State of Recycling in California

CalRecycle

California Department of Resources Recycling and Recovery

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STATE OF CALIFORNIA

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Executive Summary

For the past 25 years, the California Department of Resources Recycling and Recovery (CalRecycle) has been tasked with monitoring and promoting recycling in California. During that time, the landscape and requirements of recycling in the state have dramatically changed. This report summarizes the current state of recycling in California, particularly with respect to the implementation of Assembly Bill 341 (AB 341, Chesbro, Chapter 476, Statutes of 2011), which establishes the new goal of 75 percent recycling statewide by 2020.

Following an overview of the major laws directing recycling and diversion, this report addresses six questions:

1. What counts as recycling under AB 341?
2. What is the recycling infrastructure in California?
3. How is recycling tracked and quantified in California?
4. How is the California recycling infrastructure supported?
5. How does California's recycling system operate for different material types?
6. How does California's recycling system compare with other states and countries?

Under each of these six sections, this report details what is currently known, discusses what is unknown or estimated, and highlights where data gaps exist in terms of amounts, types, facilities, and material flows as they relate to the recycling infrastructure in California. This report is paired with a "State of Disposal in California" report that focuses on the disposal infrastructure.

AB 341's 75 percent statewide recycling goal has three components: source reduction, recycling, and composting. In contrast to earlier diversion mandates, disposal-related activities, including alternative daily cover, alternative intermediate cover, transformation, waste tire-derived fuel, and beneficial reuse at solid waste landfills, do not count toward the statewide recycling goal.

The recycling infrastructure in California is large and complex; recyclable materials often travel through multiple facilities once they are collected from a generator. Facilities may specialize in one type of recyclable material, such as a plastic reclaimer, or they may diversify, such as a material recovery facility. With specific exceptions for recycling programs that are tied to financial payments, there is no mandatory reporting requirement for recycling facilities. Instead, facilities are asked to voluntarily report annual throughput and capacity for various materials to CalRecycle. As a result, it is extremely challenging to gauge the number of recycling facilities in California, their current throughput, their actual capacity, or their ability to accommodate a growing in-state recycling market.

Most of the recycling efforts in California are supported at the local government (jurisdiction) level. CalRecycle requires individual jurisdictions to report on their types of recycling and diversion programs each year and pursuant to statute, formally reviews their progress in implementing these programs in two- and four-year cycles. In some cases, jurisdictions require more detailed reporting of recycling efforts than what is provided to CalRecycle. The data aggregated at the state level, however, does not allow for a full understanding of the statewide recycling infrastructure.

In 2013, Californians recycled an estimated 37 million tons of materials. Another 550,000 tons of material was collected through various individual programs for specific types of hazardous waste

(including used oil, covered electronics, and paint). Used oil, covered electronics, and paint are tracked reliably, since the amount of material collected is directly related to the money received by recycling processors or is required information under the paint extended producer responsibility (EPR) program. In addition, 6.8 million tons of disposal-related material (alternative daily cover, alternative intermediate cover, beneficial reuse at landfills, transformation, and waste tire-derived fuels) were reported in 2013.

Of the estimated 37 million tons of recyclables collected in 2013, *less than 4 percent was systematically tracked at the state level*. The materials were tracked through three programs: beverage container recycling, waste tire collection, and carpet EPR. For other components of the recycling stream, including plastic resin, glass, metal, and fiber (paper) recycling, composting and organic materials management, and construction and demolition recycling, material amounts are not formally tracked. The best Department numbers regarding the amount of these types of recyclables are from previous industry surveys, internal estimates, annual market surveys, or approximations using voluntarily reported facility information. None of these techniques are necessarily an accurate reflection of the recycling landscape.

Although California's recycling infrastructure compares favorably to other states in terms of the amount of material that is recycled, California knows significantly less about what types of materials are recycled in comparison to other states. For example, approximately 33 states have recycling tracking requirements at a broader array of facilities than California does. This allows for a more detailed analysis of the overall recycling infrastructure. As a result, numerous states are able to partially track metal, paper, plastic, and glass recycling, although these programs may not afford comprehensive data.

Under AB 341, California will have achieved its 75 percent statewide recycling goal when the average disposal rate is less than 2.7 pounds per person per day. However, without a more precise picture of the recycling infrastructure, it is impossible to determine whether that disposal rate will be an accurate reflection of 75 percent recycling in 2020. In other words, there will be no way to verify if reductions in disposal are actually due to source reduction, composting, or recycling in California rather than less desirable end uses.

History of Recycling and Diversion in California

California Integrated Waste Management Act (AB 939): Local Mandate for Diversion Beginning in 1989

California adopted its first statewide, general recycling program in 1989.[1] The California Integrated Waste Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989) required jurisdictions to implement programming to achieve 25 percent diversion of all solid waste from landfills by January 1, 1995, and 50 percent diversion by January 1, 2000. In preparation for the 2000 deadline, jurisdictions dramatically increased the number of diversion programs in their areas, as shown in Figure 1. Diversion programs include any local effort for source reduction, recycling, or composting. Since 2000, the overall number of diversion programs has stayed relatively level.

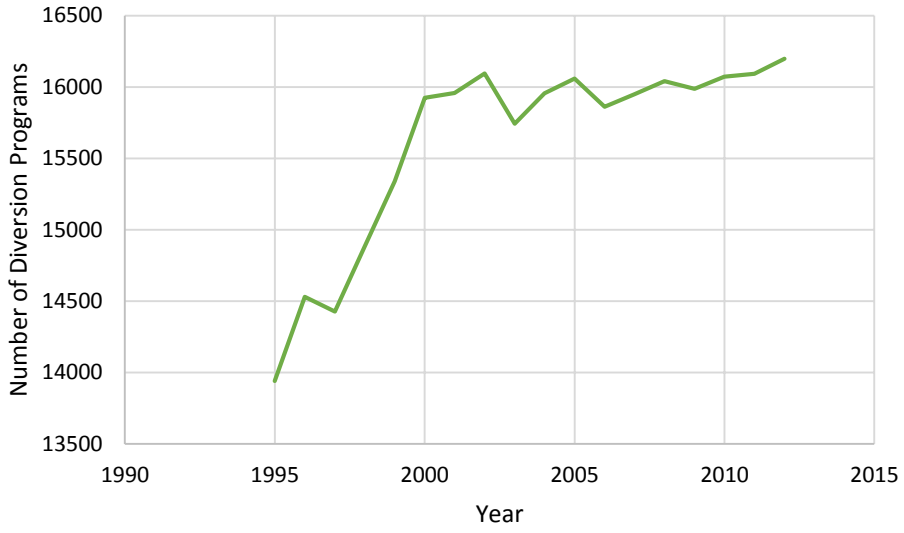

Figure 1. Overall jurisdiction-level diversion programs. Total number of individual diversion programs implemented by local jurisdictions between 1995 and 2012. Data from CalRecycle's Diversion Programs System, as reported in the Electronic Annual Report.

Prior to 2007, diversion rates were calculated using an adjustment method that relied on a complicated formula that took into account taxable sales adjusted for inflation, employment, and population. As of 2007, diversion is calculated using a per capita system that relies on existing reporting systems and utilizes a simple formula based solely on disposal and population. In order to determine the diversion rate, the current per capita solid waste disposal level is subtracted from

[1] California's first recycling program was the California Beverage Container Recycling and Litter Reduction Act of 1986 (AB 2020, Margolin, Chapter 1290).

a waste generation level derived using calendar years 2003 to 2006 as base years, which corresponds to the time when California achieved 50 percent diversion statewide and to a boom in the housing market and strong economic activity. Statewide, the base waste generation level is 12.6 pounds per person per day; residents and businesses must dispose of less than 6.3 pounds per person per day to meet the 50 percent diversion mandate. In practice, each jurisdiction has its own generation estimates and per capita disposal targets and its own unique waste generators and waste stream, so these targets cannot be compared to each other or to the statewide numbers.

Under AB 939, disposal includes landfilling, exported disposal, and transformation (waste-to-energy), while diversion includes source reduction, recycling, composting, alternative daily cover (ADC), alternative intermediate cover (AIC), beneficial reuse, transformation diversion credit, and related activities. In addition, material management practices that reduce disposal, such as land application or inert debris fill, count as de facto diversion.

