, it serves different goals and audiences than traditional government accounting reports. FCA is not the same as cash flow or general fund accounting. FCA focuses on the flow of *economic resources* (assets) and accrues (i.e., recognizes) costs as resources are used or committed, regardless of when money is spent. Because solid waste management can entail significant expenditures both before and after the operating life of management facilities, focusing solely on the use of current financial resources misrepresents the costs of MSW management and can be misleading.

The Government Accounting Standards Board, in its Generally Accepted Accounting Principles (GAAP),² endorses the use of accrual accounting practices like FCA. Many cities and counties are required to conform to GAAP. Unfortunately, accrual accounting is not fully implemented or used in day-to-day solid waste management. Most local government accounting, even under GAAP, still focuses on the use of financial resources. FCA is a better measure of the costs of MSW management because it recognizes the full costs of all resources used or committed in support of operations.

Exhibit 1-1 lists the spectrum of costs associated with MSW management, along with examples. This *Handbook* focuses on three major types of costs that are relatively easy to determine:

- *Up-front costs* comprise the initial investments and expenses necessary to implement MSW services.
- *Operating costs* are the expenses of managing MSW on a daily basis.
- *Back-end costs* include expenditures to properly wrap up operations and take proper care of landfills and other MSW facilities at the end of their useful lives; the costs of post-employment health and retirement benefits for current MSW workers also fall in this category.

How FCA Is Different

An FCA report differs from current municipal accounting and reporting practices that address different goals and audiences. For the most part, local government financial statements (including enterprise fund accounting) do not focus on the flow of economic resources or use the accrual basis of accounting, which are cornerstones of FCA.

Understanding the Costs Used in FCA

These three categories together cover the “life cycle” of MSW activities from “cradle” (up-front costs) to “grave” (back-end costs).³ These costs give an accurate and useful accounting for management and reporting.

The other categories of costs listed in Exhibit 1-1 can be included in the scope of FCA, but require special consideration, as noted below. These costs are:

- *Remediation costs at inactive sites.* Many local governments have inactive MSW landfills that require “corrective action” for known contamination of ground water, soil, or surface water. These remediation costs can be relatively well estimated,⁴ though with somewhat more uncertainty than other types of engineering projects such as roadbuilding.

**Case in Point
Lafayette, Indiana**

In 1992, Lafayette and West Lafayette, Indiana, reported substantially different average costs per household for solid waste management. The difference turned out to largely reflect costs for yard waste and cleanup of a former landfill; West Lafayette included those costs in its calculations while Lafayette did not.

Including these costs in FCA is a matter of choice. Because remediation costs are real and must be paid, they can be included; moreover, they are the result of past solid waste management practices and are thus relevant. On the other hand, incorporating such remediation costs for inactive landfills, which are not strictly costs of current MSW management, could give a misleading impression of current MSW costs.

The decision to include remediation costs depends on the intended use of the FCA information. For example, if you are using FCA to document the revenue needs of an MSW program, you might want to include costs entailed by inactive sites. If you intend to use FCA to reveal the current economics (e.g., cost per ton) of current MSW management or compare your performance to other communities or state benchmarks, you might want to exclude inactive site costs from such calculations.

- *Contingent costs* are costs that might or might not be incurred at some point in the future. These costs can best be described in probabilistic terms: their expected value, their range, or the probability of their exceeding some dollar amount. Examples include the costs of remediating

Remediation Costs

Factors to consider in determining how to handle remediation expenditures are:

- Probability of occurrence
- Status of sites

| | Active Site | Inactive Site |
|--|--|--|
| Known need to remediate (noncontingent cost) | Include in FCA as operating cost | Optional (not a cost of current activities) |
| Potential future need to remediate (contingent cost) | Optional (might not turn out to be a cost) | Optional (might not arise and not related to current activities) |

Exhibit 1-1

Types and Examples of MSW Management Costs

Up-Front Costs

- Public education and outreach
- Land acquisition
- Permitting
- Building construction/modification

Operating Costs

- Normal costs
 - Operation and maintenance (O&M)
 - Capital costs
 - Debt service
- Unexpected costs

Back-End Costs

- Site closure
- Building/equipment decommissioning
- Post-closure care
- Retirement/health benefits for current employees

Remediation Costs at Inactive Sites

- Investigation, containment, and cleanup of known releases
- Closure and post-closure care at inactive sites

Contingent Costs

- Remediation costs (undiscovered and/or future releases)
- Liability costs (e.g., property damage, personal injury, natural resources damage)

Environmental Costs

- Environmental degradation
- Use or waste of upstream resources
- Downstream impacts

Social Costs

- Effects on property values
- Community image
- Aesthetic impacts
- Quality of life

unknown or future releases of pollutants, such as leaks from currently operating municipal landfills. Contingent costs also include the liability costs of compensating for as yet undiscovered or future damage to property or persons adversely affected by MSW services. Both of these types of contingent costs can be projected, but not very precisely. (In contrast, where there is a known need to remediate, costs can be projected much more precisely.) Insurance premiums for appropriate coverages, if available, could serve as surrogates for the contingent liability costs of property damage and personal injury. You will need to decide whether or not to include these elements in FCA.

- *Environmental costs* are the costs of environmental degradation that cannot be easily measured or remedied, are difficult to value, and are not subject to legal liability. Such environmental costs often are termed

“externalities” by economists. To truly capture all of the important life-cycle cost elements, some people advocate assessing the upstream (and downstream) environmental costs of resource use, pollution, and waste entailed in providing goods and services. For example, manufacturing and transporting MSW management equipment and vehicles can entail environmental impacts prior to their use, such as depletion of nonrenewable mineral resources, air and water pollution, and waste generation. In addition, downstream environmental impacts can also arise from the eventual decommissioning or ultimate disposal of the MSW equipment and vehicles. You’ll need to decide whether your FCA efforts should attempt to include environmental and upstream/downstream costs, for which widely accepted measurement and valuation methodologies do not yet exist.

- *Social costs* are adverse impacts on human beings, their property, and their welfare that cannot be compensated through the legal system. Social costs (also termed “social externalities”) are similar to environmental externalities and are sometimes grouped together under an umbrella term. Just as with environmental externalities, the costs of social externalities can be difficult to determine. While FCA focuses on costs that can be valued readily in the marketplace, understanding social costs is important for planning efforts. Social costs include the impacts of MSW transport on neighborhoods along the routes taken, as well as the impacts of MSW facilities themselves. Issues of “environmental justice” can arise for planners when any of the following fall disproportionately on certain social groups: (1) adverse effects on property values, community image, and aesthetics; (2) opportunity costs of alternative and future land uses; and (3) noise, odor, and traffic. This *Handbook* does not attempt to monetize social costs or describe methodologies for doing so, although some references⁵⁻⁷ are provided from a growing body of knowledge aimed at better characterizing and valuing these impacts.

Exhibit 1-2 lists the types of costs that can be included in FCA and summarizes the methodologies for estimating those costs.

Whose Costs FCA Can Include

When summing costs, a key question to consider is “whose costs to include?” FCA can include:

- Local government solid waste organization costs only
- All local government costs
- Costs incurred by private sector service providers not covered above
- Costs incurred by the customer base not covered above
- Residential, commercial, or all customers
- Costs incurred by volunteer and nongovernmental groups

Exhibit 1-2

| FCA Methodologies | |
|-----------------------|--|
| Cost Category | Methodology |
| Up-front Costs | Identify up-front outlays Uncover hidden costs and include oversight and support outlays Depreciate up-front outlays |
| Operating Costs | Identify operating outlays Depreciate capital outlays Uncover hidden costs Add in oversight and support outlays |
| Back-End Costs | Estimate back-end outlays Include oversight and support outlays Amortize estimated back-end outlays |
| Remediation Costs | Estimate outlays and duration; annualize |
| Contingent Costs | Estimate probability and magnitude of costs Estimate expected value; annualize |
| “Environmental Costs” | Describe environmental “externalities” Monetize (e.g., contingent valuation, damage function approach) |
| “Social Costs” | Describe social “externalities” Monetize (e.g., contingent valuation, damage function approach) |

Your state’s laws might determine which of these costs to include. For example, the Indiana FCA law requires local governmental units that provide solid waste management to calculate and report both the full and per capita costs of such services. In Indiana, costs should be included for any MSW service a community provides either directly or indirectly through contract or franchise services. Services provided independently by private companies not under municipal contract or franchise are not included.

Local Government Costs. Communities that handle MSW management through enterprise funds frequently employ a form of FCA, often defining the scope in terms of all or most local government costs, but sometimes

Case in Point Including Collection Costs in Indiana

If an Indiana town owns and operates a landfill but performs no collection services, should collection costs be included in FCA? If the town has nothing at all to do with collection, collection costs should not be included. If the town monitors the performance of private waste collection firms or otherwise expends resources to oversee collection services, then the town’s costs should be included in FCA. If the town contracts for or franchises collection services, collection costs should be included.

solely in terms of the costs incurred by the government unit responsible for MSW. State and local accounting rules and practices can strongly influence financial accounting and reporting for MSW enterprise funds.

Private Sector Costs

In many communities, the private sector provides some or all MSW services, whether independently, under contract with a local government, or through a franchise arrangement. FCA need not unduly burden such service providers. You do not need detailed, proprietary information to determine full costs. Collecting some basic service and price data should be sufficient to allow you to prepare FCA reports.

Service Vendor Costs. Where MSW services are provided independently of local governments, vendors bill or charge their customers to recover their costs and some profit. The prices set for these customers become the costs incurred by the customer base. These costs are quite clear to customers and need not be part of FCA. On the other hand, FCA can be used to describe the costs of the complete MSW system by adding local government costs to costs paid directly by citizens.

Service Customer Costs. The customer base also incurs costs not covered above that are usually not measured or valued, but could be included in FCA. These costs reflect the customers' time and materials costs of separating and preparing recyclables, putting

MSW on the curbside for pickup, and so on. Because these costs are not hidden from the customers (who incur them directly), they can be omitted from FCA, which aims to uncover costs that are not necessarily clear to customers or public officials.

Types of Customers. Another important issue is deciding whether FCA should be applied to residential, commercial, industrial, institutional, or all system customers. It can be useful to account separately for commercial, industrial, institutional, and residential customers and not combine the costs of serving such potentially different customer bases.

Costs of Volunteers. Volunteers and nongovernmental organizations also might incur costs not covered above to support MSW management. For example, many community groups (and businesses) have volunteered to "adopt" stretches of roads and highways for litter control. Volunteer help might take the form of "paper drives" or assistance at recycling drop-off centers. A community group might organize a public education campaign. (See discussion "Uncovering Hidden Costs" in Chapter 4.)

Whatever the decision, FCA reports should be explicit about their scope, both in terms of which types of costs and whose costs are included.



Chapter 2

The Scope of FCA for MSW

Many communities have discovered that integrated solid waste management (i.e., using a mix of solid waste management approaches) can minimize costs and environmental effects and maximize recovery and conservation of energy and materials. No single solid waste management approach is perfect. Some waste cannot be successfully recycled, composted, or converted to energy. In addition, some waste will always need to be landfilled, along with any residues from recycling, composting, and waste-to-energy (WTE). Communities using integrated solid waste management can use FCA to communicate the costs of different MSW approaches.

This *Handbook* distinguishes between two ways of disaggregating the entire MSW system. You can focus on the various *activities* that are the building blocks of the system or the *paths* that MSW follows in the course of integrated solid waste management (i.e., point of generation through processing and ultimate disposition). Both the “path” and “activity” ways of looking at MSW costs can be useful. Because these two perspectives share common terminology, it is important to be explicit in presenting FCA data so that users understand the costs of different services. MSW activities include:

- Waste collection
- Operation of transfer stations
- Transport of waste from transfer stations to waste management facilities
- Waste processing and/or disposal at waste management facilities
- Any sale of by-products

MSW paths are cross-cutting components of the solid waste system. Four primary solid waste management paths are:

- Recycling
- Composting
- Waste-to-Energy
- Land disposal

Understanding the costs of each MSW activity often will be necessary for compiling the costs of the entire system and helps you evaluate whether to provide a service yourself or contract out for it. Understanding the full costs of each path is an essential first step in discussing whether to shift the flows of MSW one way or another.

The Complete Job of Solid Waste Management: MSW Activities and Paths

Exhibit 2-1 presents a generic flow chart illustrating how solid waste management is composed of activities and paths. Activities appear as boxes organized in five rows on the flow chart. Because source reduction keeps MSW from entering the management system, it is not included as an activity in Exhibit 2-1. Source reduction also does not appear as a path in Exhibit 2-1 because it reduces the amount of MSW that flows along the paths shown. The costs of source reduction activities, however, should be recognized in FCA. Exhibits 2-2 through 2-5 illustrate the four solid waste management paths.

Note that recycling, composting, and WTE paths all rely, in part, on land disposal of their residues, if any. Activity costs for land disposal, therefore, should be allocated to MSW paths in proportion to each path's contribution of waste for disposal. For example, in calculating the costs of the composting, recycling, and WTE paths, each path should be assigned the waste disposal activity costs entailed by the residues each sends for landfilling. (This means that the full costs of the landfilling path might be less than the full costs of the landfilling activity.) Other shared activity costs, such as collection, transfer, and transport, also should be assigned fairly to waste paths in proportion to the weight or volume of MSW headed in each direction.

Typically, local governments focus on the costs of the component activities of solid waste management, such as collection and disposal. Accounting systems might even be set up to record expenditures separately for these different MSW activities. Additionally, deciding whether to privatize or outsource services can depend on good cost accounting on an activity basis. However, in considering changes to the level of MSW activities—which affect how much MSW ends up being recycled, composted, converted to energy, or landfilled—you should focus on the costs of the different MSW paths, including all their component activities. The economics of recycling, composting, WTE, and disposal paths are strongly affected by the costs of collection, transfer, and transport.

Exhibit 2-6 shows the relationship between MSW activities and paths. The checks indicate those activities that are inescapable parts of MSW paths, but all the other cells are potentially part of a given MSW system as well. Paths include the cost of managing waste from the point of generation through processing and ultimate disposition. For example, a land disposal path can include costs from mixed waste collection, transfer station, transport, landfill and by-product sales activities. A recycling path might combine activity costs from curbside collection for recyclables and/or a drop-off recycling center, a materials recovery facility (MRF), and a landfill for disposal of nonrecyclable residues. Analyzing paths allows you to evaluate costs and revenues associated with individual waste management options and their respective impacts on total waste management system costs. The specifics will vary across communities.

In disaggregating full costs for the complete job of handling solid waste in a community, the “bottom line” will remain the same whether disaggregated by activity or path. If the purpose of presenting disaggregated information is to facilitate comparisons within a community about different programmatic options of handling solid waste, then the full costs are better presented in terms of MSW paths. In that way, discussions about whether to expand or reduce recycling, composting, or WTE programs in a community will be based on the actual economics of each path. If the purpose of presenting disaggregated information is to facilitate discussions about whether a service can be performed for a community

