Design

SECTION 4

This section provides an overview of the recycling measurement design process. Designing an effective recycling measurement system entails learning about how MSW and recyclables flow through your region in order to conduct an effective survey. At this stage of the process, you will also make critical decisions about the type of data to compile, where to acquire these data, and how to manage the information collected.

Step One

Learn About Your Terrain.

The more you know about the waste management infrastructure in your state or locality, the easier it will be to design a recycling measurement program that meets your specific needs. MSW and recyclables can flow in many directions through a region. The more complicated the flow, the greater the risk that materials will be counted more than once in your survey (double counting) or missed entirely (leakage). These risks can be avoided by developing a thorough understanding of the major players that handle MSW and recyclables in your area. Many agencies develop a database of the key players in solid waste management and recycling in their area to assist in measuring efforts. At a minimum, make a list of the key players detailed in Table 7 on page 24.

Many information sources can help you better understand the waste management infrastructure in your state or locality and locate key players. These include:

- *Trade associations.* National recycling and solid waste management associations can provide details on their state and local chapters. These chapters usually offer technical assistance and resources that can help you better understand your terrain. They can also identify upcoming conferences that might provide networking opportunities for identifying key players and soliciting information.

Design Steps

1. Learn about your terrain.
2. Solicit input into the system design.
3. Determine what type of information is needed.
4. Determine whom to survey.
5. Address confidentiality guarantees.
6. Determine how to manage and analyze the information.

TABLE 7. IDENTIFYING THE KEY PLAYERS IN WASTE MANAGEMENT IN YOUR STATE OR LOCALITY

RECYCLING	MSW DISPOSAL
■ Collectors and haulers that handle materials in the area.	■ Any additional collectors and haulers, not already identified, that handle MSW.
■ Large generators that self-haul their recyclables (government facilities, corporate office complexes, and grocery stores).	■ Transfer stations.
■ Drop-off and buy-back centers.	■ Disposal facilities (landfills, waste-to-energy facilities, and incinerators).
■ Processors and material recovery facilities.	
■ Recycling mills and end users.	

- *Manufacturers of products containing recycled materials.* Recycling facilities are good sources of information on the overall supply and demand of recyclable materials in your area. The information they provide can help you identify major generators, collectors, and processors.
- *Other government agencies, departments, or permitting agencies.* As mentioned earlier, different government agencies might already be involved in some kind of data collection effort that could be useful to recycling measurement. Additionally, since waste haulers and recycling businesses are often licensed at the local level, you might contact the bigger cities or counties in your area for information on key players.
- *Nonprofit organizations.* Nonprofit organizations operating drop-off centers and collection programs often have many years of experience in recycling. They can be a good source of information about the waste management infrastructure in your area.
- *Standard Industrial Classification (SIC) Codes.* You can use SIC codes to quickly search for major players in the waste and recycling industries. The codes will help you locate waste haulers, recycling companies, manufacturers, and large generators. Use the codes for supermarkets, retail stores, and other types of businesses to find large generators in the area.

Each individual or company identified is a potential source of assistance as you develop your recycling measurement system. Most importantly, each is a possible data source once you begin implementing your measurement system.

Onondaga County, New York, officials conduct site visits to gather information about local generators and recycling businesses. The county has found that the visits provide information on recycling practices that is not readily available through other methods.

Working With Chambers of Commerce

Local governments might find an excellent source of information in their chambers of commerce. Chambers can often help identify recycling businesses, waste management companies, and manufacturers. They might also have information about the types of materials local recyclers handle and the services they provide. Additionally, speaking at chamber meetings or providing articles for chamber newsletters can be an excellent way of providing a large segment of the affected business community with useful recycling information.

TIP

Understanding how MSW and recyclable materials are collected, processed, consolidated, and transported in your region will help you design an effective recycling measurement program.

Step Two

Solicit Input Into the Design of Your System.

To gain support for your system, solicit input from key stakeholders. This can be accomplished through a formal workgroup or advisory council comprised of potential survey respondents and other affected parties. Including government agency, nonprofit organization, recycling industry, and waste industry representatives in the decision-making process will foster a cooperative spirit and the exchange of ideas. Additionally, providing potential respondents with a sense of ownership in the reporting process might result in a higher response rate.

TIP

Build good working relationships with potential respondents before you begin surveying by forming workgroups or advisory councils.