Since the adoption of AB 939, the statewide rates of diversion have increased. Between 2008 and 2013, California has achieved a consistent 65 percent statewide diversion rate equivalent (see Figure 2). In addition, more than 95 percent of 413 jurisdictions have individually reached 50 percent diversion based on their population in 2013. The remaining jurisdictions have ongoing efforts to achieve 50 percent diversion.

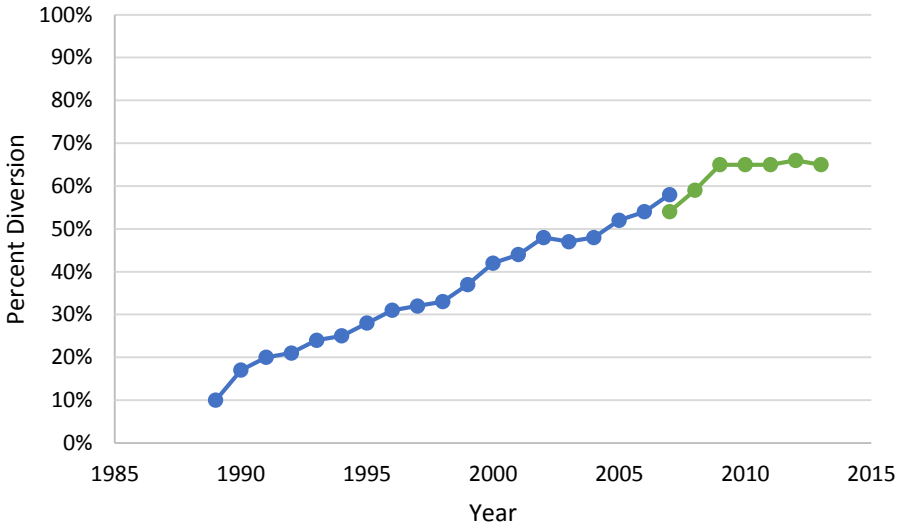

Figure 2. California statewide diversion rate since 1989. In 2007, California adopted a new per capita system for calculating percent diversion. The blue data points reflect the diversion calculation using the inflation-adjusted method, and the green data points use the new disposal reduction calculation. Data from www.calrecycle.ca.gov/LGCentral/GoalMeasure/DisposalRate/Graphs/EstDiversion.htm

It is also important to consider the total amount of waste generated in California in addition to the diversion rate. The total tons of diverted waste has increased in the last 25 years at roughly the same rate as increases in the amount of generated waste. In contrast, the total tons of disposed material has only moderately decreased (see Figure 3). The amount of disposal began to decrease in 2006; the decrease is mostly due to the economic recession, rather than extraordinary

improvements in recycling efforts. This suggests that efforts to increase diversion are primarily affecting newly added waste streams, rather than dramatically reducing the total amount of material thrown away.

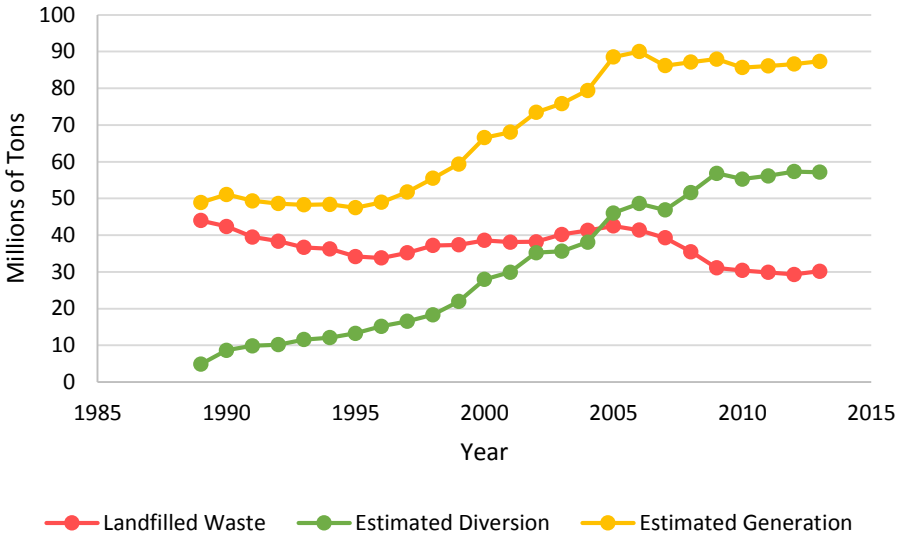

Figure 3. Materials generated, disposed, and diverted in California since 1989. Landfilled waste (red), estimated diversion (green), and estimated generation (yellow) are calculated from the base year calculated generation and reported disposal. Data for disposal from www.calrecycle.ca.gov/LGCentral/GoalMeasure/DisposalRate/Graphs/Disposal.htm

Figure 4 shows the estimated fate of 87 million tons of generated waste in California in 2013. Although CalRecycle tracks the quantity of disposed materials statewide and the quantity of materials in a few specialty material management programs, the remaining sections are compiled from voluntarily reported numbers or Department estimates. The statewide 65 percent diversion rate equivalent from landfills includes source reduction and recycling (~47 percent of all estimated generation), composting/mulch (~11 percent), ADC (~4 percent), beneficial reuse (~3 percent), and AIC, waste to energy, and waste tire-derived fuels (~1 percent).

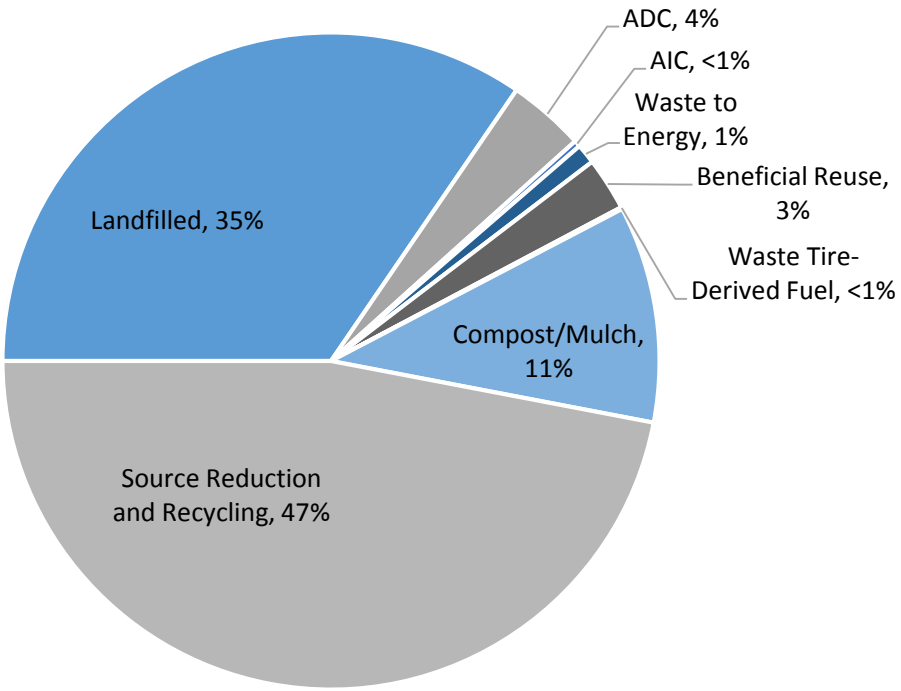

Figure 4. Estimated destination of 87 million tons of waste generated in California in 2013 based on AB 939 definitions. The total generation is determined from the 2003-2006 per person baseline and the 2013 population in California. Quantities of landfilled waste, waste to energy, ADC, AIC, and beneficial reuse are derived from the Disposal Reporting System (DRS). Quantities of waste tire-derived fuel are reported to CalRecycle. Estimates for amounts composted and mulched material are based on published reports for chip and grind facilities, and internal calculations for composting facilities. Source reduction and recycling accounts for the remaining generated waste. Values may not add up to 100 percent due to rounding.

AB 341: A New Statewide Goal for 75 Percent Recycling

In 2011, the Legislature implemented a new approach to solid waste management. AB 341 (Chesbro, Chapter 476, Statutes of 2011) requires CalRecycle to adopt regulations for mandatory commercial recycling and establish a new statewide goal of 75 percent recycling, including source reduction, recycling, and composting, by 2020. This recycling paradigm differs from AB 939 in several significant ways.