Exhibit 2-1

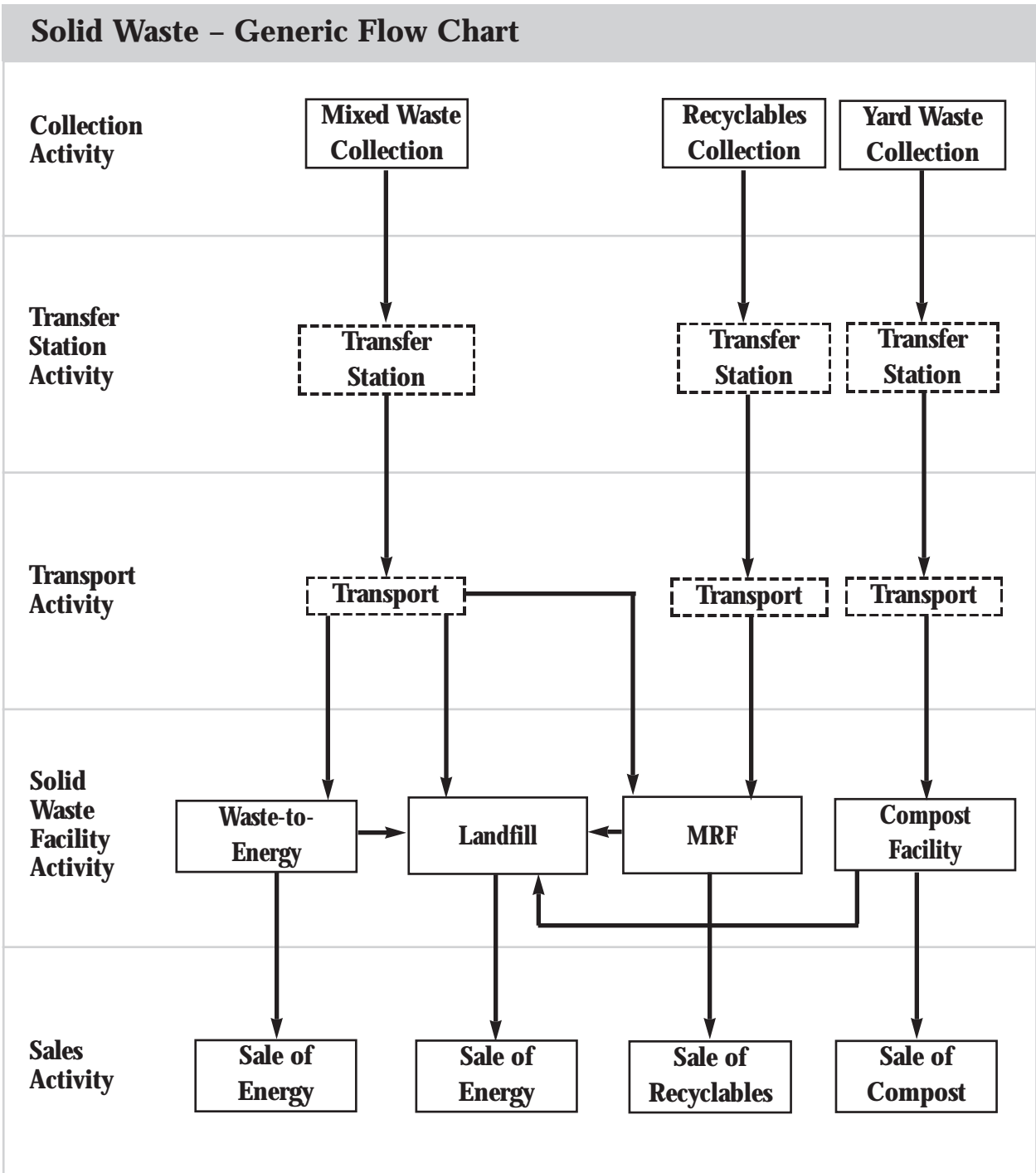


Exhibit 2-2

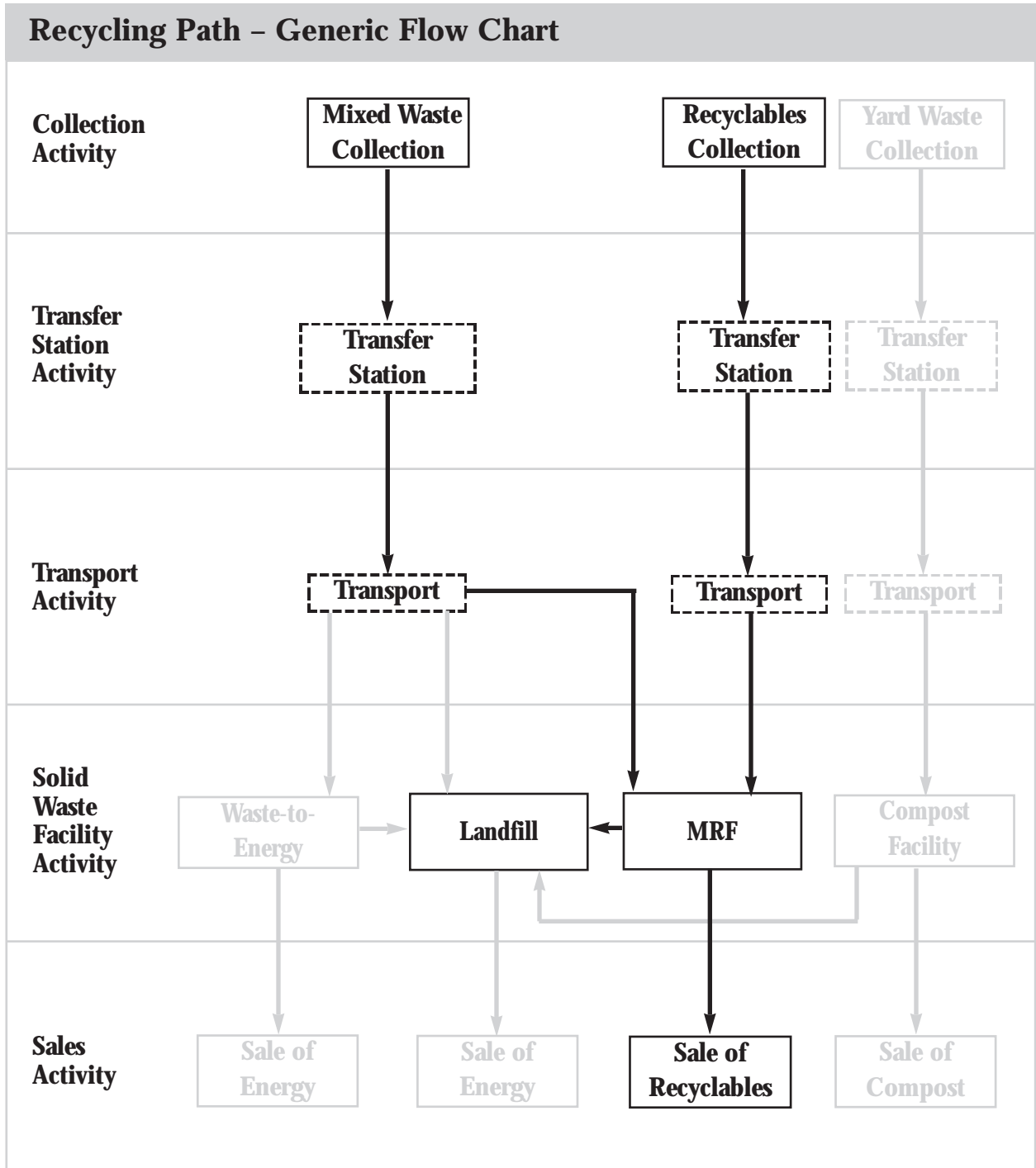


Exhibit 2-3

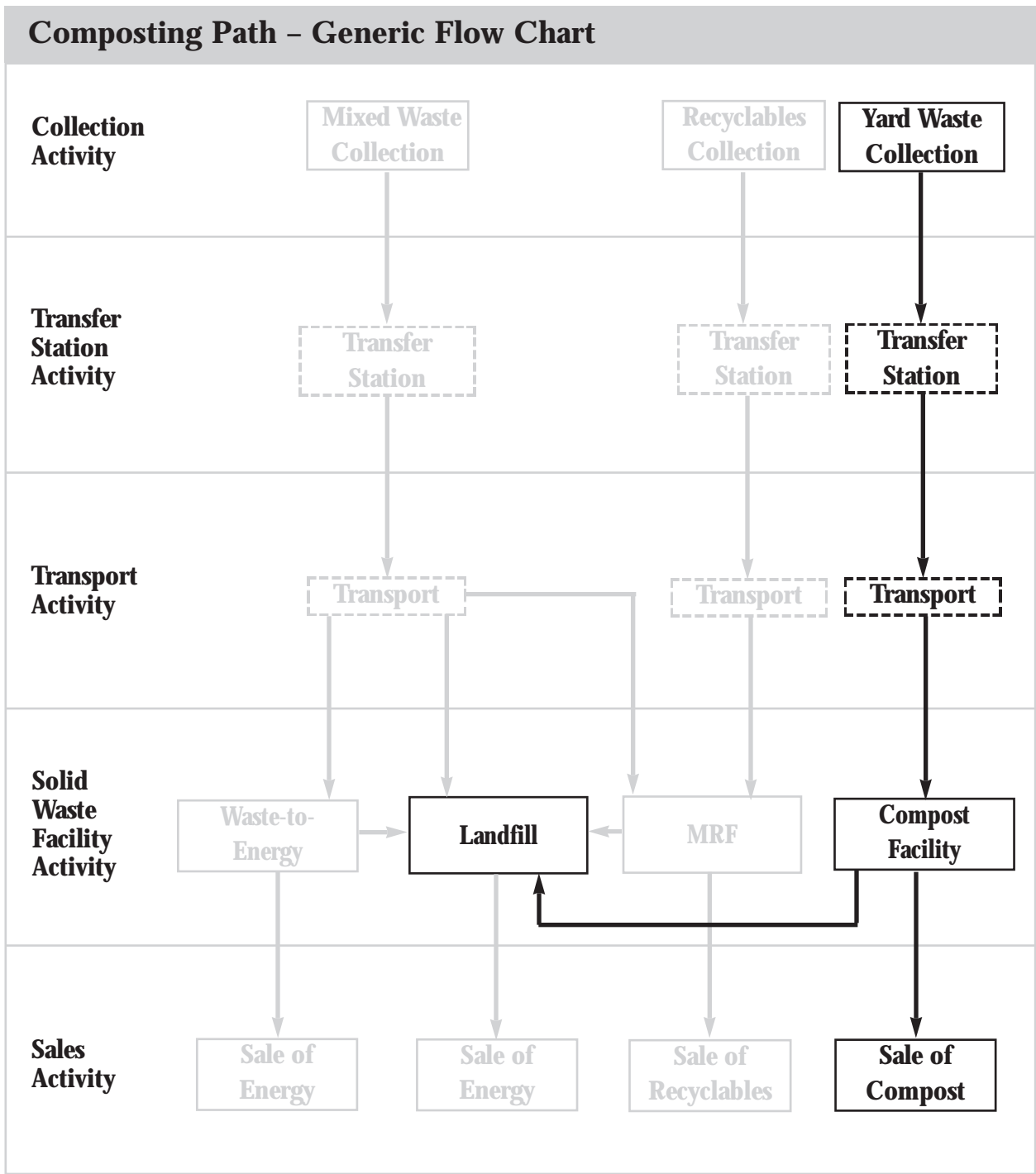


Exhibit 2-4

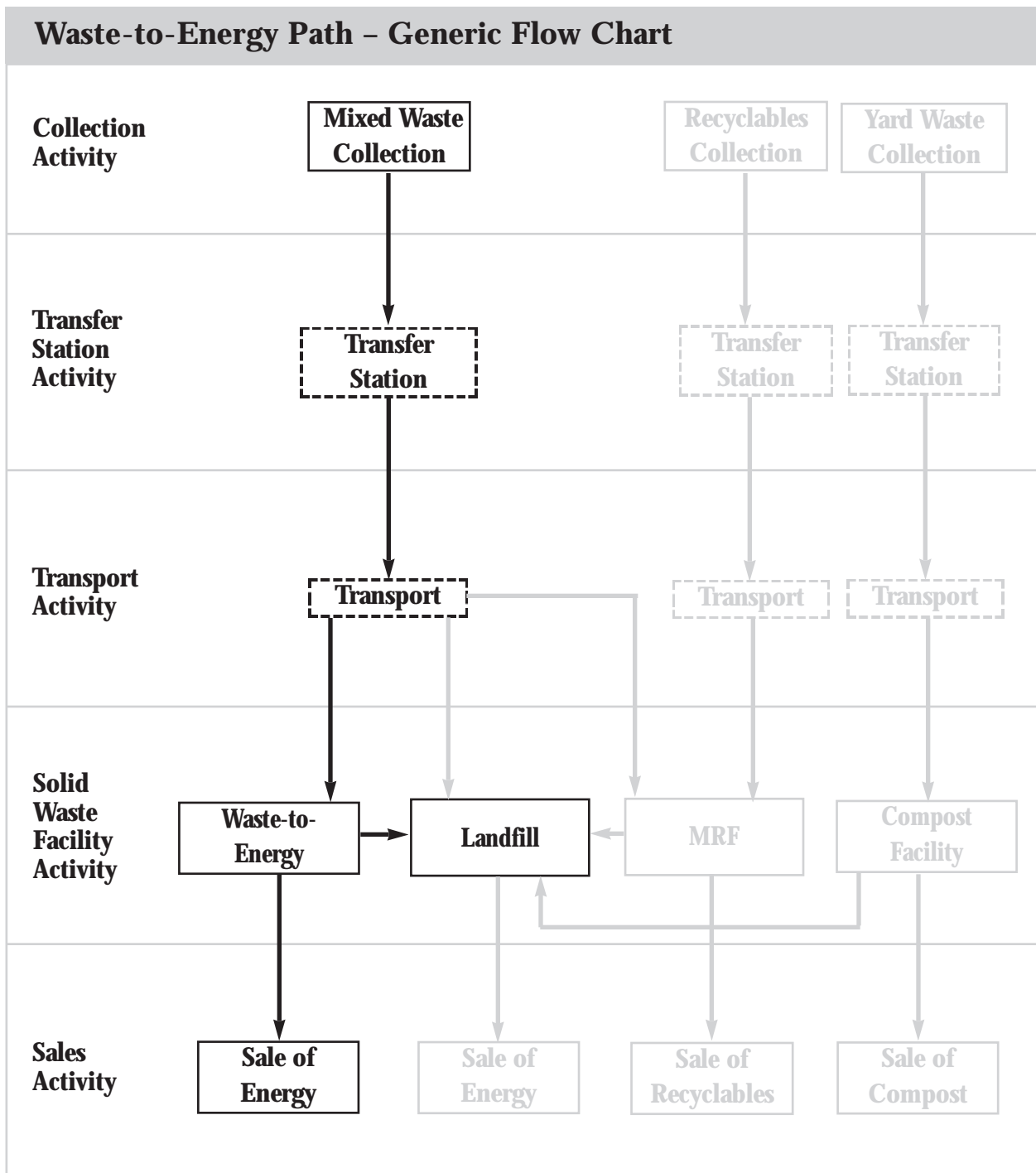


Exhibit 2-5

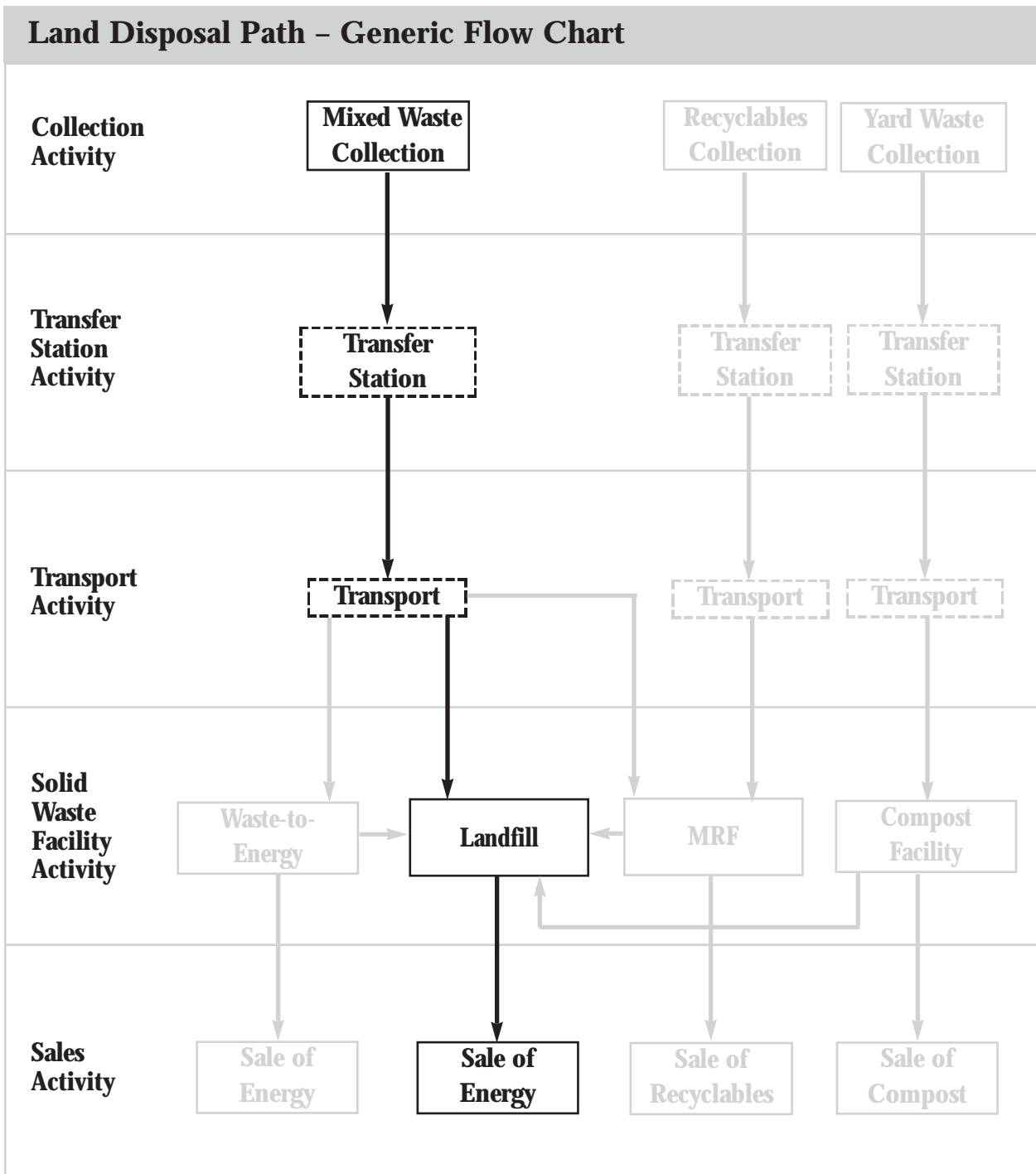


Exhibit 2-6

| Potential Cross-Walk Between MSW Activities and Paths | | | | |
|---|----------------|-----------------|----------|--------------------|
| MSW Activities | Recycling Path | Composting Path | WTE Path | Land Disposal Path |
| Collection | ? | ? | ? | ? |
| Transfer Station(s) | ? | ? | ? | ? |
| Transport | ? | ? | ? | ? |
| Facility(ies) | ✓ | ✓ | ✓ | ✓ |
| Residuals Disposal | ✓ | ✓ | ✓ | |
| By-Product Sales | ✓ | ✓ | ✓ | ? |
| Education/Outreach | ? | ? | ? | ? |

at a better price by a different provider, then the full costs might be better presented in terms of MSW activities.