Step Three

Determine What Type of Information Is Needed.

Your information needs for measuring recycling include data related to the amount of material recycled and disposed of in your state or locality, plus any information necessary for meeting your specific measurement goals. In order to perform the recycling rate calculation (see page 5 for the standard equation), you will first need data on MSW generation and recycling for the measurement year, as listed in Table 8 on page 26. MSW generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons.

In addition to these data, you also will need the following information from survey respondents:

- Company or agency name, address, phone number, and contact person.
- Type of company or agency, such as hauler, processor, manufacturer, or municipality.
- Whether conversion factors were used.
- Whether data were based on estimates.

The sample survey forms provided in Appendix C are designed to ensure that you obtain the information required to calculate the standard MSW recycling rate. The forms also allow for the collection of ancillary data related to other solid wastes (e.g., C&D debris or used oil) for those wishing to track

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The **Maryland** Department of the Environment (DOE) formed a workgroup that met for 18 months to streamline recycling measurement reporting procedures. Each county is responsible for gathering recycling measurement data. Previously, each sent surveys to the recycling processors operating within their county. Because the processors received multiple information requests, they were less likely to adequately complete each request. As a result, the state agreed to distribute a single survey to every processor. In addition, the state requested that processors supply each county with the necessary information. The new procedure has increased the response rate. DOE sends the survey forms to all counties on January 1 and to processors on January 15. The counties must report by April 1, while processors must report by February 15.

Florida formed a technical advisory committee comprised of state and local officials and recycling industry representatives. One of the main issues the committee addressed was confidentiality. The committee decided that processors would report directly to the state, and their data would be exempted from the state's Freedom of Information Act. Florida's recycling legislation was amended to incorporate these provisions. (See Appendix F for an excerpt of this legislation.)

this information. Some states or localities, for example, might desire additional information to meet legislative requirements, to measure other performance criteria, or for other purposes. Be aware, however, that collecting and compiling additional information requires more time and resources. Lengthy survey forms also can intimidate respondents and, in some cases, affect their willingness to participate in the effort.

Avoid the tendency to request more information than you actually need. For example, if you intend to use data for market development purposes, information on specific commodities, such as newspaper, steel cans, and plastic bottles, is essential. If, however, you are tracking your progress toward mandated recycling goals, then collecting overall MSW and recycling tonnages might be sufficient. Table 9 on page 28 provides some examples of data requirements based on a number of different program goals and purposes. The table illustrates the important link between your recycling measurement goals and the types of data that must be collected in order to meet those goals. To help define your data needs, consider constructing a similar table based on your identified goals.

Minnesota uses data collected annually from counties to evaluate progress toward recycling goals, to assess the availability of recycling opportunities for all state residents, and to promote buy recycled programs. For this reason, the state collects data on individual recyclable commodities at the county level.

Both the **New Jersey** and **Pennsylvania** Departments of Environmental Protection use total recycling tonnages, reported annually by municipalities, to calculate the annual disbursement of recycling grants. Municipalities receive a distribution from this fund for every ton of material recycled.

TIP

Your program goals and needs will help determine the type of information you request.

Step Four:

Determine Whom to Survey.

Once you know your terrain and the types of data you need, you can begin designing the actual survey. At this point you have to decide whom to survey. Possible survey respondents include the following chain of material handlers:

- Generators.
- MSW and recyclables haulers.
- MRFs, processors, recycling plants.
- Transfer stations.
- Disposal facilities.

Illustration 1 depicts the typical process by which recyclables move from the point of generation to final remanufacturing. While the process often differs by commodity and local situation, there are essentially three main steps—collection, processing, and remanufacturing. First, recyclable materials are generated by a consumer or business (generator) and then collected by a private hauler or government entity. Next, the materials are transported by the collector to a processing facility, such as a MRF or paper processor. At the processing facility, the recyclables are sorted, cleaned of contaminants, and

TABLE 8. DATA NEEDED TO CALCULATE AN OVERALL RECYCLING RATE

MSW

- Tonnage of MSW disposed of in your jurisdiction.
- Tonnage of MSW exported from your jurisdiction.
- Tonnage of MSW imported into your jurisdiction.

RECYCLABLES

- Total tonnage of materials recovered from MSW in your jurisdiction.
- Tonnage of glass, metals, paper, plastics, yard trimmings, textiles, and wood recovered from the MSW stream in your jurisdiction.