First, AB 341 establishes a statewide policy goal, rather than a jurisdictional mandate. This places the onus for achieving the goal on the state, rather than on the cities and counties that directly regulate waste disposal and recycling. Under the law, jurisdictions are not required to meet the new policy goal.

Second, in order to implement AB 341, CalRecycle uses different metrics to calculate the statewide recycling rate. Under the 75 percent recycling goal, a base generation level is calculated using the average per resident generation from 1990 to 2010 (10.7 pounds per person per day). This value was chosen to minimize the impacts of economic swings on generation, since the base years used under AB 939 corresponded to a strong economic boom in California. Residents and businesses must dispose less than 2.7 pounds per person per day on average statewide to meet the statewide 75 percent goal.

Finally, for the new statewide goal, CalRecycle uses a definition of recycling that differs from the historical diversion standard. The statewide 75 percent goal uses a broad, colloquial definition of "recycling" as an umbrella term for just those activities that count toward the goal, which is limited to source reduction, composting, and recycling programs. Several material uses that counted toward diversion under AB 939 no longer count toward recycling under AB 341, including ADC, AIC, beneficial reuse at landfills, transformation, and waste tire-derived fuel; these five material uses are instead defined as "disposal-related activities."

These revised definitions change the overall landscape of how California manages its generated waste. As shown in Figure 5, current disposal and disposal-related activities account for a much larger portion of the total generated waste under AB 341 (50 percent). Importantly, the estimated total waste generated in California is lower under AB 341 because it uses the more representative 1990-2010 baseline for generation rather than the higher 2003-2006 baseline used for Figure 4.

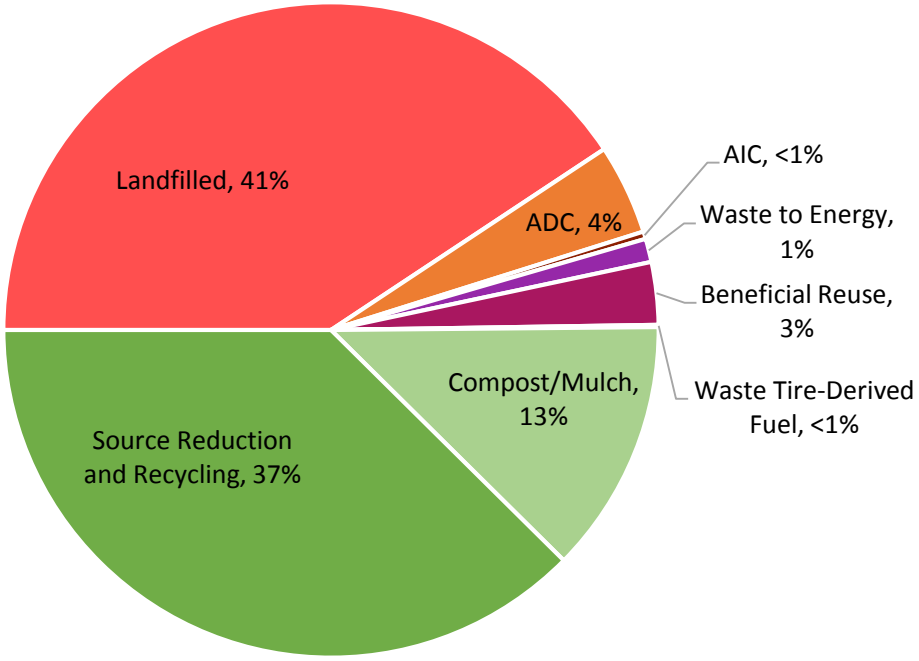

Figure 5. Estimated destination of 74 million tons of waste generated in California in 2013 based on AB 341 definitions. The total generation is determined from the 1990-2010 per person baseline and the current population in California. The remaining values were determined as described for Figure 4. Values may not add up to 100 percent due to rounding.

Under AB 341, California had a statewide recycling rate of 50 percent in 2013 (see Figure 6). This has been consistent in the past four years; recent and new efforts, such as the implementation of mandatory commercial recycling and upcoming mandatory organics recycling requirements, are aimed at increasing the overall statewide recycling rate.

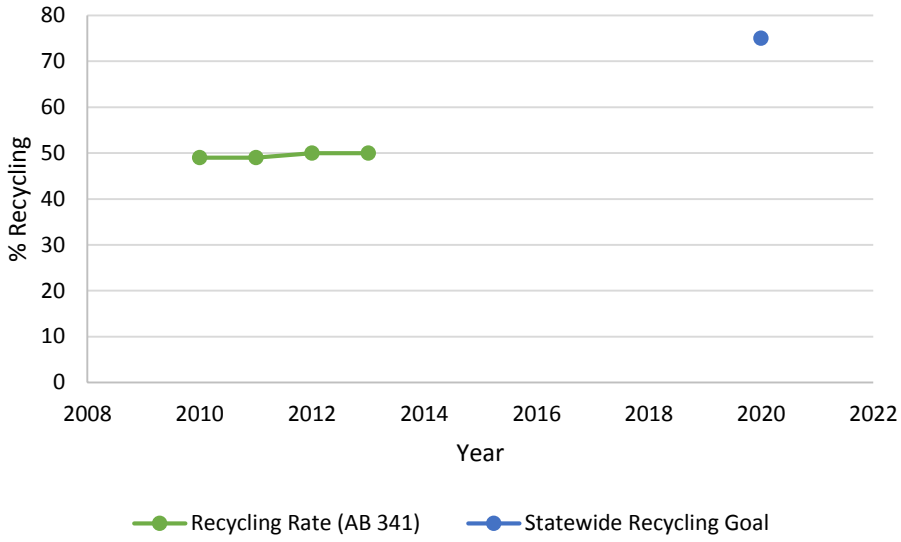

Figure 6. California statewide recycling rate since 2010. Data from www.calrecycle.ca.gov/75Percent/RecyleRate/default.htm

In order for California to reach a statewide recycling rate of 75 percent, at least half of the solid waste that is currently disposed would need to be recycled. Using a medium-growth projection, California would expect to see a total of 36 million tons of traditional disposal (as defined under AB 939) in 2020. After adding in the approximately 7 million tons of previously excluded disposal-related activity, current estimates project a potential of 43 million tons of disposal-related activity in 2020 (see Figure 7). This corresponds to roughly 22 million tons of additional material that would need to be recycled in 2020 beyond current recycling amounts.

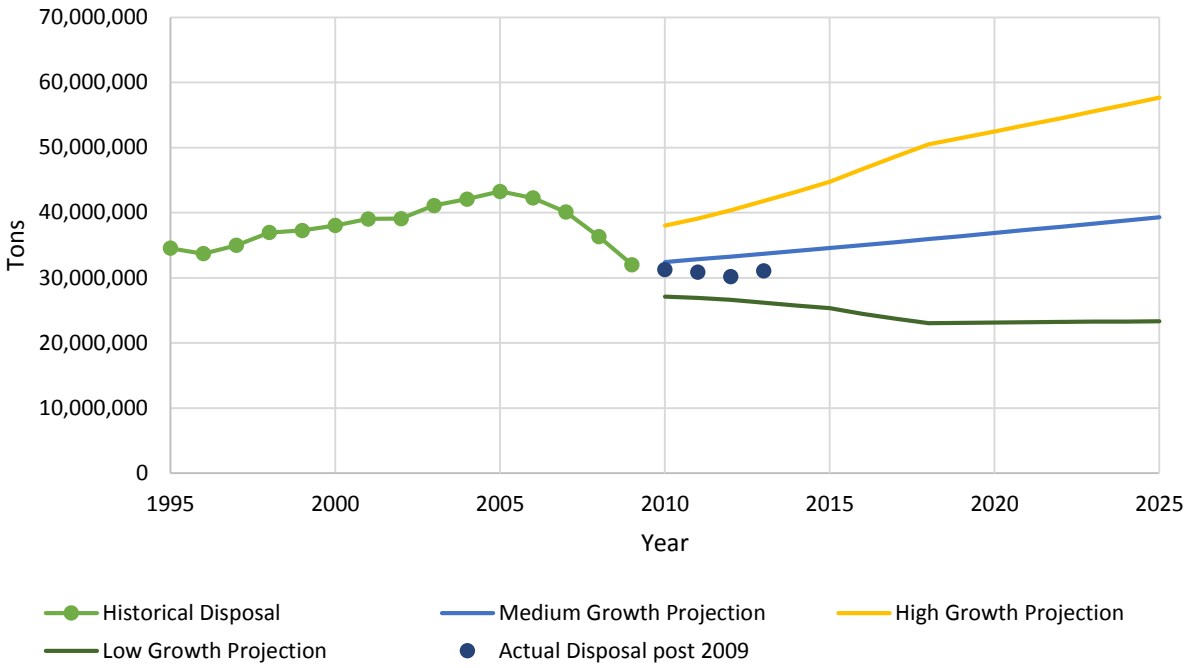

Figure 7. Historical and projected disposal for California, beginning in 2009. 1. Historical 1995-2009 solid waste disposal (landfilled, transformed, or exported for disposal) originating in California as reported to CalRecycle's Disposal Reporting System (connected green dots); 2. Projected 2010 to 2025 solid waste disposal using Woods & Poole Inc. econometric data to generate high (yellow line), medium (blue line), and low (green line) growth factors; and 3. Actual Disposal (dark blue dots) for years after 2009 for comparison purposes (material disposed after 2009 was not used in the projection calculations). Data from FacIT and DRS.