The FCA approach used in this *Handbook* lets you have the best of both worlds. In reporting FCA information, you can tailor the format to your community's needs and interests. Counties, cities, and towns can continue to track costs by activity, use that data in privatization or outsourcing (e.g., "make or buy") decisions, and report full costs to the community. Some audiences might want the costs reported separately for waste management paths such as recycling, composting, WTE, and land disposal. Reporting costs per ton for MSW paths can facilitate comparisons of different waste management strategies. In responding to such needs:

- Remember that some of the activity costs of running landfills properly belong to paths such as recycling, composting, and WTE. These paths should be allocated their fair share of landfill activity costs based on how much material (e.g., residues) they send to landfills.
- You might need to allocate collection, transfer station, and transport activity costs appropriately to each solid waste management path in proportion to their use of those activities.
- Mixing "apples and oranges" can cause confusion. If your community uses more than one MSW path, consider reporting costs by either activities or paths to avoid confusion.

The flow charts do not include other functions important to any solid waste program, particularly community education and outreach, executive and oversight functions, and support services such as billing, maintenance, and the like. These functions can be provided directly by the solid waste department or by other units of local government. Chapters 3 and 4 will describe how to identify and incorporate the costs of these functions in FCA.



Chapter 3

Compiling FCA Data

Because of the many different ways that local governments handle solid waste, there is no single recipe appropriate for all jurisdictions. You can adapt the approach described here to fit your own circumstances. As described in Chapter 1, FCA requires information about up-front, operating, and back-end costs of your current system. To compile this information systematically, the following information is helpful:

- **Descriptive information** about your current program, including its history, scope, and future plans.
- **Inventory** of assets such as vehicles, buildings, equipment, and land as well as the human resources employed to manage MSW.
- **Organizational review** identifying supervisory and advisory units to which the solid waste program reports as well as providers of services to the solid waste program.
- **Available financial records and reports.**

As illustrated in Exhibit 3-1, these four sources of information provide all the raw material needed to conduct FCA.

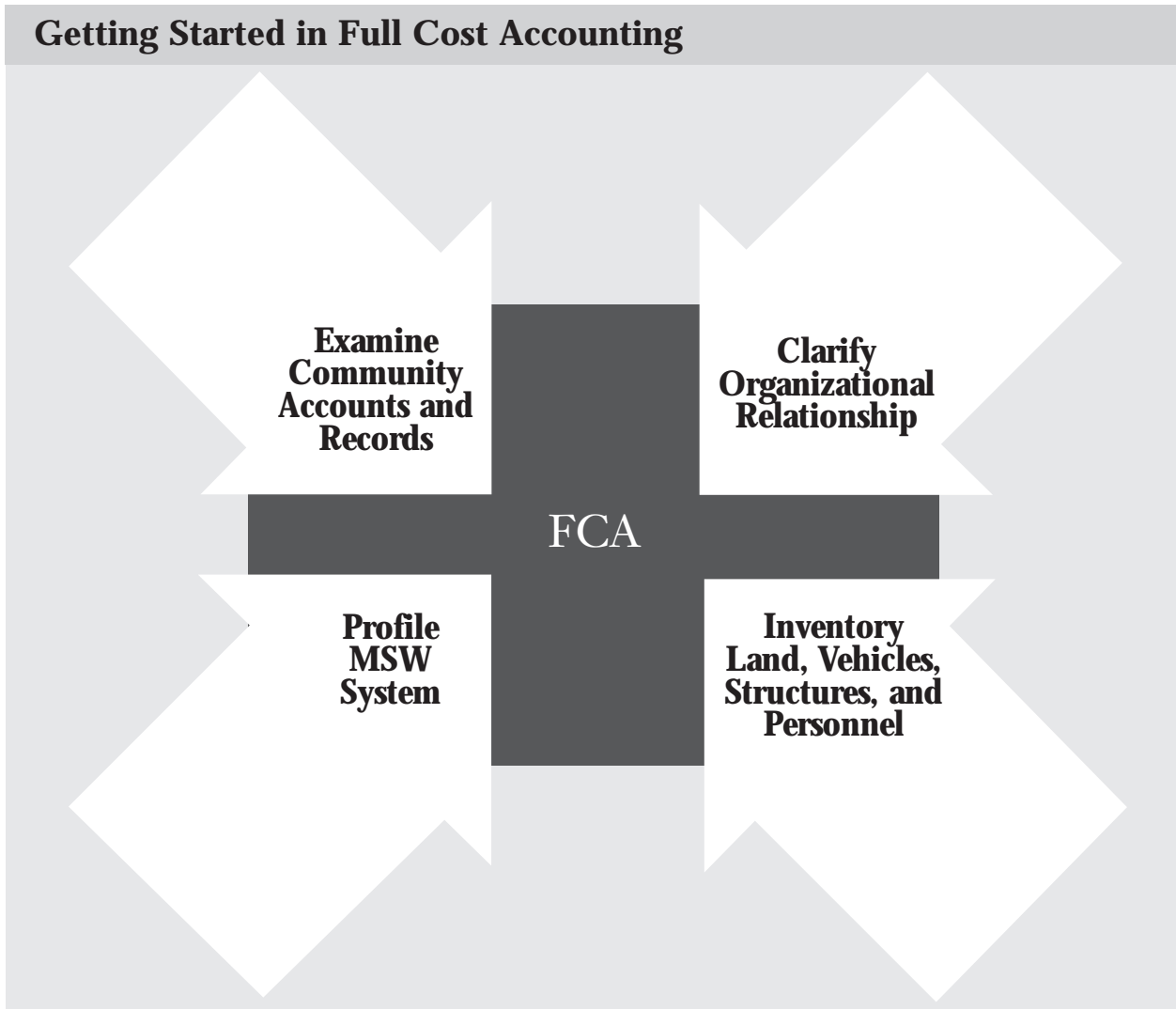
What your solid waste management system costs depends on what it does. To avoid overlooking some costs, your community might want to profile its current MSW program. The program description can answer such important questions as:

- How much waste is involved?
- Who moves it?
- How?
- How often?
- How far does it travel?
- How long does each trip take?

You might want to write down all the steps that solid waste takes from its generation to the point of processing and final disposition. By identifying all of the activities that make up your system, you can now determine their costs. Drawing a schematic diagram or flow chart of your current MSW program, developing a history or chronology of the program, and reviewing your plans

Program Description

Exhibit 3-1



for the future can all help paint a more complete picture of your current MSW management system.

MSW Flow Chart. You can use the flow chart shown in Exhibit 2-1 to map the waste flows from collection or drop-off, through transfer stations or processing facilities (MRFs), to ultimate disposal. This flow chart can help you account for all of the major activities involved in moving solid waste. You might want to tailor and annotate the flow chart to reflect your community.

Program History. The history or chronology of your solid waste program helps identify up-front costs that already have been incurred as well as current operating costs. The purpose of the chronology is to shed light on your current solid waste system. (See Exhibit 3-2.)

Future Plans. Your review of future plans can focus on anticipated dates of closure of currently operating facilities and other anticipated future capital outlays entailed by current operations. This can help identify back-end costs. Plans for landfill closure and post-closure care should exist. If they have not already been developed, cost estimates can be prepared based on those plans.

Exhibit 3-2

Sample Solid Waste Program History/Chronology

| | |
|--------|---|
| 1962 | Initiated collection activities in the central borough; wastes disposed of at Old Pond Farm, north field. |
| 1968 | Expanded collection to five towns. Opened municipal transfer station. |
| 1972-3 | Contracted with XYZ Corp. for feasibility study of waste-to-energy facility. Held three public meetings. Decision deferred. |
| 1974 | Old Pond Farm landfill deeded to the county. |
| 1976 | Set up citizen advisory committee on county solid waste planning; meetings every 6 months. |
| 1977 | Purchased 12 new collection vehicles. |
| 1981-4 | Initiated process to locate new landfill, including land use studies (ABC Corp.), technical studies (LMN Co.), and public meetings. |
| 1985-7 | Acquired land for new landfill. Initiated permit process with state DEP. |
| 1988 | Discovered problems at Old Pond Farm landfill. |
| 1990 | Received 3-year grant to start recycling program. |
| 1991 | Purchased three vehicles and leased warehouse on Main Street for recycling program for newspapers, bottles, and cans covering about one-third of community. |
| 1992 | Received permit for new landfill; stopped accepting waste at Old Pond Farm landfill. |
| 1993 | State university offered to donate composting system. |

Next, you can compile an inventory of publicly owned or used equipment, vehicles, buildings, and land employed in MSW management. (See Exhibit 3-3.) For each item on the inventory, you might wish to ask such pertinent questions as: Is it owned or leased? When was it acquired? At what cost? What is its useful remaining life? The inventory also can include descriptive information such as the capacity, quantity, and location of physical assets and can serve as a basis for developing depreciation schedules and identifying operating costs, as described in the next chapter. The inventory can include the local government employees involved in the program, as well. How many are there? Where are they? What do they do? How often?

Cross-checking the inventory against the program description can be helpful: Are all the physical assets required for each program activity found on the inventory list? If not, why? Are some assets acquired through service contracts with vendors? If so, you might want to check your financial records for payments to vendors. Items on the inventory might reveal gaps in your program profile, representing potentially overlooked program activities and corresponding costs. The same logic applies to human resources.

Inventory of Physical Assets and Human Resources

Exhibit 3-3

| Sample Inventory Format | | | | |
|--|--------------------------|--------------|--------------|------------------------|
| Program Element | Bought or Leased? | When? | Cost? | Remaining Life? |
| <p>Collection</p> <p>Equipment</p> <p>Vehicles</p> <ul style="list-style-type: none"> - 6 compactor trucks - 1 trailer - 2 vans - 1 pick-up <p>Structures</p> <ul style="list-style-type: none"> - 1 garage - 1 maintenance shed | | | | |
| <p>Transfer Station</p> <p>Equipment</p> <ul style="list-style-type: none"> - 1 front loader - 1 back loader <p>Vehicles</p> <ul style="list-style-type: none"> - 1 pick-up <p>Structures</p> <ul style="list-style-type: none"> - 1 scalehouse <p>Land</p> | | | | |
| <p>Transport</p> <p>Equipment</p> <ul style="list-style-type: none"> - 1 transfer trailer <p>Vehicles</p> | | | | |
| <p>Facilities</p> <p>Equipment</p> <ul style="list-style-type: none"> - weighing scales <p>Vehicles</p> <ul style="list-style-type: none"> - 3 water trucks <p>Structures</p> <p>Land</p> | | | | |

Organizational Review

You might also want to review your MSW program's position in your local government, including organizations that provide executive oversight, such as a Department of Public Works, Board of Freeholders or Supervisors, or the Mayor's office, as well as forums for public review and input, such as publicly supported citizens' advisory boards and planning committees. You can use the organizational chart or local government phone directory to identify relevant service providers, such as legal, payroll, motor pool, and health departments. For example, if the health department provides the inspectors who review operations at MSW facilities, then it is a service provider.

This review can help identify those public sector organizations to which the solid waste program reports or is otherwise responsible, as well as those organizations that provide services to the solid waste program. Both types of organizations can incur costs that should be recognized in FCA.

To ensure all costs are included, you might develop a checklist of potential support services to determine how they are provided to your MSW program. For example, billing services, which might be handled by a separate department entirely, should not be overlooked, because such services incur costs in supporting your MSW program. Similarly, centralized purchasing, data management, legal, and human resources services should be recognized in FCA. A list of potential support services appears later in this chapter in Exhibit 3-4 and in Chapter 4.

Finally, you might wish to collect and review your local government's relevant financial records and reports. Although several good guides to government accounting exist, the best approach to understanding financial reports is to communicate directly with the people responsible for keeping the records and preparing accounting reports. Some questions to consider include: What is being bought? What payments are made? Do they relate to MSW? Answers to these questions can help produce a more complete accounting of costs. Determining how your *accounts* are organized can help you determine feasible methods of identifying and allocating costs. (An account is a financial record that collects specific types of costs, revenues, or outlays.) Many state governments have established classifications (termed a uniform chart of accounts) for local government use. Solid waste services often are classified under sanitation, which is further broken down into sanitary administration, street cleaning, waste collection, waste disposal (with separate accounts for each facility), sewage collection and disposal, and weed control. Thus, it might take extra effort to determine costs of yard trimmings collection if the work is performed by street cleaning crews (or street department crews) accounted separately from other solid waste services.

Financial Records Review

Typically, local governments classify outlays as current expenditures, capital outlays, or debt service and further classify these outlays by program and activity. Local governments usually maintain separate accounts for different types of expenditures and report them as separate line items in financial reports. Expenditures are grouped according to the types of items or services purchased, for example:

- Salaries and wages
- Employee benefits
- Purchased professional and technical services
- Purchased property services
 - Utility
 - Cleaning
 - Repair and maintenance
 - Rentals
 - Construction
- Other purchased services (e.g., insurance, printing, and travel)
- Supplies (e.g., general, energy, books and periodicals, and food)
- Property
 - Land
 - Buildings
 - Other improvements
 - Machinery and equipment
 - Vehicles

Accounts might or might not be structured to correspond to activities in your solid waste program. For example, there might be no separate account for waste collection. Lease payments for solid waste vehicles might be reported together with lease payments for all vehicles used by your local government's agencies. Therefore, you might need to disaggregate or allocate accounts (see Chapter 4). On the other hand, accounts might be more disaggregated than needed for FCA. For example, labor costs might be reported separately for different transfer stations; such data can be combined for FCA. You might need to spend time to learn what your local government's accounts contain and mean.

Staying Organized

In general, you can work with the available financial information, filling in the gaps and making appropriate adjustments. To ensure that you identify all gaps and know which data to look for, you might wish to develop a systematic "cost framework." This framework can help you avoid becoming lost in the details, double-counting some costs, or missing costs.

An example of an organizing framework is presented in Exhibit 3-4. The columns should cover all the relevant categories your local government uses to report its expenditures. The rows should include several components:

- All MSW activities in the system
- Oversight
- Support services

The rows in Exhibit 3-4 represent *cost centers*. A cost center is any municipal activity that receives separate accounting attention. Depending on the scope and complexity of your solid waste management program, you might want to establish cost centers for any or all of the following:

- Collection
 - Mixed waste collection
 - Curbside (or backyard) collection of recyclables
 - Drop-off centers for recyclables
 - Yard trimmings collection
 - Other
- Waste transfer stations
- Waste transport
- Waste management facilities
 - MRFs
 - Compost facilities
 - WTE facilities
 - Landfills
- Public education and outreach
- Other (e.g., household hazardous waste)
- Oversight
- Support services

You can use an organizing framework to determine what financial information is relevant and whether or not it is included in available financial reports. As long as there is no overlap or gaps between the columns (financial accounts) or rows (MSW activities), the framework can help you avoid doublecounting and gaps.

Because each MSW activity might have up-front, operating, and back-end costs, Exhibit 3-5 shows another organizing framework. To combine the two approaches illustrated in Exhibits 3-4 and 3-5, add rows for oversight and support services for each of the solid waste program activities listed in Exhibit 3-5.

Exhibit 3-4

| Sample Organizing Framework | | | | | | |
|---------------------------------------|---------------------------|---------------------------|-------------|--------------------------|-----------------|-----------------------|
| SOLID WASTE PROGRAM ACTIVITIES | Financial Accounts | | | | | |
| | Labor | Vehicles Equipment | Rent | Contract Services | Interest | Other Payments |
| 1. Collection | | | | | | |
| 2. Transfer Stations | | | | | | |
| 3. Transport | | | | | | |
| 4. Facilities | | | | | | |
| 5. Sales | | | | | | |
| 6. Education and Outreach | | | | | | |
| 7. Other | | | | | | |
| Support | | | | | | |
| Accounting | | | | | | |
| Billing | | | | | | |
| Building Operations | | | | | | |
| Clerical | | | | | | |
| Communications | | | | | | |
| Data Processing | | | | | | |
| Insurance | | | | | | |
| Legal | | | | | | |
| Payroll | | | | | | |
| Personnel | | | | | | |
| Purchasing | | | | | | |
| Records Management | | | | | | |
| Other | | | | | | |
| Oversight | | | | | | |
| | | | | | | |

Exhibit 3-5

| Sample Organizing Framework | | | | | | |
|--|---------------------------|---------------------------|-------------|--------------------------|-----------------|-----------------------|
| SOLID WASTE PROGRAM ACTIVITIES | Financial Accounts | | | | | |
| | Labor | Vehicles Equipment | Rent | Contract Services | Interest | Other Payments |
| 1. Collection – Up-Front – Operating – Back-End | | | | | | |
| 2. Transfer Stations – Up-Front – Operating – Back-End | | | | | | |
| 3. Transport – Up-Front – Operating – Back-End | | | | | | |
| 4. Facilities – Up-Front – Operating – Back-End | | | | | | |
| 5. Sales – Up-Front – Operating – Back-End | | | | | | |
| 6. Education and Outreach – Up-Front – Operating – Back-End | | | | | | |
| 7. Support Services | | | | | | |
| 8. Oversight | | | | | | |
| 9. Other | | | | | | |



Chapter 4

Allocating Costs

The Difference Between Costs and Outlays

Recognizing the difference between costs and outlays is essential to FCA. This *Handbook* defines cost to mean the dollar value of resources as they are used or committed in an MSW program. An outlay is defined as an expenditure of cash to acquire or use the resource. For example, a cash outlay is made when a collection truck is acquired, but the cost of the truck would be incurred over its active life. The cost of the truck, therefore, should be allocated over the period of its use because every year of use contributes to the deterioration of the truck's value, until it must be replaced with a new truck, requiring a new cash outlay.

Similarly, outlays for constructing and permitting a landfill are made before its active life, while outlays for closure and post-closure care are made after its active life. All of these outlays are needed to acquire and use the resource of landfill capacity. Therefore, the costs of using this resource should recognize those up-front and back-end outlays as the landfill capacity is used during its operating life.