ILLUSTRATION 1. THE RECYCLING CHAIN

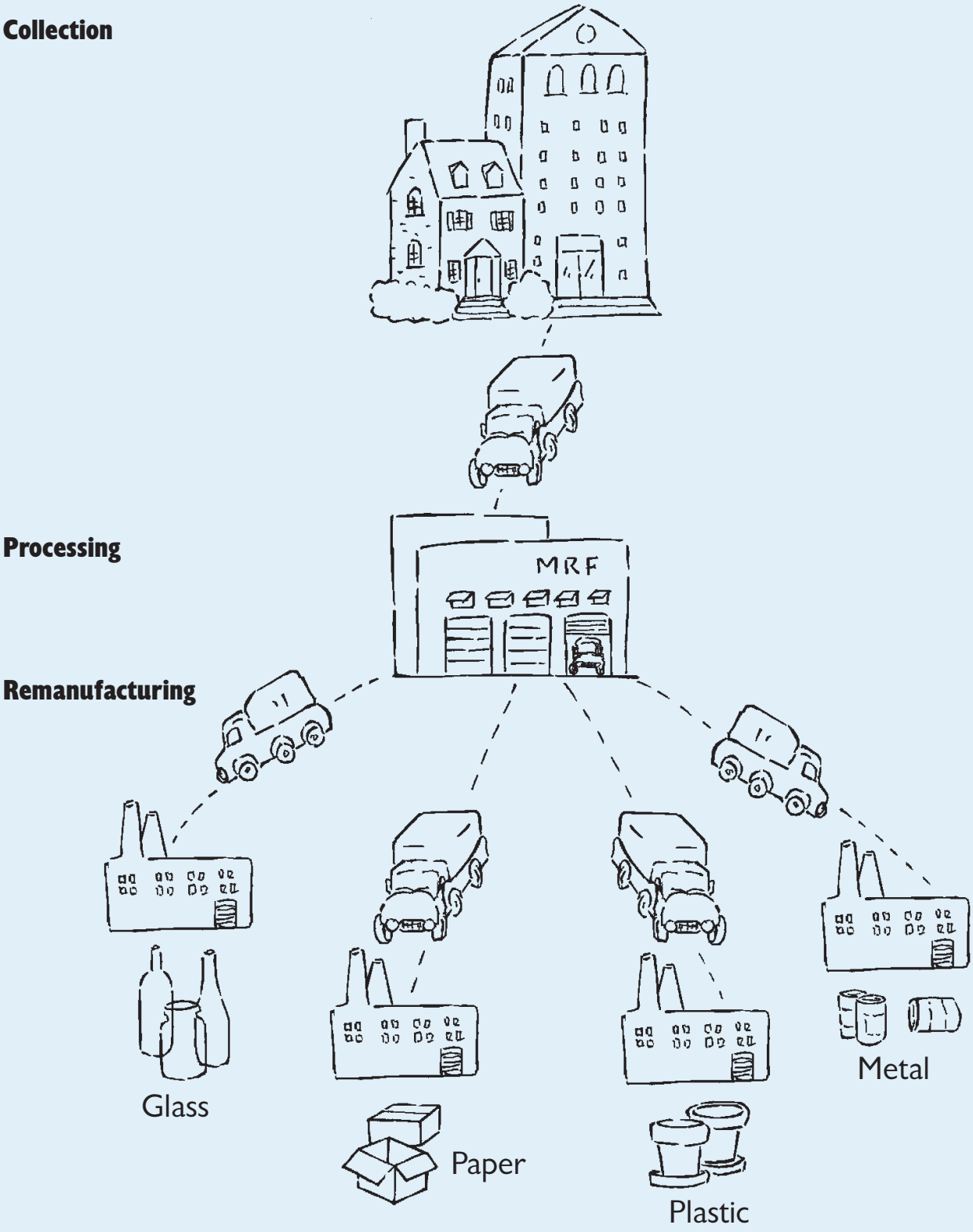

TABLE 9. DATA COLLECTION NEEDS

PURPOSE OF DATA COLLECTION	DATA REQUIREMENTS	DATA CAN BE USED TO...
Market development.	Commodity-specific data for recyclable materials[1]. Total tonnage by commodity for state or local recyclables.	Identify gaps in market availability and strength. Attract new processors and end users. Encourage manufacturers to utilize recyclable commodities in their production processes. Link processors and end users. Support buy recycled campaigns.
Evaluate and reward state or local recycling programs.	Data on broad categories of recyclable materials[2]. Total tonnage for state or local recyclables. Total tonnage of MSW disposed of.	Determine if state or local governments are in compliance with recycling laws. Help allocate grants and/or recognize residents, businesses, or industries that promote recycling.
Set or meet recycling goals.	Total tonnage for state or local recyclables.	Track progress. Identify localities that might need assistance in meeting goals.
Make changes in collection services.	Total tonnage for state or local recyclables and MSW disposed of.	Determine best management strategies.
Assess future landfill and waste-to-energy capacity.	Total tonnage for state or local recyclables. Total tonnage of MSW disposed of.	Predict changes and trends in the amount of waste and recyclables generated.

[1]Commodity-specific data refers to information on specific products in the waste stream (old newspaper), or specific resins or grades (HDPE).

[2]Broad categories data refers to general classifications of recyclables (paper, plastic, glass, metals).

prepared for final recycling. Some commodities may require additional processing beyond sorting and decontamination. Glass and plastic, for example, are often sent to glass beneficiation plants and plastics reclaimers, respectively, where they are processed into mill-ready forms. After all necessary processing has been completed, recyclables are made into new products at a recycling plant or other facility, such as a compost facility or animal bedding plant.

MSW discarded in dumpsters or left at the curb by residents is usually picked up by a public or private MSW hauler. Typically, the waste is then transported to a transfer station to be consolidated with other waste before being sent to a disposal facility, such as a landfill or incinerator. In other cases, waste moves directly from the collection point to a disposal facility.

Sometimes MSW is exported by waste haulers and transfer stations to facilities in a neighboring

TIP

Soliciting the advice of potential respondents about whom to survey can help determine from whom you are likely to get the best response and most accurate data.

jurisdiction. In the same way, landfills and other disposal facilities often accept MSW imported from other states or localities.

Determining whom to survey will depend on:

- Program goals and your specific data needs.
- Resources available for recycling measurement.
- Legislative authority to survey and collect data.
- Likely accuracy of information provided.
- Existing reporting requirements for haulers, processors, and end users.
- Type and number of recycling operations.
- Type and number of disposal facilities.

The approach presented in this guide is designed to streamline data collection, obtain the best possible data, and minimize the chances of double counting. Basically, this system approaches data collection in two ways. First, it involves the collection of recycling data separately from MSW disposal data. Second, residential recycling data are obtained differently than commercial recycling data.

For recycling data, it is most efficient to collect information at only one point in the chain. The specific point in the chain differs for residential and commercial recycling data. For residential recyclables, data is best acquired at the point of collection (the haulers). For commercial recyclables, data is best collected at the point where materials are processed (the processors). By obtaining data from one point in the recycling chain, state and local agencies will minimize the number of survey respondents and the possibility for double counting materials.

For MSW disposal data, information is collected from disposal facilities, transfer stations, and waste haulers. While disposal facilities comprise the primary source of data, transfer stations and waste haulers also can supply important information about MSW imports and exports.

An overview of the approach suggested for each type of data is provided in Table 10. A more detailed discussion of these preferred approaches follows.

TABLE 10. OVERVIEW OF PREFERRED APPROACHES FOR DATA COLLECTION

Material	Preferred Surveying Approach
Residential Recycling Data	
Various recyclables.	Collectors.
Commercial Recycling Data	
Paper.	Processors.
Glass.	Beneficiation plants.
Aluminum cans.	Nonprofits and buy-back centers.
Plastic.	Large generators.
Food scraps and yard trimmings.	Composting facilities.
Miscellaneous items.	Large generators.
Waste Disposal Data	
MSW.	Waste disposal facilities, transfer stations, and waste haulers.

TIP

If you choose to survey more than one point in the chain, ask data sources for information about only the general geographic origin and destination of the materials they manage to help avoid double counting.

Recycling Data

Residential

Municipally operated or contracted programs generally collect residential recyclables. Such programs include curbside and/or drop-off collections. These programs have grown rapidly over the past decade, and accurate data about the types and quantities of materials collected often are readily available. For this reason, residential recycling data are best obtained from the point of collection. In addition, collectors of recyclables know better where materials originated than processors or end users.