Based on CalRecycle's current projections from its 2008 waste characterization study, the waste stream in 2020 will be composed of a number of material types, including organics, inerts, paper, plastic, and metal (see Figure 8). Many of these material types already have established a recycling infrastructure and will likely comprise a large portion of the 22 million tons of recycled material needed to meet the 75 percent recycling goal.

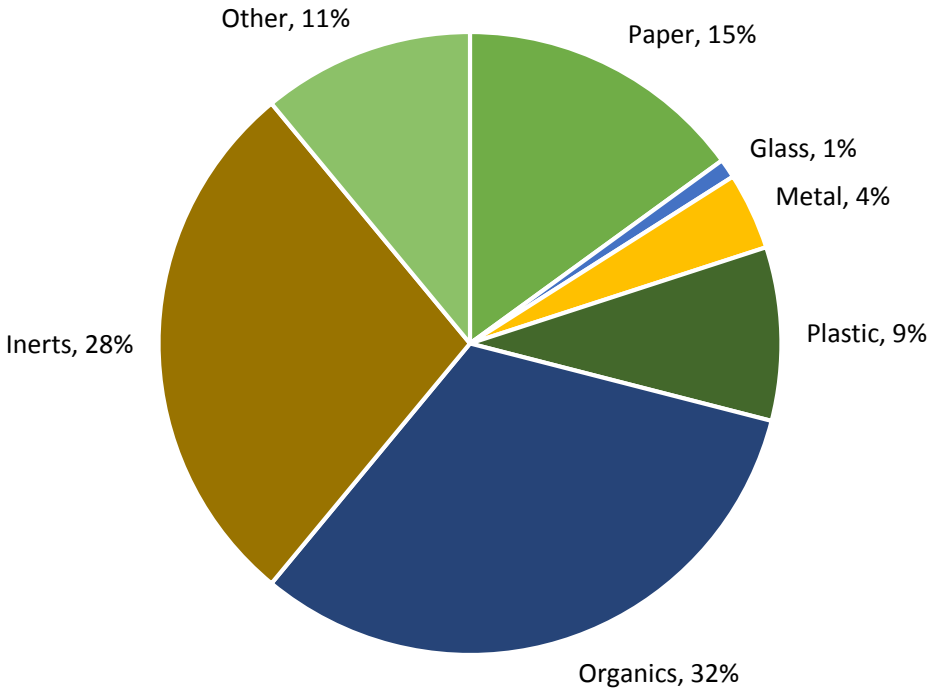

Figure 8. Estimated 2020 composition of roughly 43 million tons of disposal-related activity, based on current waste characterization studies and other data. Data from 2012 report "California's New Goal: 75 Percent Recycling."

In order to achieve the 75 percent recycling goal, CalRecycle has identified six primary focus areas: moving organics out of the landfill, continuing reform of the Beverage Container Recycling Program, expanding the recycling/manufacturing infrastructure, exploring new models for state and local funding of materials management programs, promoting state procurement of post-consumer recycled content products, and promoting extended producer responsibility. The Department is currently working to finalize its plan for achieving the 75 percent statewide recycling goal.

As CalRecycle develops its plan for implementing its statewide 75 percent recycling goal, it is also important to consider how the Department will quantify when and how that goal is reached. This report will summarize and evaluate the current tracking and reporting infrastructure that California has to support its recycling efforts.

What Counts as Recycling under AB 341?

Under AB 341, only three broad classes of waste management fall under the 75 percent statewide recycling goal: source reduction, composting, and recycling. This section defines the types of materials that do, and do not, count toward this goal.

Source Reduction

Source reduction is any action that causes a net reduction in the generation of solid waste. This includes reusing materials such as food or commodities, reducing the use of nonrecyclable materials, replacing disposable goods with reusable goods, reducing packaging, and increasing the efficiency of use of paper, cardboard, glass, metal, plastic, and other materials. Source reduction is considered by the United States Environmental Protection Agency (U.S. EPA) to be the most preferred method for managing waste.

Composting

Composting involves processing organic materials in order to speed decay into a final material suitable for incorporating into topsoil and for growing plants. Composting can be used to process food waste, yard waste, other wood waste, and biosolids. Compost must meet certain health and safety requirements, including metal and pathogen concentration limits, in order to be sold or given away in California.

Two alternatives to composting for organic material management are anaerobic digestion (AD) and chip and grind facilities. AD is a process that decomposes organic material in a low-oxygen, enclosed environment in order to produce biogas, liquid fertilizer, and compost. Chipping and grinding separates, grades, and resizes woody green waste or used lumber; the material can then be sent to a compost facility, used at a landfill as ADC, AIC, or erosion control, sold as mulch, or managed in other end markets, such as biomass conversion. Importantly, not all end uses of materials processed at chip and grind facilities count toward the statewide 75 percent recycling goal.

Recycling

Recycling is defined as the physical process of collecting materials that would otherwise become solid waste and returning them to use in the form of raw material for new, reused, or reconstituted products. California's recycling system routinely handles plastics (resins), paper (fibers), metal, and glass. These four material classes comprise the majority of non-organic recyclable materials.

In addition, California has established recycling efforts for a number of other material types. California-specific programs include:

Beverage Container Recycling Program

In 1986, the Beverage Container Recycling Program was established. Under the program, beverage distributors are required to make a redemption payment (5 or 10 cents) to CalRecycle for every qualified beverage container sold or offered for sale in California. Consumers can return qualified beverage containers to recycling centers in order to redeem the redemption payment. Most beverages packaged in aluminum, glass, plastic, or bimetal containers are eligible for the program. Excluded beverage types include milk, wine, distilled spirits, and infant formula.

Construction and Demolition

Although the United States Environmental Protection Agency does not include construction and demolition (C&D) materials in its definition of municipal solid waste, thereby excluding their reuse from its recycling calculations, California does include C&D in its definition of solid waste. California does not have a formal program dedicated to managing C&D waste, but there are numerous facilities in the state that process it for recycling. C&D materials include lumber, drywall, metals, masonry, brick, concrete, carpet, plastic, pipe, rocks, dirt, paper, cardboard, or green waste related to C&D projects.

Extended Producer Responsibility (EPR)

California has implemented several Extended Producer Responsibility (EPR) statutes that place a shared responsibility on producers and all entities within the product chain to reduce cradle-to-cradle impacts of that product and its packaging. EPR can take many different forms, but the ultimate goal of reducing the overall waste of a product is the same regardless of the product type. One common feature of EPR is that consumers pay an advance disposal fee at the time of purchase in order to fund end-of-life management. The fee is primarily used by an industry stewardship organization to implement the management program, with CalRecycle responsible for oversight. Currently, paint and carpet are managed by EPR programs in California, and CalRecycle is currently developing regulations for a new mattress EPR program.

Other Recyclable Materials

California funds several material management programs for individual materials, including used oil, tires, and certain types of electronics. These programs differ from EPR in that they place a heavier burden on the state to regulate the management of the material. Many of these items cannot be landfilled due to hazardous waste laws, nor are they considered part of the measured solid waste stream. However, their management provides insight into broader recycling practices.

Not Counted as Recycling under AB 341

Several material flows that were previously classified as diversion for diversion credit under AB 939 no longer count toward recycling under the statewide 75 percent recycling policy goal and instead count toward disposal-related activities; importantly, the specific material flows will still count toward the jurisdiction-level diversion goal. These practices currently include all types of ADC, AIC, beneficial reuse at landfills, transformation, and waste tire-derived fuel.