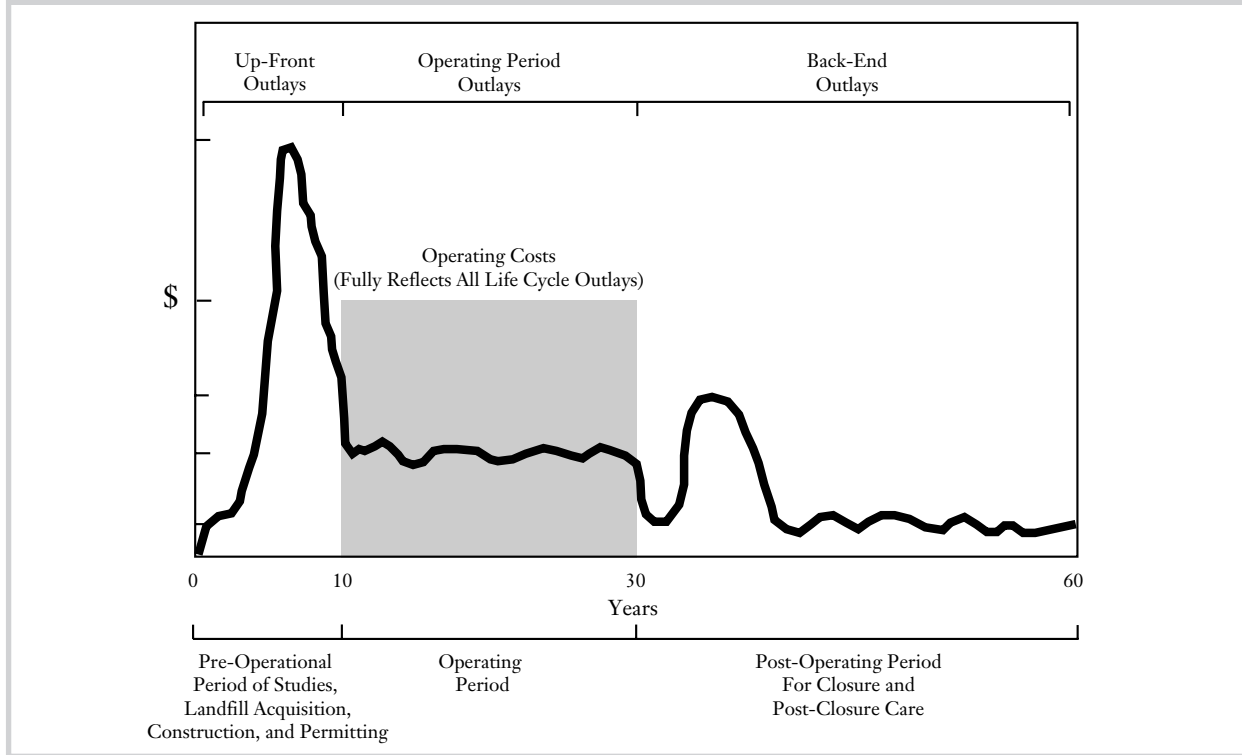
This distinction is important because while current governmental accounting practices account for outlays of public funds, they do not serve as a good basis for estimating the costs of MSW management. For example:

- Many communities acquired and developed landfill sites years ago. Current cash flow does not reflect those past outlays.
- Some necessary cash outlays will occur after a waste management facility ceases operations, such as outlays for site closure and post-closure care.
- Many costs due to MSW management might be hidden in “overhead” outlays or simply not recognized as costs because no outlays occur.

Exhibit 4-1 illustrates cash outlays (dark line) for land disposal over time. Cash outlays typically peak at the front and back end of a landfill's life. Yet these outlays all support the operating life of the facility, shown as the shaded area. The dotted line represents the full costs of the facility spread evenly over its operating life. Cash outlays (dark line) during the operating life of the landfill are substantially less than the full cost (shaded area). As a result, relying on cash outlays can be misleading. As one necessary step to determine the full costs of MSW management, outlays should be converted to costs. How they are converted depends on whether they are routine cash outlays, capital outlays, or future outlays.

Exhibit 4-1

Illustration of Landfill Life Cycle Outlays and Costs



Routine cash outlays for solid waste management activities are usually the same as the operating costs of those activities. Operating costs are regularly recurring costs of resources that are used over a short period of time (i.e., less than 1 year) and routinely reacquired in order to support ongoing operations. Operating costs generally include the following:

- Personnel wages, salaries, benefits
- Building and vehicle maintenance
- Power and fuel
- Rent and leases
- Contract services
- Interest (including mortgage interest)

The cash outlays for these items might be made biweekly or monthly, and these items actually are “used up” over the same period of time. For the purposes of an annual FCA report for solid waste management activities, cash outlays throughout the year for these routine, recurring expenditures equal their operating costs.

A *capital outlay* is an outlay of cash to acquire a resource that will be used for more than one year. Examples include the purchase price of collection vehicles and other equipment, as well as the up-front siting, land acquisition, and construction outlays for new landfills and facilities. Cash flow accounting

Routine Cash Outlays, Capital Outlays, and Future Outlays

would record these capital outlays in the year that the resources are acquired, overstating the cost of solid waste management services during that year and understating costs during subsequent years. A capital outlay can be converted into an annual cost using the established accounting technique of *depreciation*.

- **Depreciation** is a method of allocating the costs of capital outlays over the useful life of the resource. A simple “straight-line” depreciation method calculates depreciation costs by dividing the capital outlay by the useful life of the resource acquired. For example, a collection truck that costs \$150,000 with a useful life of 10 years would have an annual depreciation cost of one-tenth of its total capital cost, or \$15,000. Similarly, if a landfill is expected to last 20 years, then the annual depreciation cost for up-front land acquisition, landfill construction, and permitting would be one-twentieth of that outlay.^a

You might need to review outlay accounts from prior years to determine which outlays were made to acquire resources that are still in service and to calculate the depreciation associated with those assets. For example, if you have 20 mixed waste collection trucks in service, and your records indicate you have made outlays of \$1,800,000 over the past 10 years to acquire those trucks, then annual depreciation for the collection trucks would be \$180,000 (i.e., one-tenth of outlays, based on a 10-year useful life). No depreciation should be recorded for assets that have remained in service after their estimated useful life, if they already have been 100 percent depreciated. The inventory of equipment, vehicles, facilities, and land discussed in Chapter 3 can be very helpful in identifying those outlays that need to be depreciated:

| <u>Depreciate</u> | <u>Don't Depreciate</u> |
|---|--|
| Owned equipment, vehicles, and structures | Leased equipment, vehicles, and structures |
| Up-front developmental expenses for programs and facilities | Back-end expenses (amortize these instead) |
| Landfill property (i.e., capacity) | All other land |

How do you value assets for which outlay information cannot be found? The preferred option is to estimate the original outlay for the asset, based on the known prices of comparable items, when the asset was likely purchased. Another way is to determine (appraise) the asset's current market value (e.g., through an appraisal) and remaining useful life. Both of these options are preferable to valuing an asset based on the price of replacing it with a new one. However, replacement value can be an acceptable measure for some purposes, (e.g., when using FCA for financing capital replacement funds). For assets that appear to be “free,” see the section below on uncovering hidden costs.

^a An alternative to setting fixed depreciation schedules for up-front landfill costs is to depreciate those costs as landfill capacity is actually used (e.g., per cubic yard of volume). This is more accurate but more complicated than the straight-line method mentioned above.

Exhibit 4-2

| Standard Life for Selected MSW Heavy Equipment | | | |
|---|----------------------------|---------------------------------------|----------------------------|
| Standard Description | Standard Life Years | Standard Description | Standard Life Years |
| Backhoe, Tamper Wheeled | 5 | Trailer, Recycling | 7 |
| Backhoe, Tamper Track | 8 | Trailer, Transfer (aluminum) | 8 |
| | | Trailer, Transfer (top loading steel) | 8 |
| Compactor, Landfill | 5 | Truck, Automated, 13-15 cy | 5 |
| Compressor, Air | 5 | Truck, Automated, 18-20 cy | 5 |
| Forklift, Gas | 8 | Truck, Automated, 25 cy | 5 |
| Grader, Road | 8 | Truck, Semi-Automated | 5 |
| Loader, Wheeled (w/claw) | 5 | Truck, Flatbed | 7 |
| Scraper, Earth | 5 | Truck, Water | 10 |
| Sweeper, Street | 7 | Truck, Tractor w/Fifth Wheel | 8 |
| Tanker, Water | 7 | Truck, Other | 5 |
| Tractor, Crawler | 5 | Truck, Rearloader | 5 |
| Trailer, Fuel | 10 | Truck, Recycling, 37 cy | 7 |
| Trailer, Equipment | 10 | Truck, Recycling, 20 cy | 7 |

Source: Sacramento County, 2/93

To determine useful lives of equipment, vehicles, structures, and landfills, rely on local experience (e.g., how long have compactor trucks lasted in the past), design specifications, and vendors' representations. Exhibit 4-2 presents standard operating life values for selected heavy equipment used by Sacramento County, California.

Buildings, vehicles, and equipment that are owned should be depreciated over their remaining useful lives. If the purchases were financed, interest payments should be included as operating costs. Buildings, vehicles, and equipment that are leased generally should not be depreciated; you can treat lease payments as operating costs. In general, you should not depreciate capital outlays for land; land acquired for use as a landfill has a finite useful life and should be depreciated, however.

What about up-front developmental costs for new MSW programs, such as recycling? Outlays for community education and program planning can be substantial. These up-front expenses should be "capitalized" (i.e., treated as a capital outlay) and depreciated over the useful life of the program being launched. The continuing expenses of maintaining MSW programs and public education are simply operating costs.

A *future outlay* is an expenditure of cash in the future that is obligated by current or prior activities. For example, once you commence landfill operations you are obligated to conduct landfill closure and post-closure care in the future. Also, employee retirement benefits, such as pensions and health care, are future

outlays obligated by current employee services. Cash flow accounting would record these outlays in the years they are paid, overstating the full cost of solid waste management services during those years and understating costs during prior years. A future outlay can be converted into a cost using the established financial technique of *amortization*.

Buying and Depreciating a 3-Year Lease

Although lease outlays usually are treated as operating costs and not depreciated, situations could arise where depreciation is appropriate—for example, where a multi-year lease is purchased for a one-time, upfront payment. Depending on the market for particular buildings, vehicles, and equipment, a vendor might be willing to cut an attractive deal. In such circumstances, the outlay should be depreciated proportionately over the life of the lease.

- **Amortization** is a method of determining the annual costs associated with future outlay obligations. In general usage, amortization refers to any process of liquidating (i.e., allocating) a debt over time, as in the amortization schedule for a mortgage. Thus, the amortization of future outlays for landfill closure and post-closure care recognizes that cost during landfill operation.

Amortization of Future Landfill Closure and Post-Closure Care Outlays.

A special issue for MSW landfills involves the recognition of the financial obligations associated with landfill closure and post-closure care activities. Cash outlays for these future liabilities might not occur for many years. To ensure that government financial statements systematically and appropriately recognize the costs of landfill closure and post-closure care, GASB Statement No. 18 (August 1993)⁸ establishes a consistent method for government entities to use. This method requires the estimated total current cost of closure and post-closure care (i.e., the amount that would be paid if all equipment and activities covered in the estimate were acquired during the current year) to be recognized in proportion to the filled capacity of the landfill. As prescribed in the following formula, the cost to be recognized in a given year equals:

$$\frac{\text{Estimated total current cost} \times \text{cumulative capacity used}}{\text{Total estimated capacity}} - \text{Amount previously amortized}$$

The designated amount should be reported as a cost in each year that the landfill accepts waste. Closure and post-closure costs should include the cost of supplies, equipment, facilities (e.g., final cover), and services (e.g., monitoring) that will be incurred near or after the date that the landfill stops accepting waste, regardless of their capital or operating nature. The current cost estimate should be adjusted each year for the effects of inflation or deflation, as well as more stringent regulatory requirements and changes in operating plans, if applicable.

Although closure and post-closure care regulations apply only to MSW landfills, future outlays for decommissioning other solid waste management facilities also should be estimated and amortized as a good management practice.

If closure/post-closure obligations are amortized correctly, then any outlays to trust funds used to demonstrate financial responsibility for those obligations should not be treated as costs of closure/post-closure care. Only the transaction

costs and service fees paid to trustees, or other fees involved in securing other instruments, should be recognized as costs. These financial responsibility fees (outlays) constitute operating costs.

Hidden costs, as used in this *Handbook*, are the costs of activities or resources that appear to be free (i.e., no outlays are recorded or anticipated). Examples include the following:

- The City of Charlotte has an agreement with Mecklenberg County, North Carolina, that allows Charlotte to dispose of 170,000 tons of MSW per year at no cost.⁹ Is MSW disposal free for Charlotte? No. In fact, Charlotte received the right to dispose of its waste at no charge in exchange for the transfer of municipal assets to Mecklenberg County. Thus, depreciating the value of those assets over the life of the agreement would be one way to measure the cost of waste disposal to Charlotte. Another way would be to consider the current market value of the disposal rights owned by the city; instead of selling those rights, Charlotte is using them.
- Sacramento County's Solid Waste Enterprise Fund initially was financed by a loan from the county government with no interest and no principal repayment for the first 10 years.⁹ Although the capital was free to the enterprise fund during this initial period, capital is never free—in this case, the county government lost the interest income. From an FCA perspective, it might not matter which public entity incurs the cost.
- Many small towns have been deeded their landfills by former owners. Some towns have received gifts of composting equipment. Regardless of how they have been acquired, such assets have value. That value is consumed over time with use. Thus, there is a cost even where there has been no outlay.

The value of using goods and services should be reflected as a cost, even if there is no outlay. In general, items that are necessary or would otherwise need to be purchased (as in the examples above) should be valued and costed. Conversely, you can decide whether items that are neither necessary nor would be otherwise purchased should be costed and recognized. As described in Chapter 3, a starting point for FCA should be a detailed description of MSW activities and an inventory of physical assets and human resources to ensure that the costs and value of each activity are reflected in the full cost.

Overhead costs are the management and support costs of running a solid waste program. Management and support labor costs (including benefits) should be accounted for, together with a proportionate share of the office costs (e.g., rent, office equipment, and utilities) incurred for management and support. Specifically, overhead for a solid waste program can include:

- Management
- Executive oversight
- Advisory committees and coordinating bodies

Uncovering Hidden Costs

Overhead Costs

Case in Point
Prince William County, Virginia

Overhead costs can be significant. When projecting the costs of operating a solid waste enterprise fund, the cost for county administration is often overlooked. For example, services provided by the county attorney's office, finance department (account analysis, consulting services, investing services, and financial statement preparation), the treasurer's office (cash collection, recordation, and deposit), and the budget office (budget preparation and analysis) should be included.

In Prince William County, these costs average approximately \$300,000-\$400,000 annually. As a result, overlooking them can significantly skew your assessment of how much MSW management costs in your community.¹⁰

Case in Point
Sacramento County, California

In Sacramento County, California, solid waste management is administered by the Solid Waste Division of the Department of Public Works. The time spent at the division level directing the performance of MSW transfer station, transport, recycling, and disposal activities is an exclusive overhead cost that should be recognized. Because the Solid Waste Division is a unit of the Department of Public Works a portion of the departmental management costs should be included as a shared overhead cost in FCA.

- Billing services
- Clerical support
- Data management
- Human resources
- Legal
- Maintenance
- Payroll and accounting
- Personnel
- Purchasing
- Records management
- Training expenses

Depending on the community, some overhead costs will be exclusive to the MSW program while others will be shared costs.^b A given overhead item might be an exclusive cost in one town but a shared cost in another. Exclusive overhead costs apply solely to MSW management; shared costs involve more than MSW management (see Exhibit 4-3). For example, the costs of running a solid waste advisory committee should be considered an exclusive overhead cost, but the costs of running a citizens' advisory committee for county planning in general should be treated as a shared overhead cost. If your MSW program operates its own garage for vehicle storage and maintenance, those costs are exclusive overhead costs. If MSW vehicles are stored and serviced together with other community vehicles, those garage costs are shared overhead costs. Because many overhead costs are not exclusive to an MSW program, they are easy to overlook. Overhead costs also can be overlooked because they do not appear to be directly involved in the movement of MSW from residences to processing, treatment, or disposal facilities.

Exhibit 4-4 presents a format for identifying and recording overhead costs.

^b Accountants may refer to exclusive and shared costs using the terms direct and indirect, respectively. See the 1994 *Governmental Accounting, Auditing and Financial Reporting* (GAAFR)¹¹.

Exhibit 4-3

| Types of Overhead Costs | | |
|--------------------------------|---------------------|---------------|
| Type of Overhead | Type of Cost | |
| | Exclusive | Shared |
| Oversight | | |
| Support Services | | |

Exhibit 4-4

| Overhead Services Can Be Exclusive or Shared Costs | | | |
|---|------------------|---------------|--------------|
| Item | Exclusive | Shared | Total |
| Accounting | | | |
| Billing | | | |
| Building Operations | | | |
| Clerical | | | |
| Data Processing | | | |
| Executive Oversight | | | |
| Insurance | | | |
| Legal | | | |
| Management | | | |
| Outreach | | | |
| Payroll | | | |
| Personnel | | | |
| Purchasing | | | |
| Records Management | | | |
| Solid Waste Advisory Council | | | |
| Other | | | |
| Total Overhead Costs | | | |

Allocating Shared Costs

Because shared costs do not apply exclusively to MSW management but to other government activities as well, you should allocate only a portion of these costs to MSW. This allocation can be made on an aggregate basis for all shared costs or on a line item basis. It might make sense to treat some line items individually and group the remaining costs for aggregate treatment. The goal is to identify MSW's fair share of costs and reflect that amount in the FCA report.