Residues

Not all materials recovered through residential collection programs are recycled into new products. Some materials are lost when the materials are prepared for market. These residues are difficult to account for and can vary in amount depending on the specific collection and processing methods used. Therefore, the standardized measurement methodology does not require that these residues be tracked. While accounting for residues results in more accurate data, the time and resource commitment necessary to track residues for all commodities may not be warranted.

Leakage

Some residential recyclables can escape municipal collection programs. For example, nonprofit groups and private recyclers sometimes operate drop-off locations, buy-back centers, and collection routes outside of municipal programs. Thus, materials go directly to the processor or end users without ever entering a municipal collection system. Being aware of community recycling activities will assist agencies in accounting for residential recyclables collected outside of the municipal system.

Examples of recyclables that can escape municipal collection programs, and thereby go undetected by data collection efforts, include:

- Newspaper collected by nonprofit groups during periodic fundraising drives.
- Beverage containers returned to redemption centers in states with deposit legislation (excluding refillable containers).
- Telephone directories collected during special drives often organized by telephone companies and nonprofit organizations.
- Paint collected at household hazardous waste sites for recycling.

Obtaining Residential Recycling Data

1. Obtain data on municipal programs from cities or counties.
2. Contact nonprofit and private recyclers for additional data.
3. Obtain data as close to the point of collection as possible to ensure accuracy.
4. Cross-check collection figures with data from processing facilities and end users, if necessary.

Commercial

Materials from commercial sources constitute a significant portion of the recycling stream. For this reason, it is important to obtain commercial data to get an accurate recycling rate. Materials generated by office buildings, wholesale and retail establishments, schools, airports, and other institutions are often not handled by local governments and do not commonly travel through multimaterial operations such as MRFs. Instead, paper, glass, aluminum cans, and other items from commercial sources are generally handled, processed, and marketed separately from residential recyclables. Because every surveyed material travels along a different path from collection point to final use, designing an approach specific to each material is recommended.

In general, the preferred approach for obtaining data on commercial recyclables is to survey at the processing point. If you are unable to obtain accurate data from the processors in your area, however, consider surveying large generators of recyclables or recycling plants. Examples of large generators include government facilities, corporate office complexes, grocery stores, and warehouse operations. Because these facilities recycle a large quantity of materials, they can be excellent sources of commercial recycling data. In addition, some large generators may have their own processing capabilities, which should not be overlooked when you are locating the processors in your area.

An alternative to surveying processors is to survey recycling plants or other end users. Because recycling plants are generally

larger than processors and service a wider area, there will be fewer plants than processors to survey. However, end users might not be able to determine the place of origin of the materials they purchase. Also, if you are obtaining commercial data from recycling plants, it is important not to include data from residential recycling programs. Survey Form 3, for end users of recyclables, allows residential and commercial data to be reported separately for this reason.

Approaches for gathering commercial data for the most commonly collected categories of recyclables are described on the following pages.

Aluminum Cans

Survey nonprofit recycling facilities and buy-back centers. Restaurants, bars, airports, and large facilities such as shopping malls generate large quantities of aluminum cans, most of which are taken to nonprofit recycling facilities or buy-back centers.

If you are unable to obtain data from these facilities, contact aluminum companies directly. These companies are often involved with the collection, processing, shipping, and remanufacture of aluminum cans; they also frequently lease compaction equipment and trailers to recycling programs. Aluminum companies can assist with identifying large generators of aluminum cans in your area.

Food Scraps and Yard Trimmings

Survey composting facilities. The majority of food and yard waste collected for recycling is sent to public or private composting facilities. Many restaurants, supermarkets, and institutions generate food scraps. Recycled food scraps include both food scraps used as pig feed, as well as leftover food composted by prisons, schools, and other facilities.

Many institutions and businesses that maintain their lawns generate yard trimmings, including grass, leaves, and tree branches. Yard trimmings that are composted or mulched off site should be included in your data. Yard trimmings processed through backyard composting, grasscycling, or other onsite efforts, however, should not, as these are considered source reduction activities.

Contact state or local permitting offices to help identify permitted composting facilities that accept food scraps and yard trimmings from residential or commercial sources. The permit requirements of some localities might mandate that the facilities report the tonnage of material processed. Since not all composting facilities are permitted, identifying all the facilities that process food scraps and yard trimmings might take additional research. Also, a few types of yard trimmings, namely tree trimmings, may be sent to wood waste processing facilities. These facilities should be contacted for data, as wood waste recycling can be included in the recycling rate. Remember, however, to include only wood from trimmings, pallets, and other wood packaging, like crates. Tree stumps are included only if they are recovered from MSW; stumps from C&D projects are excluded.