One notable material stream that is not counted as recycling under AB 341 is biomass conversion. Biomass conversion is the production of energy by the controlled combustion of, or use of other noncombustion thermal conversion technologies on, non-food green waste. Under AB 341, biomass conversion was not considered in the base year generation calculation and does not count toward recycling or disposal-related activities, placing this process outside the scope of this law. In practice, increases in the amount of material sent to biomass conversion counts as de facto diversion.

Similarly, materials such as tires or biomass that are processed by engineered municipal solid waste (EMSW) facilities in order to generate energy count as de facto diversion under AB 341. However, other types of solid waste processed at EMSW facilities will count as disposal.

Under AB 341, the use of all waste-derived materials, including green waste, sludge, ash, compost, or C&D, as ADC or AIC does not count toward the 75 percent recycling goal. Furthermore, with the passage of AB 1594 (Williams, Chapter 719, Statutes of 2014), green material ADC will no longer be counted toward diversion as of 2020. This declassification of ADC for the purposes of recycling and diversion may have consequences for jurisdictions and the state as they implement the 50 percent diversion mandate and the 75 percent statewide recycling goal. For example, based on the 2013 per capita disposal calculations, 10 additional jurisdictions would not have met their 50 percent mandate if green material ADC had not counted as diversion.

As will be discussed in greater detail later, the recycling activities covered under AB 341 are difficult to accurately track. As a result, California's recycling rate is based on the measured quantity of disposed materials and the calculated quantity of generated waste, rather than on the amount of materials that are directly recycled.

What Is the Recycling Infrastructure in California?

Overview

California has several thousand facilities and operations in the statewide recycling infrastructure. However, there is no comprehensive statewide data repository for recycling facilities; not all recycling facilities are permitted or are required to provide any information to the state. In addition, CalRecycle has not implemented mandatory general reporting for recycling facilities or operations, so most of the available information on the quantity of materials handled by the industry comes from voluntary reporting through the Facility Information Toolbox (FacIT, www.calrecycle.ca.gov/FacIT/) and is refined based on Department estimates. As a result, all of the facility counts and throughputs are best estimates rather than absolute numbers. This makes it extremely challenging to evaluate how much additional recycling infrastructure will be needed to accommodate the approximately 22 million tons of additional recycling and composting capacity needed by 2020 under the statewide 75 percent recycling goal.

Recycling Collection and Facility Infrastructure

Collection Infrastructure

Recyclable materials are typically collected in one of four ways:

1. Collection programs offered by a city, town, or county, or by private haulers under contract with a local government agency.
2. Back-hauling by businesses, or private hauling under contract, that develop independent strategies for collecting and handling recyclable materials.
3. Pick-up of source-separated recyclables (for example, only cardboard) by independent recyclers.
4. Self-haul of recyclables to a recycling center, drop-off facility, or material recovery facility (MRF).

Residential customers generally use the first option for recycling collection. Most jurisdictions provide “blue bin” programs, in which residents and businesses can separate recyclables from trash for further processing. As shown in Table 1, there are approximately 600 curbside recycling programs in California. In many cases, a single city or jurisdiction will have more than one curbside recycling collection program. Importantly, there are active curbside programs in almost 400 of the 413 jurisdictions throughout the state.

Table 1. Active collection and transfer programs and facilities in California.

Facility Type	Statewide Active Facilities	Total Capacity (Tons/Year)	Current Throughput (Tons/Year)	Available Capacity (Tons/Year)
Curbside Program	602			
HHW/Electronic Waste Collection	41	304,000	227,000	77,000
Medication Collection	319	15	8	8
Sharps Collection	620	71,000	35,000	36,000
Used Oil Collection	2,712			
Carpet Collection	63			
Paint Recycler/Collector	72			
Recycling Centers (Beverage Containers)	2,211			
Transfer Station	473	60,400,000	25,100,000	35,300,000

Data accessed from FacIT on January 28, 2015. Data for recycling centers accessed from DORIIS on January 2, 2015. Facility counts reflect publicly listed facilities that are actively operating. Data gaps indicate unavailable information or fewer than three reporting facilities for an activity. Current throughput and available capacity may not add up to total capacity due to rounding.

In addition to general recycling curbside programs, there are several material-specific collection programs for household hazardous waste (HHW), electronic waste, medications, sharps, used oil, carpet, paint, and beverage containers. The number of collection points for a program can vary widely depending on the specific material being collected, the program duration, and the handling needed to properly manage the material. In addition, the number of active facilities for HHW and electronic waste reflects the number of facilities that collect and deliver this material to processors or markets that have provided this information to CalRecycle; this number does not reflect all of the collection points for HHW or electronic waste (approximately 500 statewide) in California. Typically, material-specific programs handle a small volume of material and will be discussed in greater detail later.

Transfer stations are facilities where municipal solid waste is aggregated before being sent to a landfill or to another facility for further processing. Transfer stations also collect or sort recyclables. It is challenging to calculate how much of the material that moves through transfer stations is part of the recycling stream, rather than the disposal stream.

Recycling Processing Facilities

Once recyclable materials have been collected, there are a variety of facilities where materials are sorted, consolidated, and prepared for end markets. Table 2 shows a summary of recycling processing facilities, which include general and specialized processing facilities.

Table 2. Active recycling processing facilities in California.

Facility Type	Statewide Active Facilities	Total Capacity (Tons/Year)	Current Throughput (Tons/Year)	Available Capacity (Tons/Year)
Material Recovery Facility	161	36,100,000	15,300,000	20,800,000
Construction and Demolition Processing	514	52,800,000	24,600,000	28,200,000
Beneficiation (Glass)	8	1,300,000	1,000,000	250,000
Paper Stock Processing	64	7,000,000	4,800,000	2,200,000
Plastic Reclaimers	102	240,000	190,000	50,000
Plastic Shredding and Grinding	100	158,000	145,000	13,000
Scrap Metal Processing	149	155,000	80,000	75,000
Waste Tire Processing	47	1,800,000	900,000	900,000
Covered E-Waste Processing	36	225,000	190,000	34,000
Beverage Container Processors	218			

Data accessed from FacIT on January 28, 2015. Data for beverage container processors accessed from DORIIS on January 2, 2015. Facility counts reflect publicly listed facilities that are actively operating. Data gaps indicate unavailable information or fewer than three reporting facilities for an activity. Current throughput and available capacity may not add up to total capacity due to rounding.

A material recovery facility (MRF) receives recyclables and sorts the materials by type or grade to meet the commodity specifications of the end use markets. MRFs are not defined in statute or in regulation; as a result, there are many different types of facilities that could be classified as a MRF. Figure 9 shows the locations of MRFs listed in FacIT. The total of 161 facilities listed in FacIT is only an estimate; CalRecycle does not have a comprehensive list of MRFs in California. These facilities are distributed throughout the state, but most often correspond to urban centers.