Case in Point Upper Arlington, Ohio

For its yard trimmings collection and disposal program, Upper Arlington, Ohio, assigns one full-time employee, assisted by a part-time employee during the spring and summer. One vehicle is used for weekly collection and disposal. To determine the cost of collecting and disposing of yard trimmings, the town:

1. Analyzed total city expenditures to determine which costs should be considered overhead.
2. Determined which costs have to be allocated.
3. Determined the method for allocating costs.
4. Determined the costs of yard trimmings collection and disposal.
5. Added the allocated overhead costs to nonoverhead costs to obtain total costs.¹²

Estimated costs for 1992 were:

Exclusive Costs

| | |
|-------------------------------|-----------------|
| Personnel and operating costs | \$64,866 |
| Vehicle costs | |
| Gas, oil, parts | \$3,400 |
| Labor | 1,815 |
| Depreciation | 14,292 |
| Interest expense | 3,836 |
| Total exclusive costs | \$88,209 |

Allocated Costs

| | |
|---------------------------|------------------|
| Divisional administration | \$13,648 |
| Department administration | 9,192 |
| Citywide administration | 15,439 |
| Total allocations | \$38,279 |
| Total yard trimmings cost | \$126,488 |

There are two relatively simple methods for allocating shared costs to MSW: 1) size of budget relative to the other government activities and 2) number of personnel.

Budget Share Method

To allocate shared costs according to the budget share method, you first need to determine the annual budgets of all government programs, excluding the costs of functions being treated as shared. If your annual budget is \$13 million, and \$3 million is spent by centralized support and oversight services, then \$10 million can be used as the denominator in the equation below. The numerator is the budget of the MSW program itself. If you spend \$2 million on MSW, then the quotient (.2) becomes the allocation multiplier, as shown:

$$\frac{\text{MSW annual budget}}{\text{Total budget minus centralized services}} = \text{Allocation Multiplier}$$

Example

$$\frac{\$2 \text{ million}}{\$13 \text{ million} - \$3 \text{ million} = \$10 \text{ million}} = .2$$

MSW's portion of the shared costs is calculated by applying the allocation multiplier against the total shared costs:

$$\text{Allocation Multiplier} \times \text{Shared Costs} = \text{MSW's Portion of Shared Cost}$$

Example

$$.2 \times \$3 \text{ million} = \$600,000$$

Thus, annual MSW management costs \$2,600,000 in this example. Two million dollars are exclusive costs, and \$600,000 are shared costs.

Personnel Share Method

The personnel share method is similar. The numerator in the equation below is the number of employees (or full-time equivalents) in solid waste management, including both salaried personnel and wage earners. The denominator is the total number of personnel involved in government programs minus the personnel in the shared overhead and service units. The quotient is the allocation multiplier, as shown:

$$\frac{\text{MSW personnel}}{\text{All personnel minus centralized service staff}} = \text{Allocation Multiplier}$$

MSW's portion of the shared costs is calculated in the same way as shown above. Applying the allocation multiplier to the total shared costs produces MSW's share.

The two methods might yield somewhat different results, but extreme precision is not necessary. For some shared costs, there might be no single "correct" allocation multiplier. Where local governments contract out significant activities, the budget share method might be preferable, because contract costs should be easier to determine than the number of contractor personnel.

For specific shared cost line items, the following allocation multipliers could be used:

- Building maintenance — Share of MSW floor-space in square feet (to total government floorspace, excluding space occupied by building maintenance)
 - Personnel share method
- Vehicle maintenance — Share of vehicles
 - Share of miles driven
 - Share of fuel use
- Billing and collection — Share of MSW charges (to total amounts billed for all taxes, fees, and charges)
 - Share of MSW accounts (to total number of accounts billed)
- Human resources — Personnel share method
- Computer/office equipment services — Share of computers/printers equipment services

Behavioral Aspects of Allocations

Allocating shared costs equitably is sometimes easier said than done. Most people will readily take credit for revenues but will be more hesitant to accept responsibility for costs, even though the costs and revenues are related. This can lead to differences of opinion on how to fairly apportion costs, particularly when good data are not available. Consider the person who answers the phone at a municipal department of public works, fielding calls about solid waste as well as water/sewer service. How do you allocate this person's time and cost? Even if the costs involved are relatively small, the discussion can heat up if the allocation process and result do not seem fair. Because affected managers must perceive the allocation process to be fair, get their input when developing cost allocations.

Inter-Department Billing

Creating special accounts or inter-department billing systems can help achieve a more accurate allocation of costs. For example, if there are substantial legal costs associated with an old landfill, then an inter-department billing system can allow the legal department to charge the old landfill account directly to avoid confusing these costs with the ongoing legal costs of the new landfill. In this case, the old landfill account would record the charges as a direct cost, the new landfill account would be charged appropriately, and both accounts would receive their shared cost allocations for the more routine activities of the legal department. Small communities may need to record such inter-department charges only for unusual, one-time costs, but larger municipalities may benefit from more routine inter-department billing to keep track of the amount of support service costs devoted to solid waste management.

- Legal services
 - Personnel share method
 - Budget share method
- Payroll
 - Personnel share method
- Purchasing
 - Share of purchases (number of transactions or dollar value of transactions)

The level of detail and amount of effort invested should match the size of your MSW program. If shared costs represent a relatively small percentage of total solid waste management costs, then a simple allocation formula will not distort significantly the full cost estimate. Using a simple formula to allocate large shared costs that might be unrelated to ongoing solid waste management activities, however, could distort and overstate the full costs of MSW activities.

For example, if solid waste management employees account for 10 percent of all nonoverhead local government employees, then solid waste management could be allocated 10 percent of total local government support service and oversight costs. This might be a reasonably accurate way to allocate shared costs for centralized payroll and personnel services. Legal costs, however, might be largely attributable to an old landfill or other government liabilities unrelated to current solid waste management. Using the personnel share method of allocation could pose a significant potential for bias only if the legal costs being allocated are substantial. In addition, if you contract (or use franchises) for MSW services and do not directly perform many MSW activities, there might be little overhead involved and few staff, but the budget share might be substantial; the budget share method would be more appropriate than the personnel share method in this scenario.

Pulling It All Together

Following the guidance in this chapter, you can estimate the full costs of solid waste management and complete a report like the one shown in Exhibit 4-5. Exhibit 4-6 shows an annual report of expenses prepared by the Sacramento County Department of Public Works Refuse Enterprise Fund.

Exhibit 4-5

| Annual Full Cost of Solid Waste Management | |
|---|----------|
| Operating, Up-Front, and Back-End Costs | |
| Operating Costs | |
| Wages, Salaries, and Benefits | \$ _____ |
| Maintenance | \$ _____ |
| Power and Fuel | \$ _____ |
| Rent/Leases | \$ _____ |
| Contract Services | \$ _____ |
| Interest | \$ _____ |
| Insurance, Licenses, Taxes | \$ _____ |
| Oversight and Support Services | \$ _____ |
| Other | \$ _____ |
| Up-Front Costs | |
| Depreciation (Vehicles/Equipment/Buildings/Landfills) | \$ _____ |
| Depreciation (Oversight and Support Services, e.g., Program Planning, Permitting, and Outreach) | \$ _____ |
| Other | \$ _____ |
| Back-End Costs | |
| Amortized Closure and Post-Closure Care | \$ _____ |
| Amortized Retirement Benefits | \$ _____ |
| Amortized Oversight and Support Services | \$ _____ |
| Other | \$ _____ |
| Overhead Cost Share | |
| Executive and Management Oversight | \$ _____ |
| Centralized Support Services | \$ _____ |
| Other | \$ _____ |
| TOTAL | \$ _____ |

Exhibit 4-6

**Sacramento County Department of Public Works
Refuse Enterprise Fund Expenses
Year-to-Date Through June 30, 1993**

Labor Costs

Salaries and Employee Benefits 11,964,368

Equipment Costs

Equipment Maintenance 4,888,243

Fuels and Lubricants 846,659

Depreciation Expense 4,613,214

Equipment Replacement Factor 1,733,710

Equipment Rental and Leases 293,243

Subtotal Equipment Costs 12,375,069

Other Operating Costs

Household Hazardous Waste Program Contract 378,839

State Fees 953,348

Franchise Contracts Payments 2,563,931

Franchise Contracts Subsidies 124,442

Maintenance-Land Improvement 2,993,257

Other Operating Expenses 2,344,862

Unanticipated Capital Expenditures 2,425,000

Subtotal Other Operating Costs 11,783,679

General and Administrative

Bad Debt Expense 82,459

Franchise Contracts Bad Debt Expense 979

Insurance 280,662

Communication Services 116,219

Accounting Services 17,595

Utility Billing Services 1,190,928

Facility/Leased Property Use Charges 328,975

Division and Department Overhead Allocation 1,029,220

Countywide Cost Allocation 320,710

Interest Expense 21,267

Other General and Administrative 896,286

Subtotal General and Administrative 4,285,300

TOTAL EXPENSES 40,408,416



Chapter 5

Reporting FCA Data

The annual tax bill often might be the primary mechanism your local government uses to communicate the costs of solid waste management to citizens. But tax bills frequently do not itemize the municipal services that taxpayers are funding. Combining solid waste management costs with the costs of other municipal services that are funded through property taxes can obscure what residents and businesses are paying for MSW management. They might believe that solid waste management costs virtually nothing and does not depend on how much MSW they generate. As a result, they have no incentive to engage in source reduction or recycling. Reporting the full costs of solid waste management not only reveals what those costs are, but also can provide a basis for a system of FCA-based rates (e.g., unit-based fees). These fees, in turn, have a direct impact on generator behavior and can create incentives for source reduction and reuse.¹⁴

In reporting FCA information to the public, you might wish to:

- Tailor the report to the audience. Overly complicated reporting formats can confuse the audience and obscure the message.
- Adjust full cost estimates to recognize certain offsetting revenue streams.
- Consider different ways of putting the full cost of MSW into perspective.

This chapter discusses each of these topics.

Case in Point Munster, Indiana

Munster, Indiana, was one of three local governments in Indiana that volunteered to demonstrate FCA under the new state law.¹³ Munster (population 19,949) provides collection services to about 7,100 residential and commercial customers. Private vendors also collect waste from multi-family residences and commercial customers. Munster supplements weekly curbside MSW pickup with curbside sorting and pickup of recyclables. The town also contracts with a private vendor for a drop-off center, which handles about 2,000 tons per year. In addition, over 4,500 tons of yard waste are composted. The town owns its landfill, where 8,000 tons of MSW are brought per year. Munster reported the full cost of garbage/recycling services in 1991 as:

| | |
|-----------------------|-------------|
| Garbage Collection | \$196,647 |
| Garbage Disposal | \$765,761 |
| Recycling | \$233,145 |
| Yard Waste Composting | \$196,647 |
| Full Cost | \$1,392,200 |

Subtracting \$50,000 of revenues from sales of recyclables and compost yields a bottom line of \$1,342,200.

Tailoring the Report to the Audience

The public, management, and politicians are all potential “customers” for FCA reports. Different audiences are likely to have different interests and information needs. In deciding how to present information to these customers, you can focus on the cost questions they likely care most about:

- What does solid waste management cost the community?
- How much cash must be raised to cover the costs?
- What does recycling cost?
- How much money does recycling save?
- Why does (fill in the blank) cost so much?

Your community is likely to have other specific solid waste management questions as well. FCA will not provide answers to all of these questions. Concerns about how to pay for the costs and how to handle MSW, for example, go beyond the scope of FCA.

Overly complicated reporting formats can confuse the audience and raise more questions than answers. Keeping detailed back-up data can enable you to respond to more specific inquiries if they arise. The following criteria are important in producing good FCA reports:

- Brevity
- Readability
- Logical format
- Lack of jargon
- Use of charts
- Description of scope

A full cost report can be as simple as the following:

Full Cost Accounting

Solid Waste Management in Fullcostville

Full Costs in 1994 equal \$1,072,147

This might be an adequate level of detail for your customers. If not, you might want to disaggregate the bottom line. Disaggregating full costs can have the following potential benefits:

- Enhances managerial and public understanding
- Highlights the resource mix used (e.g., labor vs. physical assets)
- Allows comparison of costs of component services
- Answers questions likely to be asked

If taken too far, however, disaggregating costs can obscure the big picture with too many details. Regardless of level of detail, it is important to carefully define what is included in the cost numbers so that people understand what the numbers mean. Accompanying text or footnotes can be helpful.

Keeping in mind the difference between costs and outlays, as described in Chapter 4, you might want to report outlays and costs separately, as follows:

| Full Cost Accounting | | | |
|--|--------------------|--------------------|--------------------|
| <u>Solid Waste Management in Fullcostville, 1994</u> | | | |
| | Total | Recycling | Landfilling |
| Cash Outlays | 905,866 | 201,332 | 704,534 |
| Non-Cash Cost | 166,281 | 12,006 | 154,275 |
| | <u>\$1,072,147</u> | = <u>\$213,338</u> | + <u>\$858,809</u> |

The distinction between (cash) outlays and (noncash) costs might be confusing for the general public, however. In addition, communities that purchase disposal services from vendors—whether businesses or other communities—and do not own their disposal facilities are not likely to have major noncash costs. Such communities might see less value in reporting cash outlays separately from non-cash costs.

| Full Cost Accounting | | | |
|--|-------------------|-----------------|------------------|
| <u>Solid Waste Management in Cleancounty, 1994</u> | | | |
| Total | Collection | Disposal | Recycling |
| \$2,936,937 | = \$1,109,272 | + \$1,326,885 | + \$500,780 |

Some information can be difficult to interpret. For example, the format above might be confusing for a community that has collection programs for both mixed waste and recyclables.

The above example obscures how much of the collection cost of \$1,109,272 is for recyclables collection and how much is for mixed waste collection. Because paths are mutually exclusive, reporting collection activities as a subtotal can be confusing whenever collection applies to solid waste intended for more than one path: recycling, composting, WTE, and landfilling. The same is true for activities such as transfer stations and transport, which might be used for solid waste heading toward different destinations, such as MRFs, composting facilities, WTE facilities, and landfills.

What Is the Necessary Level of Detail? If the purpose of presenting disaggregated information is to facilitate comparisons within your community about different programmatic options, then the full costs are better presented in terms of MSW paths. In that way, discussions about whether to expand or reduce recycling, composting, or WTE programs will be based on the actual economics of each path. If the purpose of presenting disaggregated information is to facilitate discussions about whether a service can be performed for your community at a better price by a different provider, then the full costs might be better presented in terms of MSW activities.

Adjusting Full Cost Estimates for Offsetting Revenue Streams

To be useful, FCA should recognize certain revenues associated with MSW management. Adjusting for revenues gives a more accurate picture of the net costs of MSW services. Net costs are the full costs of solid waste management minus revenue derived from the sale of by-products such as recyclables, compost, energy from waste, and landfill gas.

There are four types of revenues associated with MSW management:

- **By-product revenues** are generated from the sale of marketable products created as a by-product of solid waste management. Revenues derived from the sale of recycled materials, compost, and energy generated by a WTE facility and recovered landfill gas are by-product revenues.
- **Service revenues** are derived from fees charged for the amount of MSW services used, such as unit pricing for solid waste collection or landfill tipping fees. Local governments control the fee rate for services provided (e.g., the fee per trash container collected), but residents are charged only for the level of service they receive (e.g., the number of containers collected).
- **Assessed revenues** are derived from taxes or fees assessed in a manner that is unrelated to the level of service provided, as when property taxes or flat fees are used to fund solid waste management activities.
- **Transfer revenues** are funds provided by the state or federal government, whether as grants or some form of revenue sharing.

By-product revenues are an integral part of the economics of solid waste management because they are determined by market forces beyond the control of local governments. Market forces do not determine the other types of revenues; service revenues and assessed revenues result from fee and tax rates controlled by local governments. Similarly, transfer revenues are controlled by state and federal governments. Once the full costs and by-product revenues are known, you can calculate the level of service rates, assessed revenues, and transfer revenues needed to fund solid waste management.

By-Product Revenues. Exhibit 5-1 presents a format for recording the by-product revenues of solid waste management. By-product revenues should be available from sales records. Detailed information about the amount of each by-product material sold (e.g., tons per year) and the revenues per unit amount (e.g., dollars per ton) is not essential for FCA. You need to identify only the total by-product revenues (the shaded area in Exhibit 5-1) for recycling, composting, WTE, and landfill gas.

Exhibit 5-1

| Full Cost Accounting: By-Product Revenues | | | |
|--|--------------|---------------------|---------------------------------|
| Item | Units | Revenue/Unit | Total By-Product Revenue |
| Aluminum | # | \$/# | \$ |
| Clear Glass | # | \$/# | \$ |
| Colored Glass | # | \$/# | \$ |
| Old News Print | # | \$/# | \$ |
| Old Corrugated Cardboard | # | \$/# | \$ |
| HDPE | # | \$/# | \$ |
| PET | # | \$/# | \$ |
| Steel | # | \$/# | \$ |
| Total Recycling Revenues | | | \$ |
| Compost Revenues | # | \$/# | \$ |
| Energy Revenues | # | \$/# | \$ |
| Landfill Gas Revenues | # | \$/# | \$ |
| TOTAL BY-PRODUCT REVENUES | | | \$ |

Exhibit 5-2 illustrates the by-product revenues for a large community resulting from the sale of recycled materials, leaf compost, and WTE energy production.