Glass

Survey beneficiation plants. These large glass processing facilities convert street glass into mill-ready cullet and are the primary markets for glass in many regions. These processing facilities often have commercial glass receipts detailing tonnages received from particular localities. Restaurants and bars, institutions (schools), and large facilities (airports and shopping malls) all generate glass recyclables that may be sent to these processing facilities.

If no beneficiation plants exist in your area, you can collect data from a variety of other sources. In some areas, municipalities pick up glass from commercial establishments as part of their residential recycling collection program. In other areas, nonprofit recycling organizations collect glass. Determine who collects commercial glass in your area and survey these individuals using Survey Form 1. Remember that only container glass and glass from packaging, furniture, consumer electronics, and appliances can be counted in the recycling rate calculation. Glass from transportation equipment and C&D projects is excluded.

If you are unable to obtain accurate data at the collection or processing point, survey large generators, recycled glass plants, or appropriate trade associations. Remember, the further down the recycling chain you survey (the closer to end use) the more difficult it will be to determine where the materials originated and to account for imports or exports.

Again, make certain not to include glass from residential recycling programs with the commercial glass.

Paper

Survey paper processors. Because processors handle paper at its last stage before leaving a particular jurisdiction, they usually have accurate information about which county or municipality generated the paper and can identify what paper has been imported. Processors collect paper from government offices, schools, office buildings, and a wide variety of other institutions. The processors clean and bale these materials, then transport them to local recycling plants or export them.

Keep in mind that only postconsumer waste paper is counted in the MSW recycling rate. Preconsumer paper, such as manufacturing and converting waste and overissues of newspapers and magazines, is not counted (see Table B on page 13). Also, only paper that was originally generated in your jurisdiction is counted. Ask processors to exclude all imports of paper received from outside your area. Use Survey Form 2, for processors of recyclables, which requests that only data on materials generated within a particular jurisdiction be reported.

Plastics

Survey large generators. The majority of commercial plastics recycling is conducted by businesses with multiple locations who generate large quantities of a particular plastic item and self-haul directly to processors or end users. Examples of plastic items commonly recycled by commercial sources include stretch wrap, grocery sacks, and dry cleaning bags. Stretch wrap is the material used by product manufacturers and distributors to bind shipping cartons to pallets. Retail store distribution centers and manufacturing plants generate large amounts of stretch wrap and should be contacted for information on recycling efforts. For information on plastic bag recycling, contact large dry cleaners and grocery store chains.

If you are unable to obtain accurate data from large generators, survey plastics reclaimers or end users. Trade associations may be able to help you locate reclaimers and end users in your area.

Other Miscellaneous Items

Survey large generators. As recycling technology develops, more and more items are recovered from MSW and developed into new products. Many companies have taken the lead and are expanding their recycling programs to include such items as computer parts, microfilm, polystyrene, and other materials. Examples include government agencies (office products), universities and schools (polystyrene and computers), and manufacturing plants (pallets). While some of these materials may be a small percentage of the waste stream, including them will increase the accuracy of your recycling rate and help remind recycling officials that these materials can be part of a new or expanded recycling program.

TIP

Staying abreast of new recycling technology can help you account for additional sources of commercial recycling data.

Waste Disposal Data

In order to determine total MSW generation for the recycling rate calculation, data are needed on the amount of MSW disposed of in your jurisdiction. Because each community's waste stream is different, surveying local disposal facilities can ensure accurate waste disposal data and help you account for imports of waste. Disposal facilities include private and public landfills, waste-to-energy facilities, and incinerators. It is critical to include only MSW.

In addition, be careful to account for imports and exports of waste, and exclude from the data any natural disaster materials and waste defined as Other Solid Waste. (See the Glossary in Appendix A for complete definitions.)

Disposal facilities are good sources of information on MSW imports, while transfer stations and haulers can supply data on the amount of MSW exported from your jurisdiction. Disposal facilities and transfer stations will have an easier time differentiating between MSW and other solid waste because they have the capability to inspect each incoming load and determine how much of the waste is MSW. On the other hand, waste haulers can estimate the percentage of MSW on the basis of customer lists. These points are important to keep in mind as you decide whom to survey.