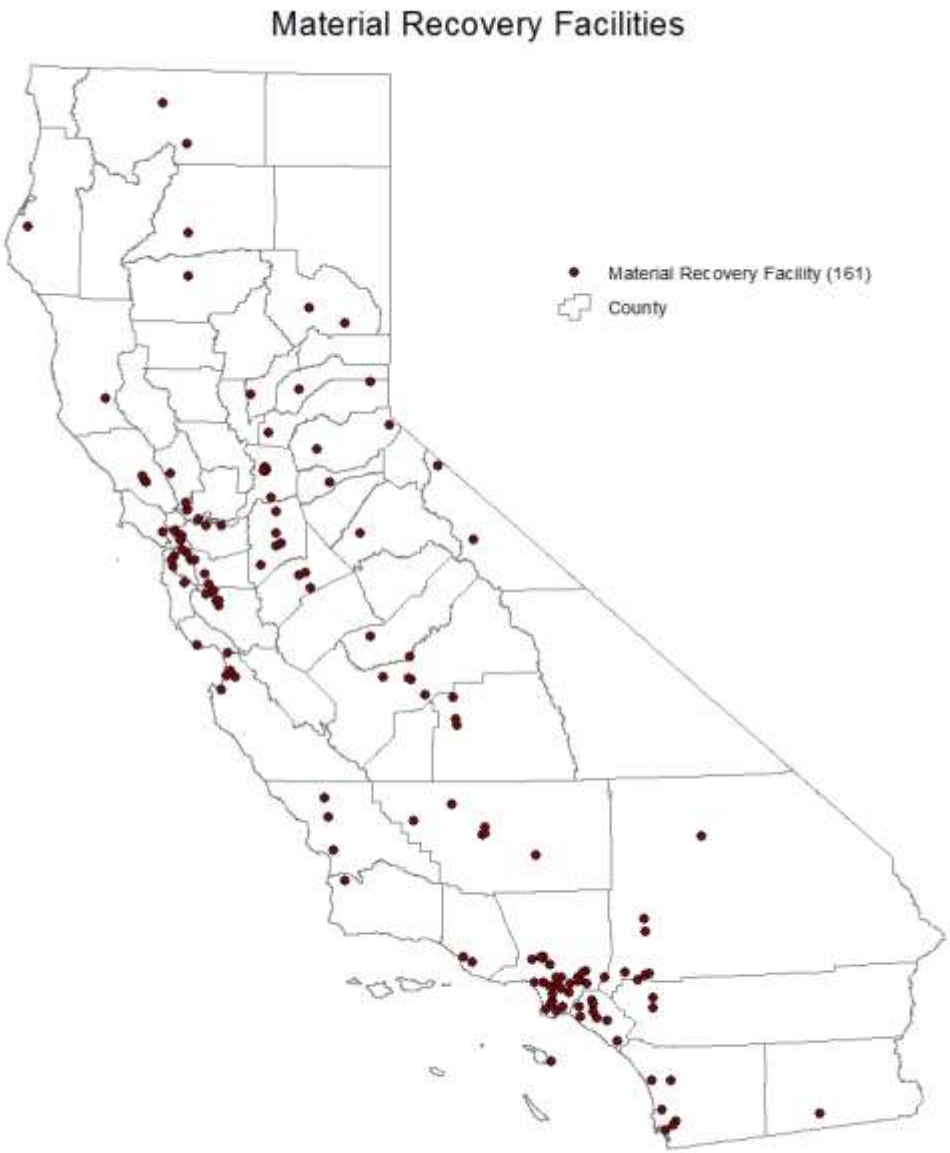

Figure 9. Material recovery facilities in California. Data from FacIT.

The three most common types of MRFs are multi-stream, single-stream, and mixed-waste processing. At a multi-stream MRF, incoming recyclables have usually been collected separately from each other; for example, a curbside program that separates paper from glass or plastic prior to pick-up may feed to a multi-stream MRF. At a single-stream MRF, all incoming recyclables have been collected in one stream, such as in a residential blue bin program; recyclables collected

in this manner often have a higher level of contamination than materials received at a multi-stream facility. Finally, a mixed waste processing facility (MWPF, or "dirty MRF") receives municipal solid waste which is then processed and sorted to recover recyclable commodities. FacIT lists MRF throughput at 15.3 million tons annually. Based on the 2006 report "Characterization and Quantification of Residuals from Materials Recovery Facilities," between 6 percent (for multi-stream) and 81 percent (for mixed waste) of the incoming material at MRFs is residual and is usually sent to landfills for final disposal. From the 2006 report, the extrapolated total quantity of MRF residuals was 7.4 million tons in 2005.

Due to the weight of C&D debris, this material is handled separately from other recyclable materials. C&D is collected almost exclusively in large containers or in large bodied trucks by the municipality, private haulers, or independent recyclers. Although some C&D materials are processed at MRFs, most C&D is collected and processed at specialty facilities or on-site. C&D processing facilities may specialize in pure material streams, such as concrete, or mixed debris, such as wood mixed with metal and other materials, in order to extract the recyclable materials. The listed FacIT capacity and throughput for C&D processing is very high (52.8 and 24.6 million tons, respectively). It is likely that a portion of the material processed at these C&D facilities ultimately goes to landfills, some of which may be used beneficially at the landfill, and the estimated FacIT throughput may not be reflective of the actual volume of C&D material that is recovered for recycling.

Some recyclable materials, such as glass and plastic, also go through secondary processing to upgrade the value of the material prior to its use in a manufacturing facility that uses recycled content feedstock. These facility types include glass beneficiation, paper stock processing, plastic reclaimers, plastic shredding and grinding, and scrap metal processing. These facilities have a modest throughput and have minimal remaining capacity. Figure 10 (left panel) shows the distribution of processing facilities throughout the state. The majority of these facilities are located near urban areas, including Los Angeles and San Francisco.

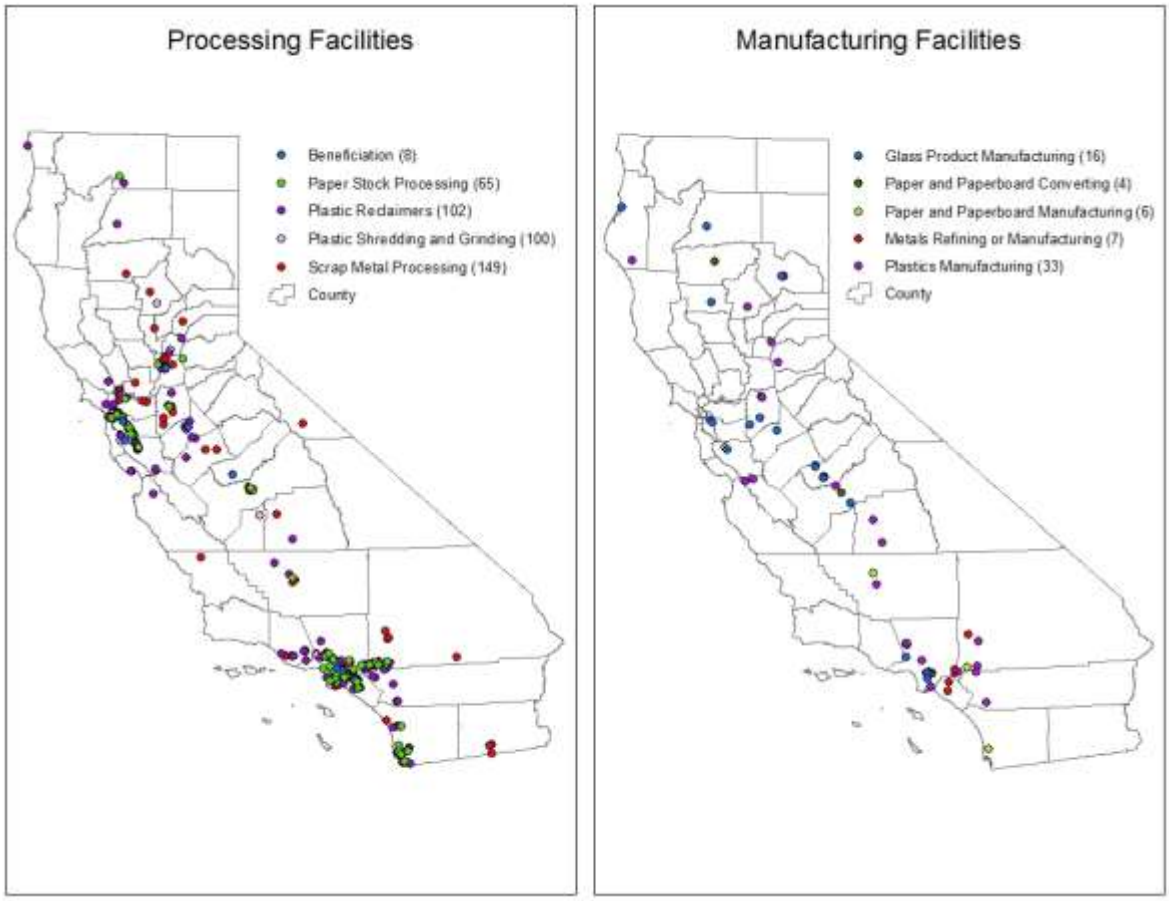

Figure 10. Processing and manufacturing facilities for recyclables in California. The left panel shows processing facilities for glass, paper, plastic, and metal. The right panel shows manufacturing facilities for glass, paper, plastic, and metal. Data from FacIT.