Exhibit 5-2

| Full Cost Accounting: Sample By-Product Revenues | | | |
|---|----------------|---------------------|---------------------------------|
| Item | Units | Revenue/Unit | Total By-Product Revenue |
| Sales of Recyclables | | | |
| Aluminum | 104 | \$801 | \$83,304 |
| Glass | 546 | 28 | 15,288 |
| Steel | 182 | 36 | 6,552 |
| Newspaper | 1,690 | 0 | 0 |
| Plastic | 78 | 108 | 8,424 |
| Total Recycling Revenues | | | \$113,568 |
| Compost Revenues | 5000 | 2 | 10,000 |
| Energy Revenues | 260,000 | 27.5 | \$7,150,000 |
| Landfill Gas Revenues | - | - | 0 |
| TOTAL BY-PRODUCT REVENUES | | | \$7,273,568 |

By-product revenues can be reported as a line item following the full cost estimate. In its simplest form, the FCA report can be presented as follows:

| Full Cost Accounting | |
|---|---------------|
| <u>Solid Waste Management in Combustown, 1994</u> | |
| Full Costs | \$9,290,073 |
| By-Product Revenues | (\$7,273,568) |
| Net Costs | \$2,016,505 |

If you report both the full cost total and subtotals for solid waste management paths, then the by-product revenues can be linked appropriately. Using the by-product revenue numbers from Exhibit 5-2 would produce a report based on MSW paths like the following:

Full Cost Accounting

Solid Waste Management in Combustown, 1994

| | Recycling | Composting | WTE | Landfill | Total |
|---------------------|------------------|-------------------|-------------|-----------------|--------------|
| Full Costs | \$678,940 | \$49,283 | \$7,633,850 | \$928,000 | \$9,290,073 |
| By-Product Revenues | (113,568) | (10,000) | (7,150,000) | 0 | (7,273,568) |
| Net Costs | \$565,372 | \$39,283 | \$483,850 | \$928,000 | \$2,016,505 |

There are countless ways to report FCA information. You can report the costs of your entire MSW program or its various paths and their associated revenues, as described above. You can report the net costs of managing solid waste per household or per ton of waste. Which method you choose will shape how residents understand the costs of MSW management in your community. Each method offers a different way of putting the costs of MSW management into perspective.

Although average costs, such as cost per household or cost per ton of waste, are a useful means of reporting costs, care should be taken in comparing the average costs of various activities or paths. Such comparisons must be made with caution so that they do not lead to erroneous and/or misleading conclusions.

Cost Per Household

Net cost per household is the net cost of MSW management per year divided by total households served. It can be used to indicate the amount of service fees and assessed taxes that must be collected on average from each household to pay for the full costs of solid waste management, taking into account by-product revenues. For example, you can estimate the number of mixed waste containers set out per household on average each year (i.e., average containers per collection times the average number of collections per year). Then, you can divide the annual net cost per household by the number of mixed waste containers per year per household. The result indicates the unit pricing fee per mixed waste container that would be needed to cover the full costs of solid waste management, assuming no reduction in the number of containers because of fee-induced increases in source reduction or recycling.

Adjustments. If you are handling waste generated by other communities, you must adjust the full cost numbers to estimate the per household cost of managing your own wastes. For example, if 20 percent of the waste disposed of in your landfill is generated from outside your community, then the cost per household would be misleading if it includes costs for handling other people's waste. The adjustments do not eliminate the cost of managing other people's MSW; those are still real costs. These adjustments should not take into account any revenues received for handling waste from outside your community; from

Reporting Costs of Solid Waste Management

Case in Point Franklin, Indiana

Based on its FCA report, Franklin, Indiana, calculated that garbage collection and disposal were costing \$112.12 per household per year; after privatizing, the cost was estimated at \$71.28 per household per year.¹⁵

Funding Needs Per Household

If your community receives transfer revenues from state and/or federal sources earmarked for solid waste services (e.g., grants for planning or implementing recycling), then it makes sense to recognize these revenues in determining the funding needs for the program. A similar logic applies to revenue derived from fines. However, it is appropriate to recognize these revenues only when estimating funding needs, however. Likewise, certain costs recognized in FCA may not be relevant for a community's assessment of its financing needs.

the FCA perspective, it is appropriate to back out these costs, regardless of how much is reimbursed. The cost of MSW management and the net cost per household are not affected by such payments and therefore should be offset by by-product revenues alone.

To make this adjustment, you can subtract the marginal costs of managing other people's waste from the full costs before dividing by the total number of households. Alternatively, you can subtract the average cost of managing other people's waste from the full cost before dividing by the total number of households. Dividing the full cost of the activity (e.g., landfilling) by the total number of units handled (e.g., tons) yields the average cost per unit. This cost can be multiplied by the total number of units of other people's waste to determine the average cost of managing other people's waste.

Although net cost per household gives a useful perspective on the full costs of solid waste management, it is not necessarily a meaningful basis for comparing solid waste management activities or paths. One reason that such comparisons might be inappropriate is that net cost per household is heavily influenced by the proportion of waste managed along a particular path. For example, if your recycled waste (say 25,000 tons) is one-half of your land disposed waste (50,000 tons), and the cost per ton is the same for both activities (say \$100 per ton), then the net cost per household for recycling will be one-half of the net cost for land disposal (i.e., half as many tons times the same net cost per ton). Therefore, "net recycling cost per household" will be one-half of the "net land disposal cost per household" only because recycling manages half as much waste. This sheds no light on the inherent economics of either recycling or land disposal. Thus, while net cost per household can be useful in putting total costs into perspective, net cost per ton is a better basis for comparing solid waste management activities or options.

Cost Per Ton

Cost per ton is the net cost divided by the tons of waste managed. Cost per ton can be used in evaluating whether to perform an activity in-house or contract out. It can help you compare different bids or proposals from outside contractors to perform a waste management activity. Cost per ton also is a handy benchmark for similar activities that can be accounted for separately. For example, a municipality might track and compare costs for two or three separate transfer stations; a county using several haulers might want to compare their costs. On the other hand, making comparisons of different activities within the solid waste system on the basis of cost per ton (or otherwise) is not recommended because the results often will be incomplete or biased.

- Comparing the cost per ton of a MRF to a landfill activity omits the significant costs of collection (and transfer and transport costs, if any) that must be incurred to bring MSW to those facilities.

- Comparing the costs per ton of recyclables collection to mixed waste collection omits the costs of transfer, transport, and processing the materials. Moreover, because recyclables might differ significantly from mixed waste in volume, weight, and quantity per household, interpreting collection cost comparisons of recyclables to mixed waste should be done with care.
- Comparing landfills and alternative MSW facilities should recognize that costs are incurred to dispose of non-recyclable residues from recycling, composting, and WTE facilities.

Therefore, this *Handbook* recommends that comparisons that cut across the activity columns in Exhibit 2-1 be made on the basis of complete paths. Because paths are mutually exclusive, cost per ton is a very useful basis for comparing full costs. Comparing the average cost of one path to another should be done with care, recognizing that average costs reflect economies of scale.

Whether used for activities or paths, however, cost per ton is a one-dimensional yardstick that might need to be supplemented by other appropriate considerations, particularly when making projections about the cost impacts of changes to how you manage MSW. Full cost data must be used with care in making projections of what waste management will cost if your community significantly changes its current waste management strategy. Moreover, while full cost statistics reveal what waste management costs your community, it does not reveal what waste management should cost.

Exhibit 5-3 illustrates how to calculate the net costs per ton of solid waste management paths. This format allows you to evaluate the total costs and net costs of each solid waste management path. The total cost of each path can be calculated by adding overhead costs to activity costs. You can adapt this format to examine or report the comparative costs of different solid waste management paths, both with and without overhead costs.

Using Cost Per Ton for Projections. You should exercise caution when drawing management or planning conclusions (e.g., budget projections) from net cost per ton comparisons. Cost per ton information should not be the sole basis for making projections of costs or cost savings expected from *changes* in the way you deal with solid waste. For example, if the net cost per ton of the recycling path (including recycling collection and residual disposal costs) is \$90, and the net cost per ton of the land disposal path (including mixed waste collection, transfer, and transport) is \$95, then you should not assume that you can save \$5 per ton in the short run by recycling more tons and sending less waste to a landfill. At a minimum, you need to estimate variable and fixed costs to make such projections. Variable costs include primarily operating costs that can be avoided in the short run. Fixed costs include primarily capital costs that cannot be avoided in the short run.

Exhibit 5-3

| Full Cost Accounting: Summary of Costs per Ton for MSW Paths | | | | | |
|---|-----------------------|------------------------|-----------------|----------------------|--------------|
| Costs | Recycling Path | Composting Path | WTE Path | Disposal Path | Total |
| Activity Costs: | | | | | |
| Collection | | | | | |
| Transfer Station(s) | | | | | |
| Transport | | | | | |
| Facility | | | | | |
| Residuals Disposal | | | | | |
| Education/Outreach | | | | | |
| Overhead Costs | | | | | |
| Total Costs | | | | | |
| By-Product Revenues (subtract) | () | () | () | () | () |
| Net Costs | | | | | |
| Tons Received (divide) | | | | | |
| Net Cost Per Ton | | | | | |

Role of Variable vs. Fixed Costs in Near-Term Cost Projections. FCA results can be used to estimate the cost or savings of changes in the near term in the mix of waste flows through the solid waste management system only if all costs are variable.

- When you pay a per-ton tipping fee for land disposal at a landfill owned by another entity (e.g., a private waste management firm), then land disposal can be (depending on contract terms, if any) an entirely variable cost because disposal costs to the local government vary directly with waste disposal tonnage.
- However, if you own your landfill, then only a portion of land disposal costs actually will be reduced when waste is diverted (e.g., through recycling), because variable costs account for only a portion of total land disposal costs. The remainder is fixed costs.

The variable cost portion of land disposal costs includes outlays for operation and maintenance and other outlays that could be reduced quickly in response to lower waste disposal tonnage, thus reducing costs. The fixed cost portion includes interest, depreciation, and amortization for landfill capital outlays, up-front, and back-end costs, and other outlays (e.g., security) that could not be reduced quickly in response to lower waste disposal tonnage. In fact, the outlays represented by depreciation already have been paid in full, which is why

they are fixed costs. Interest payments on capital assets also are fixed costs, because they are not reduced or deferred when those assets are used at less capacity or left idle. In the short run, by definition, there is no way to avoid fixed costs.

A similar logic applies to the other activities involved in the recycling and landfilling paths. For example, when you franchise or contract for waste collection, then collection costs might be entirely variable (depending on the terms of the franchise or contract). When you own the trucks and perform collection yourself, there might be fixed costs that are incurred regardless of the amount of waste actually collected.

Role of Variable vs. Fixed Costs in Long-Term Cost Projections. Although there generally is no way to avoid fixed costs in the short run, a permanent and predictable extension in the expected life of a landfill (e.g., through waste diversion) can produce both accounting and economic benefits. Planners are developing methodologies for valuing the economic benefits of extending landfill capacity, which is a topic beyond the scope of this handbook. A program (e.g., recycling, composting, WTE) that can be expected to significantly extend landfill life in a reasonably predictable way can be recognized in FCA terms.

Although accountants frown on making frequent adjustments to depreciation and amortization schedules, they would likely view extending landfill depreciation schedules to reflect waste diversion as legitimate, unless the landfill life extension were due to reduced waste disposal volumes resulting from cyclical downturns (e.g., recessions) that are neither permanent nor predictable. GASB 18,¹⁶ summarized in Chapter 4, currently requires recognition of future closure and post-closure costs based on annual use of landfill capacity. Waste diversion would reduce the amount of closure and post-closure costs appropriately recognized in a given year. Lengthening depreciation schedules has the effect of “reducing” some of the fixed costs by spreading them over a longer period. Alternatively, if depreciation schedules are not extended to match the lengthened useful life of the landfill, the fixed costs due to interest and capital depreciation will disappear for the final years of the facility’s extended life, once they have been fully recognized. In long-term cost projections, therefore, all landfill costs can be treated as variable, because their magnitude can be affected by the level of operations at the land disposal facility.

This means that you can use FCA numbers for making rough projections of the long-run cost implications of different MSW paths without needing to take into account variable vs. fixed costs. In making projections, keep in mind that FCA numbers may reflect a mix of both current operating costs and current costs of the use of assets purchased in the past, which do not reflect inflation-adjusted replacement costs. Moreover, there are better bases for making cost projections for significant changes in MSW programs (see pages 53 through 58).

Fixed vs. Variable Costs and Overhead. Overhead costs might have a relatively smaller fixed cost component or might be treated as fully variable and assigned using formulas that reflect variable costs (budgets, personnel, waste quantities, number of vehicles, etc.). On the other hand, overhead costs might be treated as largely fixed, because they will not be reduced by changes in how waste is managed. While overhead might be viewed as fixed in the short run, in the long run, as overhead functions are made more efficient or perhaps eliminated, overhead costs may be variable.

Avoided Cost

The concept of *avoided cost* can arise when describing the costs of solid waste management activities and paths or making management decisions about future changes in the solid waste management system in your community. Avoided cost often is used in reference to land disposal. The avoided cost of (i.e., due to) MSW following the recycling, composting, or WTE path is considered to be equal to the cost reductions, if any, in MSW collection, transfer, transport, and land disposal (i.e., the land disposal path). Land disposal is the best basis for defining avoided cost, because only some portions of the waste stream are recyclable, compostable, or combustible, but all solid waste can be buried in a landfill. Therefore, every ton of waste that is recycled, composted, or combusted, less any residues, is a ton of waste that does not require land disposal. The avoided cost due to these other waste management paths can be thought of as the avoided cost of the land disposal path.

Avoided Cost Do's and Don'ts

If recycling costs \$100 per ton and land disposal costs \$90 per ton, it would be:

Correct to Say

- Recycling costs an extra \$10 per ton compared to land disposal

Incorrect to Say

- Recycling costs only \$10 per ton, given the land disposal costs avoided

Estimates of avoided cost can easily be misused. Much depends on whether the focus is on (1) specific MSW activities or paths, (2) the total costs of the entire system for handling MSW, (3) near-term marginal changes, or (4) longer-term major changes to the MSW program.

Costs of MSW Activities or Paths. With respect to a particular waste management activity or path, a common pitfall is to subtract the avoided cost of landfilling from the cost of an alternative to landfilling (e.g., recycling, composting, or WTE). For example, if the net cost of recycling is \$100 per ton and the net cost of land disposal is \$90 per ton, then it is incorrect to subtract \$90 from \$100 and conclude that “the net cost of recycling is \$10 per ton after taking into account the avoided cost of

landfill disposal.” This mistake is a sure prescription for disappointing local governments and residents who must pay \$100 per ton for the net cost of recycling, after taking into account by-product revenues received from the sale of recycled materials. The full costs per ton of recycling, composting, or WTE are not affected by any resulting avoided costs of landfilling. Any avoided costs of land disposal do not themselves reduce the costs of recycling, composting, or WTE. Therefore, avoided costs of land disposal should not be subtracted from the net cost of recycling in this example. This is true even when the costs of land disposal are fully variable, because land disposal is purchased from a vendor on a unit basis.

Total MSW System Costs. While it is misleading to adjust the costs of recycling, composting, and WTE to reflect land disposal costs avoided, the MSW system as a whole will incur reduced land disposal costs as a result of landfill diversion programs. These avoided costs are real. Any avoided costs of land disposal will be reflected in new calculations (or projections) of total MSW system costs following changes to the MSW program. Bear in mind that because avoided costs are not revenues, they do not necessarily reduce the total costs of MSW management or the fees and taxes that residents must pay for solid waste management. However, the total costs for managing solid waste in the community will reflect both costs avoided and costs incurred as a result of incorporating alternatives to land disposal into integrated solid waste management. The

Short-Term Marginal Changes

For short-term marginal changes, better cost projections will result from consideration of fixed and variable costs than from using the full cost estimate alone. FCA can help you estimate fixed and variable costs using rough rules of thumb, which may be sufficient when considering short-term marginal changes in levels of activity.

difference between the total cost of managing solid waste with and without an alternative program is known as the incremental, or differential, cost of the program.