Other Sources of MSW Disposal Data

Disposal facilities, transfer stations, and waste haulers are the main sources of waste disposal data, but they are not the only sources. Keep in

mind that waste disposal data can be obtained from two additional sources: (1) processing facilities that are preparing recovered materials, such as tires or wood waste, for fuel markets, and (2) large generators that dispose of waste on site or self-haul waste to facilities out of your jurisdiction. While they might not significantly impact your recycling rate, knowing the extent of these activities will help you in your planning efforts.

In several states and localities, disposal facilities are required to report tonnage information in order to hold a permit. In **Minnesota, Texas, Ohio, and New York,** for example, disposal facilities report the quantity of waste handled to fulfill permit requirements. In **Oregon,** landfill operators report tonnage data in conjunction with a per ton disposal fee levied by the state.

Step Five

Address Confidentiality Guarantees.

Understanding and addressing the confidentiality concerns of the recycling and MSW industries is critical to ensuring a high response rate, especially if you are relying on a voluntary reporting system. Confidentiality is an important concern to many haulers and processors who might be reluctant to share proprietary information. Although confidentiality concerns present potential roadblocks, a number of programs have successfully addressed this issue. Some suggestions for ensuring confidentiality include:

- Avoid asking for customer lists on survey forms.
- Obtain a legislative exemption from your state's Freedom of Information Act. (See Appendix F for sample legislation from the state of Florida.)
- Agree not to release proprietary information used to compute a recycling rate.
- Ask survey respondents to mark sensitive information as "confidential."
- Use a third-party (accounting firm or trade association) to aggregate data, while keeping the sources of material confidential.

If necessary, collect recycling information from recycling plants, which tend to be less reluctant than other data sources to share aggregate tonnage information.

Step Six

Determine How to Manage and Analyze the Information.

Information is not useful unless it is meaningful and easy to access. Be sure to invest sufficient time and effort into developing an information management system that allows you to use the information you gather. There are numerous software packages, including databases and spreadsheets, that can help you manage and analyze the data you collect.

Using computers to compile and maintain data improves the efficiency of data analysis and management. They streamline the process and minimize the level of effort required to manage the data. Government agencies use software packages such as Foxpro, Paradox, and Excel. (EPA does not endorse any particular product.) All of these packages can be operated on a PC with standard components—DOS or Windows, a 486 PC, 8 MB RAM, and an 850 MB hard drive. While a database system is more adept at organizing information, it usually has greater design requirements and calls for a substantial data entry effort. Also, a database typically requires that one staff person be dedicated to its operation due to its highly technical nature, whereas several staff members can be trained to operate a spreadsheet. A spreadsheet system manages numerical data more efficiently,

Many state and local agencies use database and spreadsheet systems to compile and manage data. **Florida** uses a spreadsheet and has advised counties to purchase Excel using state grant money. This enables Florida to send each county a disk to use for reporting data. The state of **Washington** uses a combination system of both a database and a spreadsheet. The database is used for data entry purposes, while the spreadsheet is used to perform calculations.

and it allows agencies to merge information from individual disks received from reporting entities onto a master file, thus minimizing the need for data entry. A spreadsheet system, however, does not allow for the easy manipulation of text. Therefore, database programs have emerged as the leading software application for recycling measurement.

An alternative to using only a spreadsheet or a database is to use a combination of both types of software. For example, survey respondents could report data on a spreadsheet, and you could use a computer program to convert the data for importation into a database.

Exports and Imports

The standard measurement methodology requires that exported MSW and recyclables be included in your recycling rate calculation, while imported MSW and recyclables be excluded. When deciding whom to survey, it is important to consider how you will track exports and imports. Tracking exports and imports will provide you with an accurate picture of the total amount of MSW generated and recycled in your jurisdiction. Below are some suggestions for how to accurately account for the movement of materials in and out of your state or locality.

Recyclables

Obtaining residential recycling data from the point of collection minimizes the danger of missing exported materials or counting materials that were imported from outside your jurisdiction.

If you choose to survey processing facilities and end users, be aware that data from these sources are more likely to include materials from outside your jurisdiction (imports). When surveying these facilities, be very clear in your instructions that you are seeking information only on materials that originated in your state or locality. The survey forms included with this guide ask respondents to report only materials from a particular jurisdiction.