Manufacturing Facilities Using Recycled Content

Once recoverable materials are collected and sorted or processed, they are delivered to recycling or manufacturing markets in California, domestically, and internationally. There is minimal manufacturing infrastructure in California for recycled glass, paper, plastic, and tires, as shown in Table 3, in terms of the number of facilities and the estimated throughput. *If all of the reported material from processing facilities for glass, paper, and plastics went to manufacturing facilities in California, the supply would exceed the manufacturing capacity by more than 300 percent.* Figure 10 (right panel) further illustrates the distribution of manufacturing facilities for recycled glass, paper, plastic, and metal. Interestingly, recycling manufacturing facilities are distributed throughout the state. As will be discussed in the next section, a significant portion of recyclables collected in California are exported for manufacturing into new products or other uses.

Table 3. Active manufacturing facilities using recycled content feedstock in California.

Facility Type	Statewide Active Facilities	Total Capacity (Tons/Year)	Current Throughput (Tons/Year)	Available Capacity (Tons/Year)
Construction and Demolition Materials Manufacturing	37			
Glass Product Manufacturing	16	1,100,000	1,000,000	100,000
HHW Manufacturing	7			
Metals Refining or Manufacturing	7			
Other Recycling Manufacturing	34			
Paper & Paperboard Converting	4			
Paper & Paperboard Manufacturing	6	220,000	220,000	0
Plastics Manufacturing	33	71,000	68,000	3,000
Retreading	4			
Tire-Derived Product Manufacturing	17	9,000	6,000	3,000
Used Oil Transfer, Storage, or Manufacturing	39			

Data accessed from FacIT on January 28, 2015. Facility counts reflect publicly listed facilities that are actively operating. Data gaps indicate unavailable information or fewer than three reporting facilities for an activity.

CalRecycle does not have an estimate as to the capacity of C&D processing facilities. However, it is unlikely that the 37 C&D plants could handle the estimated 24.6 million tons of material moving through C&D processing facilities. Instead, material may be processed on-site, go to landfills, or be sent out of state.

The 39 used oil transfer, storage, and manufacturing facilities are all permitted to receive hazardous waste; however, the majority of these facilities only store or transfer used oil. There are five used-oil manufacturing facilities in California that convert used oil into re-refined oil or fuel products.

Organics Processing Facilities

Most organic material, including food and yard waste, is processed through a different set of facilities than commodity recyclables. Organic materials may be processed through composting, anaerobic digestion, or other technologies to produce energy, fuels, or chemicals. Chipping and grinding facilities may process organics for composting or use as mulch. As will be discussed in greater detail later, the throughput for chipping and grinding facilities listed in FacIT is significantly different than the throughput measured from industry surveys. Other organics management includes specialty facilities, such as mushroom or worm farms. Overall, the remaining available capacity at organics management facilities is relatively low.

Table 4. Active organics materials management facilities in California.

Facility Type	Statewide Active Facilities	Total Capacity (Tons/Year)	Current Throughput (Tons/Year)	Available Capacity (Tons/Year)
Anaerobic Digestion	13	467,000	187,000	281,000
Biomass Conversion	32	5,300,000	5,300,000	56,000
Composting	169	8,000,000	6,200,000	1,800,000
Composting - Research Operation	14	93,000	92,000	1,000
Chipping and Grinding	156	11,200,000	7,300,000	4,000,000
Other Organics Management	23	790,000	740,000	50,000

Data accessed from FacIT on January 28, 2015. Facility counts reflect publicly listed facilities that are actively operating. Current throughput and available capacity may not add up to total capacity due to rounding.

Summary of Facilities

The facilities listed above form a complex web of interactions within California's recycling infrastructure. For example, one recyclable item might move from a consumer to a curbside collection program and MRF before being exported for further processing, while another might be collected alongside municipal solid waste, sent to a MWPF, reprocessed, and finally manufactured into a new product in-state (see Figure 11). The movement of byproducts from each of these facilities further complicates the network, as materials move back and forth between facilities; specific examples of the interaction between facilities will be discussed in later sections.

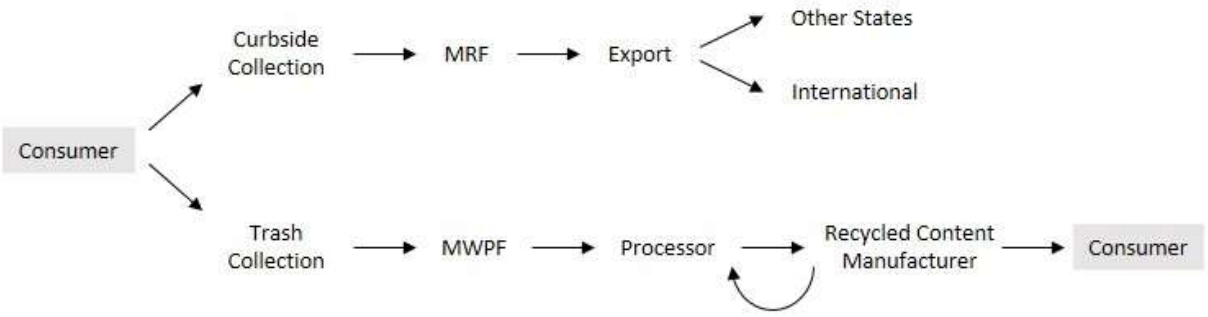

Figure 11. Example of two different paths one recyclable material might take after being used by a consumer.

In addition, the facility information available from FacIT underrepresents the facilities within the recycling infrastructure in California.[2] For example, some processing facilities do not require permits, are not regulated by CalRecycle, and do not voluntarily provide data to CalRecycle. In

[2] FacIT imports information from the Solid Waste Information System (SWIS), the Disposal Reporting System (DRS), and Division of Recycling Integrated Information System (DORIIS). However, the databases do not all track the same facilities for the same purposes and do not generally request information on current throughput or capacity.

addition, not all of the facility types report on their capacity or throughput. Further inaccuracies in the reported capacity and throughput come from permits listing the maximum possible capacity, rather than the practical capacity, and overcalculating current throughput.

The complicated network between facilities, coupled with incomplete records on the identity, throughput, and capacity of facilities, makes it challenging to track how many tons of recyclable material is processed in California and to evaluate how much additional infrastructure would be necessary to handle California's growing recycling system.

Role of Brokers

In addition to the physical facilities located in California, recycling brokers facilitate the movement of recyclable goods between facilities and ultimately to end markets. A broker buys and sells materials domestically and internationally without ever physically handling the goods. As a result, recyclable materials can pass through many hands from the time it is collected to when the materials are manufactured into new goods. This adds complexity when trying to track recyclables throughout the process. It would be helpful to better understand the extent of the role brokers play because they are an important part of the flow of materials into California, around California, and out of California. They are not permitted, regulated, or tracked by CalRecycle, but their cooperation could help CalRecycle assess the state's recycling infrastructure, flows and opportunities.

Import and Export of Recyclables

One important feature of California's recycling system is that significant quantities of recyclable items are shipped out of the country. In 2013, California exported approximately 18.6 million tons of recyclable material oversees through the ports; recyclables exported at ports were valued at $7.5 billion. More than 94 percent of the materials were metals and mixed paper, cardboard, and paperboard (see Figure 12).

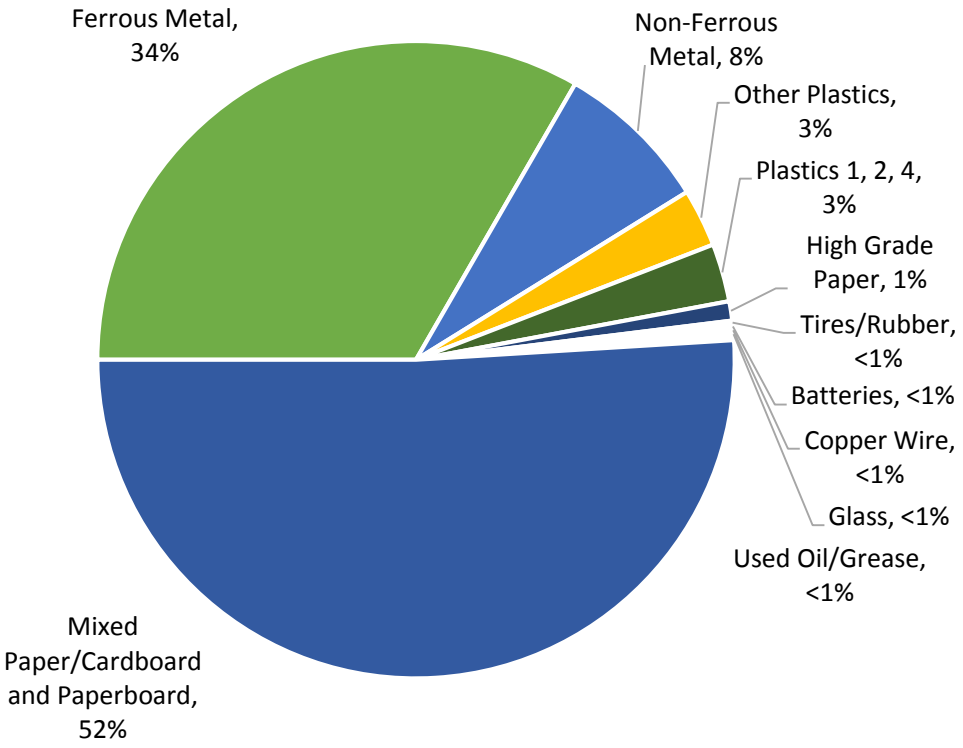

Figure 12. Composition by weight of 18.6 million tons of exported recyclable material from California sea ports in 2013. Data from "2013 California Exports of Recyclable Materials." Values may not add up to 100 percent due to rounding.