Near-Term Marginal Changes. The avoided cost of marginal, short-term changes in land disposal can be estimated by analyzing the fixed and variable cost components of MSW collection, transfer, transport, and land disposal. The “avoided cost” in the short term will be no greater than the variable cost. In other words, fixed costs cannot be avoided in the short term. Using the term avoided cost in this context can lead to confusion, because it implies that costs have been avoided absolutely, thus reducing total MSW program costs. As noted above, this is not necessarily true. Rather, in the short term, one set of costs (e.g., landfilling) has been more or less replaced by another set of costs (e.g., recycling). Any potential total system cost reduction derives not from the absolute amount of the variable landfill cost “avoided” but from the difference in (1) the size of the variable cost component of land disposal and (2) net costs of landfill alternatives. This is true even if land disposal is fully variable in cost, as shown in the table below.

| (a) Net Recycling Cost/Ton | (b) Net Land Disposal Cost/Ton | (c) Land Disposal Variable Cost/Ton | (d) Net Total Cost Saved/Ton [(c) minus (a)] |
|----------------------------------|--------------------------------------|---|---|
| \$100 | \$90 | \$90 | (\$10) |
| \$100 | \$90 | \$60 | (\$40) |
| \$100 | \$90 | \$30 | (\$70) |

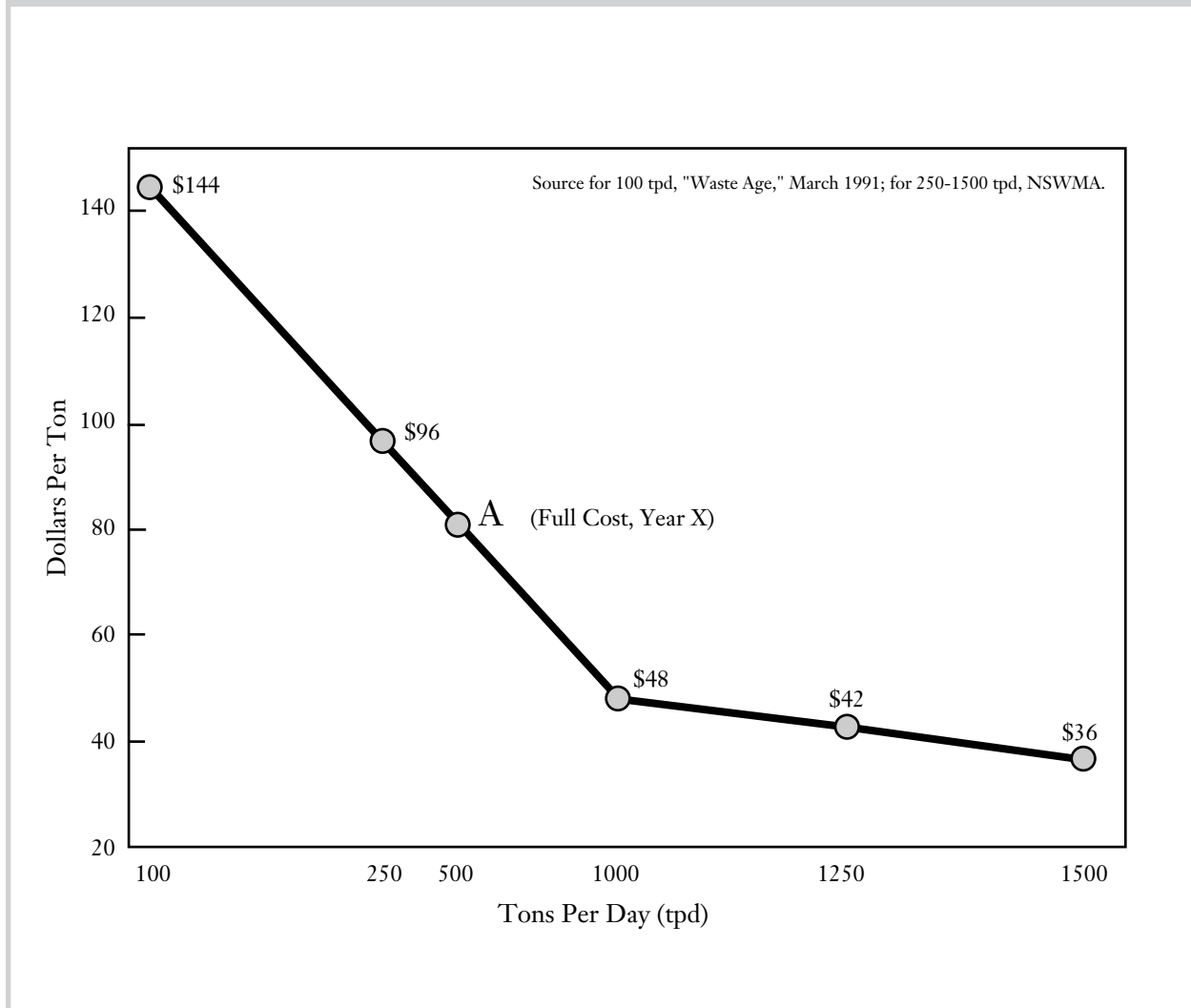
The table compares three scenarios. In each, the net cost of recycling [column (a)] is \$100/ton, and the net cost of land disposal [column (b)] is \$90/ton. The only difference is in the amount of variable costs [column (c)]. When land disposal costs are fully variable, the net cost saved [column (d)] is -\$10/ton, the difference between the \$90/ton variable cost of land disposal and the \$100/ton cost of recycling. This means that total costs will increase by \$10 for each additional ton of waste recycled. When only \$60/ton of land disposal is variable, the net cost saved is -\$40 per ton, the difference between the \$60/ton variable cost of landfilling and the \$100/ton cost of recycling. When variable costs constitute \$30/ton for landfilling, the net cost saved by recycling is decreased to -\$70/ton. In each case, the variable cost of landfilling is “avoided” in the short term but replaced by the greater (in this example) net cost of recycling.

Long-Term Major Changes. If the increase in MSW to be diverted from the land disposal path is significant (i.e., more than a marginal change), a projection of avoided cost based on the current costs of landfilling might overstate savings because landfill diversion and other factors can significantly increase

future unit costs of land disposal. The cost following a major program change will depend on economies or diseconomies of scale, which can be thought of as falling on a “cost curve.”

Exhibit 5-4

Economies of Scale at Landfills



A “cost curve” relates the per ton cost of an activity or path to the scale of that activity or path. In general, the greater the volume of units processed, the lower the per unit cost because fixed costs can be “spread” over more units and more efficient technology can be applied. This effect is referred to as “economies of scale.” The per ton cost of MSW activities or paths in the long run will reflect their relative economies of scale. Exhibit 5-4 illustrates a cost curve for the current costs of land disposal. As shown, economies of scale begin to level out for land disposal facilities processing between 750 and 1,500 tons per day; in other words, the cost per ton decline is relatively small in this area. On the other hand, economies of scale are strong between 100 and 250 tons per day; the cost per ton is very sensitive to the volume of waste disposed. Point A on the curve represents the full cost calculation for a given year at a particular

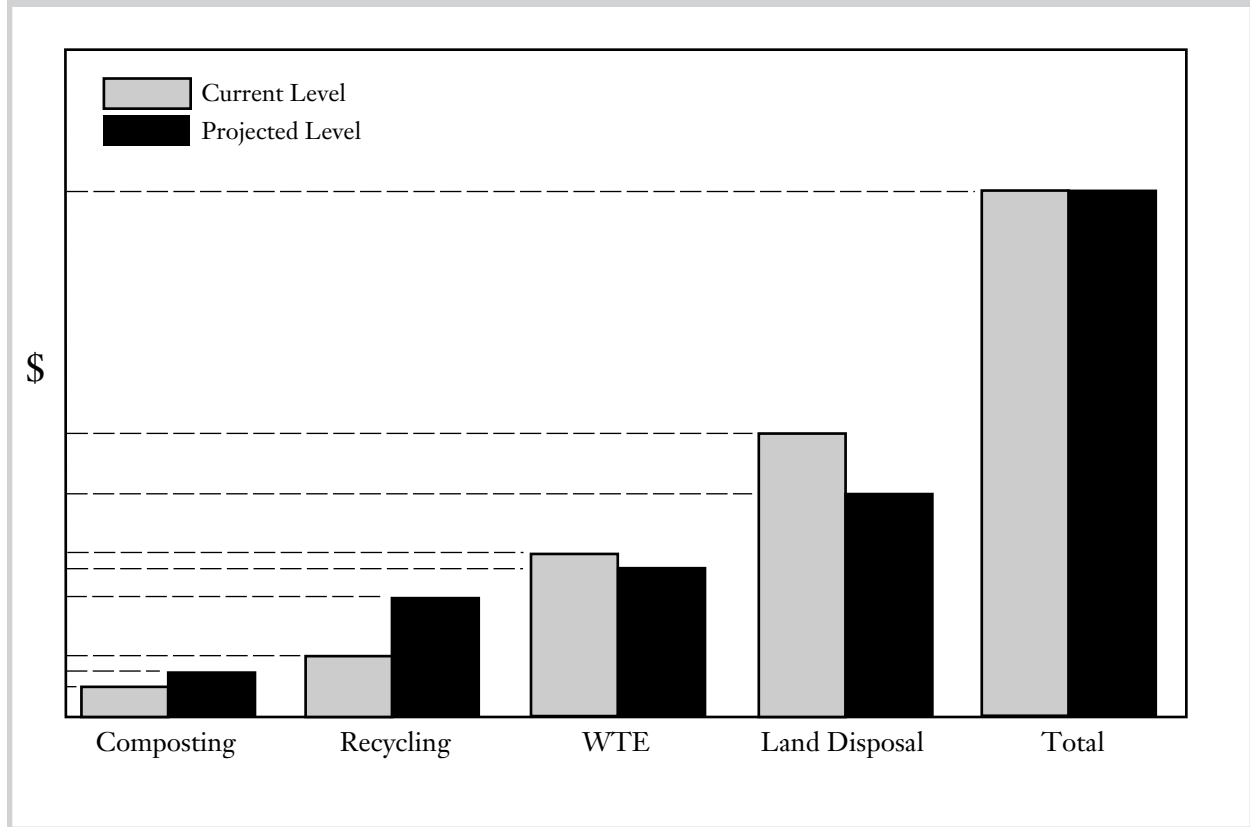
scale of operations. For planning and management purposes, a single point might be a poor basis for extrapolating and projecting future costs, particularly if major changes are contemplated in the volume of waste to be handled.

Projecting the long-term costs of activities or paths that communities might want to increase or decrease (e.g., long-term avoided costs of land disposal) is best done on the basis of a cost curve, which takes scale economies and diseconomies into account. Depending on the shape of the cost curve, unit costs per ton might decrease more or less steeply with increasing volume, due to economies of scale. Although FCA can identify a point on the curve (e.g. point “A”) and help estimate variable and fixed costs for projections of the effects of marginal changes, FCA alone is an insufficient basis on which to draw the cost curve and project long-term costs and cost savings from major changes to the MSW system. Unfortunately, data to construct an appropriate cost curve for a community might not be readily available.

If the focus is on projecting the total cost of the entire system for handling MSW in the long run, avoided cost can refer to the total reduction in full costs of landfilling associated with the smaller volume of MSW sent directly to land disposal. Depending on the shape of the cost curve, the total cost of land disposal might decrease with lower volumes even as the unit cost per ton rises. Whether your community as a whole experiences reduced total costs depends on how the total avoided cost compares to the total increase in the costs of the alternatives to direct land disposal. Again, while the per ton cost might decrease with greater volumes processed, the total cost of the landfill alternatives likely will rise as their volumes of MSW handled increase. Exhibit 5-5 illustrates how a projected shift in the handling of waste can result in avoided costs of land disposal and WTE that together offset increased costs for greater levels of composting and recycling. The net result, in that example, is that total costs remain the same. Other scenarios are possible, however. Although FCA can provide a point on the cost curve and facilitate estimates of fixed and variable costs, planners and managers will want to estimate the shape of the cost curve, or other points on it, if more than marginal changes in waste management practices are being evaluated.

Exhibit 5-5

Current Full Costs and Cost Projections



Avoided Replacement Cost

The *avoided replacement cost* is the net cost that you expect to pay for land disposal when a new landfill or landfill contract is necessary. Although avoided cost can be calculated from FCA reports for current operations, estimating future avoided replacement cost requires some additional research beyond a review of your own accounting records. Full exploration of the concept of “avoided replacement cost” is beyond the scope of this *Handbook*. The following discussion is intended as an overview.

Many local governments have relatively low current land disposal costs associated with existing landfills that might close. Avoided replacement cost recognizes that (fixed) costs might increase when older facilities are replaced with newer ones. For example, depreciation and interest costs for older equipment and facilities are based on capital outlays made years ago, without any adjustment for inflation. Any inflation since the time of those outlays will mean that new facilities and equipment will require larger capital outlays, which will result in higher depreciation and interest charges. Also, older equipment and facilities might incur no interest costs if they have been paid off in full and might record no depreciation costs in their last years if their useful life turned out to be longer than the estimate used to fully depreciate the original outlay. Finally, facilities such as landfills and WTE facilities might be especially likely to incur higher replacement costs due to the cost of new environmental requirements. In this situation, local governments might want to research and estimate the replacement cost for land disposal at a new landfill or another existing landfill, including any additional costs for transfer and transport if the new landfill would be further away. This estimated future cost for land disposal can be used as a rough measure of the avoided replacement cost due to recycling and other waste management paths, to the extent that such efforts extend the life of the low-cost landfill and delay the higher replacement cost for land disposal.

- For example, if the net cost of recycling is \$100 per ton, and the net cost of land disposal is \$90 per ton, then the avoided cost due to recycling can be no more than \$90 per ton, and there is an incremental cost of at least \$10 per ton for every ton of waste that is recycled.
- When the capacity of the local landfill will be exhausted, and the net cost of land disposal at another landfill will be \$120 per ton, then the avoided replacement cost due to recycling is \$120 per ton. Every ton of waste recycled extends the life of the existing low-cost landfill and delays the \$120 per ton replacement cost for land disposal. Therefore, recycling might impose an incremental cost of at least \$10 per ton in the short run, but it might provide an incremental benefit of up to \$20 per ton in the long run.

You can compare the replacement cost per ton for land disposal to your current net cost per ton for other MSW paths in Exhibit 5-5. If the replacement cost per ton for land disposal is higher than the net cost per ton for other waste management paths, then these paths are providing a long run incremental benefit to local residents, even if these paths create an incremental cost in the short run.

Management and Planning Applications for Full Cost Information

This *Handbook* does not explore the many potential applications of FCA data to management and planning issues, such as design of cost-based user rates (e.g., unit-based pricing), identification of potential cost-savings from process redesign, privatization/outsourcing decisions, and so on. The previous sections have addressed some of the issues that can arise in making comparisons and cost projections based on FCA numbers. Exhibit 5-6 illustrates, for a set of hypothetical cost information, the types of comparisons that can be made and lists the key concepts relevant to each type of conclusion. However, these concepts might be defined and used differently by other organizations and experts; there is no standardized terminology.

Exhibit 5-6

| Comparing MSW Costs: Key Concepts for Managers and Planners | | |
|--|--------------------------|--|
| Cost Information | Key Concepts | Conclusions |
| Recycling Net Full Costs \$100/ton | Full Costs | <ul style="list-style-type: none"> Recycling x tons costs \$10/ton more than land disposal of x tons |
| | Variable and Fixed Costs | <ul style="list-style-type: none"> In the near term, increased recycling might add \$50/ton to total costs, recognizing fixed costs of land disposal |
| Land Disposal Net Full Costs \$90/ton Net Variable Costs \$50/ton Net Replacement Costs \$110/ton | Full Costs | <ul style="list-style-type: none"> The net cost of recycling x tons should be only \$10/ton greater than the net cost of land disposal of x tons in the long run, when all costs are variable |
| | Avoided Replacement Cost | <ul style="list-style-type: none"> In the next few years, or when it is necessary to replace exhausted landfill capacity, recycling x tons will cost \$10/ton less than land-filling |



Appendix A

An Illustration Of Using FCA For MSW Management

A simplified example might help to illustrate how FCA can be used to report the costs of MSW management. Readers unfamiliar with these concepts might find more realistic examples too complex and distracting. Some of the many factors omitted from this illustration are addressed throughout this *Handbook*.

Assume that Anytown, located in Anystate, USA, generates 200,000 tons of MSW per year, which is managed using a strategy of (1) collecting 20,000 tons of source-separated materials for recycling (10 percent recycling rate) and (2) landfilling the remaining 180,000 tons of collected mixed waste plus 2,000 tons of residues from source-separated materials that were not in fact recyclable. Anytown sells 18,000 tons of recyclables (i.e., the 20,000 tons collected minus the 2,000 tons of residue) for \$450,000. Applying an FCA approach similar to that presented in this *Handbook*, Anytown produces a full cost report as follows:

| | |
|---------------------|--------------|
| Full Cost | \$20,700,000 |
| By-Product Revenues | (450,000) |
| Net Cost | \$20,250,000 |

Anytown is considering whether to change its MSW strategy. Because Anystate requires communities to prepare FCA reports, Anytown is able to locate two other similar communities using different strategies. The communities—Othertown and Compostville—have similar populations and demographics.

Othertown also generates 200,000 tons of MSW per year. It collects 60,000 tons of source-separated waste for recycling (30 percent recycling rate) per year, much more than Anytown, and directly landfills the remaining 140,000 tons of mixed waste plus 6,000 tons of residues from the source-separated materials. Othertown sells 54,000 tons of recyclables for \$1,566,000. The full cost picture for Othertown looks as follows:

| | |
|---------------------|---------------|
| Full Cost | \$21,330,000 |
| By-Product Revenues | (\$1,566,000) |
| Net Cost | \$19,764,000 |

Othertown is managing its solid waste at a total cost somewhat less than Anytown (i.e., about 2.4 percent less); the savings is \$486,000 (i.e., \$20,250,000 minus \$19,764,000).

Compostville has similar demographics to Anytown and Othertown and likely generates the same amount of waste (200,000 tons per year). It has implemented a program for encouraging backyard composting as well as curbside collection of yard trimmings for composting by a vendor. Backyard composting is believed to have reduced the total amount of solid waste collected by 5 percent from 200,000 to 190,000 tons per year, including 60,000 tons of source-separated waste for recycling, 20,000 tons of yard trimmings for composting, and 110,000 tons of mixed waste for direct disposal. Of the 60,000 tons of source-separated waste, 6,000 tons end up as nonrecyclable residue for disposal in the landfill together with 1,000 tons of residue from the composting facility, and the 110,000 tons of mixed waste, for a total of 117,000 tons of waste landfilled. Revenues from the sale of recyclables and compost are nearly \$2 million. The FCA report for Compostville looks as follows:

| | |
|---------------------|---------------|
| Full Cost | \$20,360,000 |
| By-Product Revenues | (\$1,966,000) |
| Net Costs | \$18,394,000 |

Compared to Anytown, Compostville saves \$1,856,000 in costs, which is over 9 percent of Anytown's cost.