The best way to obtain commercial recycling export data is to survey large generators, because they might be collecting, consolidating, or transporting recyclables on their own. These generators often recycle large quantities of office paper and old corrugated containers, yard trimmings, wood packaging (pallets and crates), scrap metal, and miscellaneous items such as microfilm, computers, and furniture.

If you survey only processors, you might miss some materials collected by private haulers and processed outside of your jurisdiction (exports). If you have the resources, consider contacting private recycling haulers to estimate the amount of material exported from your state or locality for processing or remanufacture.

MSW

Determining quantities of exports and imports requires an understanding of the waste flow in your area. If you know the waste management infrastructure in your area, you will have a sense of the amount of exporting and importing taking place. A good place to start in determining the amount of MSW being exported is to survey waste haulers, since they are the first point in the disposal chain. Transfer stations are also good sources of information on waste exports.

For imports, accurate data can be obtained by surveying landfills, incinerators, and waste-to-energy facilities. State and local governments that ask for import data from disposal facilities have found that the facilities are not hesitant to provide this information.

The survey forms included with this guide are designed to make it easy for data sources to report information on MSW imports and exports.

States gather information about exports from a variety of sources. **Minnesota** determined the majority of waste leaving the state was going through transfer stations, so these facilities were surveyed for this information.

Washington knows that only one landfill in the state receives imported waste and that all waste exported from the state is taken to a landfill in Oregon. Officials in **Mecklenburg County, North Carolina,** decided to license waste haulers as a way to track exports. A court ruling in Alabama concluded the state could require reporting of information on the destination of waste, but could not mandate where the haulers disposed of waste.

Estimation

Under the standard methodology, estimation of data on MSW recycling and disposal is acceptable as long as the estimates are based on good, solid knowledge of the sources and flow of MSW in your area, and the estimates are noted. Collecting raw data is the preferred approach for obtaining all data necessary to calculate a recycling rate. In some cases, however, data sources may be unable to provide information on certain materials that cannot be easily measured due to the way they are managed. For example, commercial MSW is often collected in the same vehicles as MSW from multifamily residential buildings due to the use of similar waste containers. Also, MSW and materials classified as Other Solid Waste (C&D debris) are sometimes mixed together during collection and sent to disposal facilities in the same vehicle or container. In these cases, it may be necessary to estimate separate totals for the different types of waste.

In **Arlington County, Virginia,** MSW from multifamily residences (apartments and condominiums) and commercial businesses is aggregated together during collection.

Waste haulers are therefore unable to differentiate between residential and commercial waste. To estimate the amount of MSW from multifamily residences disposed of at their waste-to-energy facility, officials multiply the total multifamily population (obtained from census data) by the average number of pounds of MSW generated per person (obtained from a local study). This number is added to the amount of MSW generated by single-family homes, which is more easily tracked because it is collected separately, to arrive at a total residential MSW figure.

Double Counting

In an attempt to collect comprehensive, accurate data on recycling and waste disposal, many agencies have encountered instances of double counting of data. The best way to avoid double counting is to collect data from only one point in the chain—either collectors, processors, or end users (disposal facilities or recycling plants).

Florida surveys only large processors that handle more than 600 tons of recyclables per year. Since most of the recyclables ultimately pass through these large processors before leaving the state, complete data are captured without having to consider double counting.

Washington's approach of only surveying at the collection point avoids double counting while at the same time produces reliable information on the source of materials, which is useful for tracking recycling at the county level.

In **New Jersey,** the scrap metal industry has developed a mechanism for reporting recycling data to the state that avoids double counting, streamlines data collection, and also ensures confidentiality. The New Jersey chapter of the Institute of Scrap Recycling Industries (a national trade association) sends a survey form that it developed to all its members, employs an accounting firm to aggregate the data, and reports the total to the state directly. The survey form includes the names of the six major scrap processors and end users in the state, through which most of the scrap metal in the state eventually passes. These six companies report the total amount of scrap metal received from sources within New Jersey. Other companies report data only if the metal was sent to a company other than the six major processors and end users.

As a result of this system, data is not counted twice, businesses have a greater incentive to report accurate data since they do not have to reveal proprietary information, and complete data is captured since all the major players are surveyed. In addition, the state's recycling measurement costs are reduced. A disadvantage of this system, however, is that the state is unable to verify the accuracy of the data. In addition to being used in New Jersey, this system was recently codified by the Tennessee legislature.