Having completed its FCA report and located similar communities where MSW management costs less, Anytown is now able to scrutinize its costs more closely to identify potential cost savings. There is no guarantee that Anytown will reduce its MSW costs by adopting the strategies used in Othertown or Compostville, because there are many factors that can affect the cost of solid waste management. These factors include population density, waste streams handled, available technology, prevailing labor rates, productivity, service mix (e.g., frequency and type of collection), proximity of MSW facilities, and economies of scale. In addition, a community might have other goals to consider besides cost minimization. However, FCA can provide useful information for solid waste managers and their communities that, with further analysis, can support sound management and planning.

In addition to comparing the "bottom line" full costs of MSW management in the three communities, the data presented earlier can be presented on a "*net cost per ton*" basis for each community as follows. Recall that the total tons of waste processed will be greater than the tons received/collected to the extent that waste received/collected for recycling, composting, or WTE results in residues that must also be landfilled (i.e., handled twice). This is illustrated in the following chart:

Tons of Waste Handled By Path and Activity

| Place | Recycling | | Composting | | Landfilling | | Total | |
|--------------|-----------|----------|------------|----------|-------------|----------|---------|----------|
| | Path | Activity | Path | Activity | Path | Activity | Path | Activity |
| Anytown | 20,000 | 20,000 | 0 | 0 | 180,000 | 182,000 | 200,000 | 202,000 |
| Othertown | 60,000 | 60,000 | 0 | 0 | 140,000 | 146,000 | 200,000 | 206,000 |
| Compostville | 60,000 | 60,000 | 20,000 | 20,000 | 110,000 | 117,000 | 190,000 | 197,000 |

Although the full cost for the entire MSW system is the same, whether reported by activities or paths, the cost per ton will vary, depending on whether the total cost for the community is divided by (1) the tons received/collected for processing or (2) the tons actually processed. This example employs the latter approach. Chapter 5 discusses use of the cost per ton and other ways to report FCA data.

Because 10 percent (i.e., 2,000 tons) of the source-separated materials taken for recycling end up being disposed of in the landfill, Anytown handles a total of 202,000 tons per year. Taking into account the revenues from the sale of the recyclables, the net cost per ton is \$100.25 ($\$20,250,000 \div 202,000$). Othertown handles 206,000 tons of MSW per year because 10 percent of the 60,000 tons of source-separated materials end up being landfilled (6,000 tons of residue + 60,000 tons of source-separated material + 140,000 tons of mixed waste = 206,000). Othertown's net cost per ton is \$95.94, which is nearly 4.3 percent less than the net cost per ton in Anytown. Compostville's net cost per ton is \$93.37 ($\$18,394,000 \div 197,000$ tons). These results are summarized below:

| | Anytown | Othertown | Compostville |
|-------------------------|--------------|--------------|--------------|
| Full Cost | \$20,700,000 | \$21,330,000 | \$20,360,000 |
| By-Product Revenues | (450,000) | (1,566,000) | (1,966,000) |
| Net Cost | \$20,250,000 | \$19,764,000 | \$18,394,000 |
| Percent Cost Difference | | (2.4%) | (9.1%) |
| Tons Handled | 202,000 | 206,000 | 197,000 |
| Net Cost per Ton | \$100.25 | \$95.94 | \$93.37 |
| Percent Cost Difference | | (4.3%) | (7.4%) |

This table shows that, in terms of net total cost differential, Compostville has a substantial advantage over Othertown, when they are both compared to Anytown. On a net cost per ton basis, however, Compostville and Othertown

are much closer together. Because there are many factors that can affect costs, this type of comparison across communities might have limited value. To make better use of the data, further disaggregation is needed. For example, the FCA numbers can be disaggregated to correspond with MSW activities or paths; then unit costs (i.e., costs per ton) can be calculated as follows:

| Anytown | | | |
|-------------------------|-------------------|---------------------|--------------|
| | Recycling Path | Landfilling Path | Total |
| Full Cost | \$2,700,000 | \$18,000,000 | \$20,700,000 |
| Tons/Year | 20,000 | 180,000 | 202,000 |
| Cost/Ton | \$135 | \$100 | \$102.48 |
| By-Product Revenues/Ton | \$25 | 0 | - |
| By-Product Revenues | (\$450,000) | 0 | (\$450,000) |
| Net Cost | \$2,250,000 | \$18,000,000 | \$20,250,000 |
| Net Cost/Ton | \$112.50 | \$100 | \$100.25 |

The cost per ton of recycling MSW in Anytown is significantly greater than its cost per ton of landfilling, even when by-product revenues are taken into account, as they should be. Note that this FCA information does not indicate whether Anytown's costs have been optimized nor whether Anytown should change its program. The FCA data simply describe the existing situation.

| Othertown | | | |
|-------------------------|-------------------|---------------------|---------------|
| | Recycling Path | Landfilling Path | Total |
| Full Cost | \$6,630,000 | \$14,700,000 | \$21,330,000 |
| Tons/Year | 60,000 | 140,000 | 206,000 |
| Cost/Ton | \$110.50 | \$105 | \$103.54 |
| By-Product Revenues/Ton | \$29 | 0 | - |
| By-Product Revenues | (\$1,566,000) | 0 | (\$1,566,000) |
| Net Cost | \$5,064,000 | \$14,700,000 | \$19,764,000 |
| Net Cost/Ton | \$84.40 | \$105 | \$95.94 |

Othertown's FCA report reveals that its cost per ton for recycling is substantially less than its cost per ton for landfilling. Again, this does not mean that Othertown has optimized its MSW costs, nor do the FCA numbers indicate whether or how Othertown should change its program.

| Compostville | | | | |
|-------------------------|----------------|-----------------|------------------|---------------|
| | Recycling Path | Composting Path | Landfilling Path | Total |
| Full Cost | \$6,654,360 | \$1,709,060 | \$11,996,580 | \$20,360,000 |
| Tons/Year | 60,000 | 20,000 | 110,000 | 197,000 |
| Cost/Ton | \$110.91 | \$85.45 | \$109.06 | \$103.35 |
| By-Product Revenues/Ton | \$29 | \$20 | 0 | - |
| By-Product Revenues | (\$1,566,000) | (\$400,000) | 0 | (\$1,966,000) |
| Net Cost | \$5,088,360 | \$1,309,060 | \$11,996,580 | \$18,394,000 |
| Net Cost/Ton | \$84.81 | \$65.43 | \$109.06 | \$93.37 |

Compostville has reported that its cost per ton for MSW composting is lower than its cost per ton for recycling and landfilling. If Compostville received no by-product revenues from the sale of compost, then MSW recycling would cost a small amount less per ton than composting (i.e., \$84.81 for recycling vs. \$84.45 for composting). As with the communities above, these FCA numbers simply document current costs and do not indicate whether or how costs could be reduced.

As noted in Chapter 5, and discussed at more length in Chapter 2, comparisons can be made either in terms of MSW activities or paths. This illustration is based on MSW paths; this means that the paths include their fair share of waste collection, transfer, and transport activity costs as well as disposal activity costs for recycling and composting residues. As a result, each community's total tons of waste processed per year is greater than the tons of waste entering its component paths, because both recycling and composting generate residues that are landfilled. Exhibit A-1 illustrates how the costs of MSW activities can be used to build up the costs of MSW paths. The exhibit illustrates the costs for the fictitious community of Compostville.

What can be learned from comparing these net cost per ton numbers across the three communities? Recycling costs \$84.40 per ton in Othertown and \$84.81 in Compostville but \$112.50 per ton in Anytown. Why? Similarly, Anytown receives \$25 per ton in by-product revenues while Othertown and Compostville receive \$29 per ton. Why? Are there economies of scale at work in recyclables sales? Or could the communities be collecting different materials? Could Othertown be closer to purchasers of recyclables, thus reducing transport costs? How do the communities compare in terms of overhead? Labor costs? Answering these questions will require further disaggregation of costs and analysis. FCA can identify costs, cost differentials, and, ultimately, cost drivers, giving local officials the ability to formulate good questions and develop answers.

Exhibit A-1

| Hypothetical Illustration of FCA for MSW Paths (in thousands of dollars) | | | | | |
|---|-----------------------|------------------------|-----------------|-------------------------|--------------|
| | Recycling Path | Composting Path | WTE Path | Landfilling Path | Total |
| Activity Costs | | | | | |
| Collection | 2,750 | 600 | 0 | 4,237 | 7,587 |
| Transfer Station(s) | 200 | 0 | 0 | 400 | 600 |
| Transport | 384 | 0 | 0 | 725 | 1,109 |
| Facility | 1,040 | 489 | 0 | 4,030 | 5,559 |
| Residuals Disposal | 280 | 47 | 0 | | 327 |
| Education/Outreach | 600 | 224 | 0 | 25 | 849 |
| Overhead Costs | 1,400 | 349 | 0 | 2,580 | 4,329 |
| Total Costs | 6,654 | 1,709 | 0 | 11,997 | 20,360 |
| By-Product Revenues <i>(subtract)</i> | (1,566) | (400) | (0) | (0) | (1,966) |
| Net Costs | 5,088 | 1,309 | 0 | 11,997 | 18,394 |
| Tons Received <i>(divide)</i> | 60,000 | 20,000 | 0 | 110,000 | 197,000 |
| Net Cost Per Ton | \$84.81 | \$65.43 | 0 | \$109.06 | \$93.37 |

Using FCA, a community can determine the full costs of solid waste management, as well as its component costs, and can identify what drives the costs. For example, note that the full cost of composting is only \$65.43 per ton in Compostville, including public education and outreach activities; on the other hand, Compostville’s cost per ton for landfilling is actually 9 percent higher than in Anytown. In fact, a large portion of the bottom-line savings realized by Compostville comes from diverting 5 percent (10,000 tons) of the waste stream into backyard composting. Without FCA to begin to level the playing field, comparisons across systems are probably misleading at best. With FCA, one can, bearing in mind differences in technological configuration, desired service levels, and waste streams handled, get some idea whether someone might have found a better way.



Full Cost Accounting Glossary

Account is a financial record of cash movements, collecting specific types of outlays or inflows of financial resources.

Accounting basis is an accounting concept that refers to when expenditures, expenses, and related liabilities are recognized in accounts and reported in financial statements; it relates exclusively to timing on either the cash or accrual method.

Accrual basis accounting recognizes (i.e., accrues) costs as services are provided, or as events and circumstances occur that have cash consequences, regardless of when cash outlays are made.

Amortization is a method of determining the annual costs associated with obligations for future outlays (e.g., the reduction of debt by regular payments sufficient to retire the debt by maturity).

Assessed revenues are derived from taxes or fees assessed in a manner that is unrelated to the level of service provided, as when property taxes or flat fees are used to fund solid waste management activities.

Avoided cost refers to the reduction in the costs of one MSW activity or path that results from use of a different MSW activity or path; typically, avoided cost means the reduction in the costs of collecting, transferring, transporting, and landfilling MSW that results from source reduction, recycling, composting, or waste-to-energy.

Avoided replacement cost is the net cost that a local government expects to pay for land disposal when a new landfill or landfill contract becomes necessary.

Back-end costs include expenditures to properly wrap-up operations and take proper care of landfills and other MSW facilities at the end of and after their useful lives; the costs of post-employment health and retirement benefits for MSW workers fall in this category.

By-product revenues are generated from the sale of marketable products created as a by-product of solid waste management, such as recyclables, compost, energy from waste, and landfill gas.

Capital outlay means an outlay of cash to acquire a resource that will be used in MSW operations over more than one year. Capital outlays (past, present, and future) must be converted into annual costs for full cost accounting purposes.

Cash flow accounting, also known as cash basis accounting or general fund accounting, is a system where cash outlays are recorded as they are actually paid out for goods and services.

Contingent costs are defined in this *Handbook* to mean the costs of remediating unknown or future releases of pollutants, such as leaks from municipal landfills, as well as the liability costs of compensating for as yet undiscovered or future damage to the property or persons of parties who are affected adversely by MSW activities.

Cost means the dollar value of resources used for MSW management.

Cost center is any solid waste management activity that receives separate attention through an account or group of accounts.

Depreciation is a method of allocating the costs of capital outlays over the useful life of the resource, which is the period of time during which the resource is expected to provide services.

Direct costs are costs that are clearly and exclusively associated with solid waste management.

Enterprise funds are mechanisms used by local governments for activities that can be financed and operated like a private business.

Environmental costs, as defined in this *Handbook*, include environmental degradation that cannot be easily remedied or measured, is difficult to value, and is not subject to legal liability; these costs are often termed environmental “externalities.” See also “property damage liability” and “natural resources liability.”

Fixed costs include interest, depreciation, and amortization for past or future landfill capital outlays and other costs (e.g., security) that cannot be reduced quickly in response to lower waste disposal tonnage.

Flow of current financial resources, an accounting term, is the measurement focus of most government funds, including the general fund, debt service funds, and enterprise funds. This focus records accruals for expenditure transactions which have occurred by year end that are normally expected to result in cash disbursement early enough in the following year to require the use of available expendable financial resources reported at year end.

Flow of economic resources, an accounting term, is the measurement focus used in the corporate sphere and for certain types of government funds to measure economic resources, claims to those resources, and the effects of transactions, events, and circumstances. This focus includes depreciation of fixed assets and amortization of liabilities.

Full cost accounting is a systematic approach for identifying, summing, and reporting the actual costs of solid waste management, taking into account past and future outlays, oversight and support service (overhead) costs, and operating costs.

Future outlay means an expenditure of cash in the future that is obligated by current or prior activities.

GAAFR is the *Governmental Accounting, Auditing and Financial Reporting Handbook*, published by the Government Finance Officers Association, that provides detailed professional guidance to finance officials and auditors on the application of GAAP; the GAAFR is not itself GAAP.

GAAP means Generally Accepted Accounting Principles, which consist of the rules, procedures, and conventions that define accepted accounting practices at a given time. GAAP includes broad guidelines as well as detailed procedures and practices. Much of GAAP is issued in codified form by GASB.

GASB refers to the Government Accounting Standards Board, an independent body responsible for setting accounting standards (i.e., GAAP) for activities and transactions of state and local governments. GASB was established in 1984 to succeed the National Council on Governmental Accounting.

General fund accounting — see cash flow accounting.

Hidden costs, as used in this *Handbook*, refer to the costs of activities or resources that appear to be free.

Indirect costs are costs that are not exclusively related to solid waste management but that relate to more than one local government activity. Such indirect costs for solid waste management (and other local government activities) can include accounting and payroll, personnel, legal, purchasing, data processing, records management, and executive oversight (e.g., the mayor's salary and office expenses).

Integrated solid waste management incorporates several different approaches for handling the entire MSW stream. Using a combination of approaches allows each type of waste to be managed according to environmental and economic considerations, with priority going to source reduction, reuse, and recycling, while reserving landfills as the least desirable waste management method. See also “waste management hierarchy.”

Measurement focus is an accounting convention that determines: (1) whether a government's operating statement presents information on the flow of financial resources or on the flow of economic resources, and (2) which liabilities (and assets) are included on a government's balance sheet and where they are reported.

Modified accrual basis of accounting refers to the accrual basis of accounting adapted to the government fund focus on the flow of current financial resources; this means that costs will be recognized when the liability is incurred and will be liquidated with current resources.

Natural resources damage liability refers to the types of damage to property held in public trust that can be compensated through the legal system.

Net cost of a solid waste management activity or path is its full cost minus its by-product revenues. The net cost divided by the tons of waste managed yields the net cost per ton for that activity or path.

Net cost per household indicates the amount of service fees and assessed taxes that must be collected on average from each household to pay for the full costs of solid waste management, after taking into account any by-product revenues. The net cost per household equals the net costs per year divided by total households served.

Net cost per ton is the best common denominator for comparing the current costs of solid waste management activities or paths within or across local government jurisdictions.

Operating costs are regularly recurring costs of resources that are used over a relatively short period of time (i.e., less than 1 year) in order to support ongoing MSW operations.

Outlay is an expenditure of cash.

Overhead costs are the management and support costs of running the solid waste program.

Personal injury liability refers to the types of damage to individuals that can be compensated through the legal system.

Property damage liability refers to the types of damage to private property that can be compensated through the legal system.

Routine cash outlays for solid waste management activities are the same as the operating costs of those activities.

Service revenues are derived from fees charged for the amount of MSW services used, such as unit pricing for solid waste collection and tipping fees for waste disposal.

Social costs are defined in this *Handbook* as impacts on human beings, their property, and welfare that cannot be compensated through the legal system; also termed “social externalities.”

Societal costs is a term sometimes used to encompass both environmental and social externalities.

Transfer revenues are funds provided by local, state, or federal governments, whether as grants or some form of revenue sharing.

Unit pricing charges solid waste generators (e.g., primarily households) based on how much they throw away. Also called “variable rate pricing” and “pay-as-you-throw.”

Up-front costs reflect the initial investments and expenses necessary to start an MSW activity or path.

Variable costs of land disposal include costs of operation and maintenance and other costs that can be reduced quickly in response to lower waste disposal tonnage.

Waste management hierarchy emphasizes a preferred order of management approaches: first, source reduction; second, recycling; third, waste combustion with energy recovery; and finally, landfilling.



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