Although it is difficult to quantify how much of this material comes from California rather than neighboring states, it is likely that the majority (60 to 80 percent) originates in California. Imported recyclables from other states are not generally tracked, and as a result, it is challenging to determine if those materials are recycled in California or are directly taken to the ports for final export. Based on limited, initial information from Imported Material Reports (IMRs) collected by California Department of Food and Agriculture for CalRecycle, at least 46,000 tons of recyclables were imported between March and December 2014. However, the IMRs were focused on imported beverage containers and do not reflect the total amount of imported recyclables.

Recyclables that are exported through the port system are primarily distributed to China, Taiwan, and South Korea (see Figure 13). Some recyclables are actually processed into recycled content feedstock or new products after they are shipped overseas, but other materials are not, and it is difficult to track the final handling of materials. The lack of information on end-uses, adherence to environmental health standards, and regulatory compliance are potential concerns with the exportation of recyclable materials.

Recyclable material in California is also exported to other states as well as Mexico and Canada by rail and truck, although there is no data detailing the quantity or composition of material that exits the state in this manner.

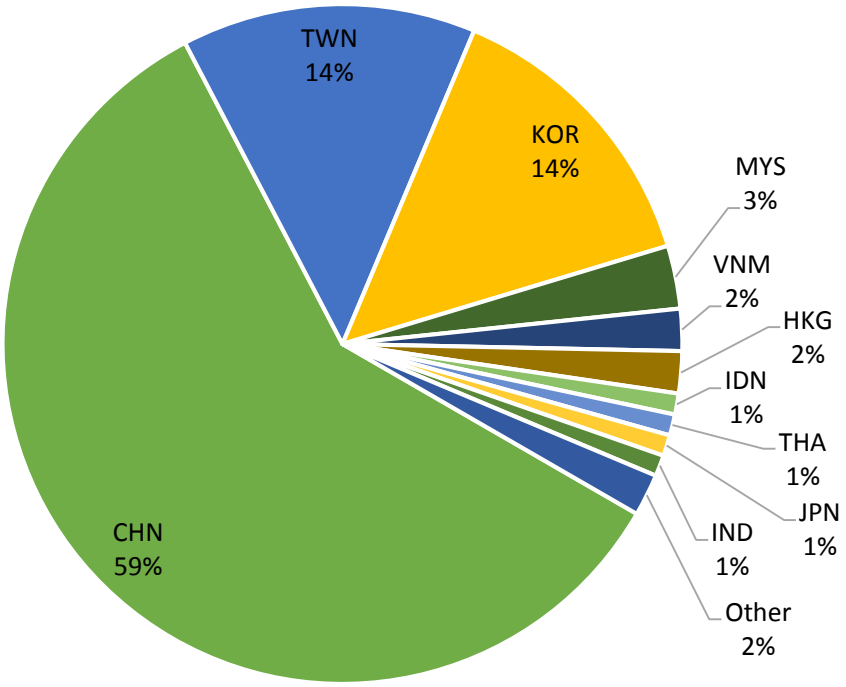

Figure 13. Destination, by weight, of materials exported from California through sea ports in 2013. Data from 2014 exports report.

When exported, some bales of "recyclable" materials contain trash, other nonrecyclable items, or incompatible recyclable items; some bales shipped to China prior to 2013 reportedly had up to 40 percent nonrecyclable trash included in a "recyclable" bale. These bales are difficult to process at recycling facilities and can result in entire bales of mostly recyclable materials being sent to landfills. In order to stem the tide of substandard recyclable bales, China launched "Operation Green Fence" in February 2013. The goal of the 10-month initiative was to prevent the importation of recyclables contaminated with solid waste by setting a maximum contamination level of 1.5 percent in each bale. Although the Green Fence officially ended in November 2013, the initiative resulted in better processing, higher-quality bales of recyclables, and the expansion of domestic markets.

Currently, exported recyclables comprise a major portion of California's recycling efforts and are counted as recycling toward the 75 percent statewide recycling goal. As discussed earlier, it is difficult to track and assess the extent and quality of recycling outside of California. Recyclables exported through California's ports accounts for approximately 17 percent of the total generated waste stream (see Figure 14, assuming that 70 percent of exported recyclables originate in California).

Given the variability in quality of exported recyclables and final processing, counting all exported bales of recyclable material as 100 percent recycling may not be an accurate reflection of the

amount of recycling. Under the carpet EPR program, no exported material is counted toward the EPR recycling goal; however, exported material still counts as diversion under AB 939. If this same approach of excluding all exported recyclables were taken for California's entire recycling stream, California's statewide recycling rate would drop from 50 percent to 33 percent.

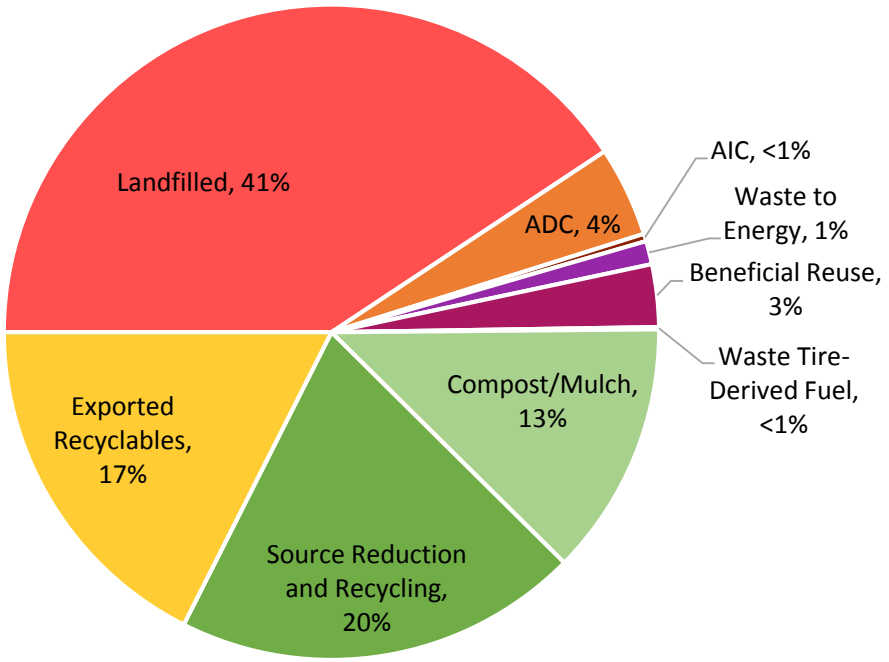

Figure 14. Estimated destination of 74 million tons of waste generated in California in 2013 based on AB 341 categories, including exports. Value for exported recycling is based on 70 percent of exported recycling originating in California, or 13 million tons. The remaining values are calculated as described for Figure 5 and may not add up to 100 percent due to rounding.

If exported recycling were instead handled by in-state recycling, there are several anticipated benefits to California in terms of increasing jobs and reducing greenhouse gas emissions. In CalRecycle's 2013 report "AB 341's 75 Percent Goals and Potential New Recycling Jobs in California by 2020," it was estimated that if the manufacturing of exported recyclable commodities into usable materials was done domestically, it would create 58,000 new jobs in California.

In-state processing of recyclables also has the potential to reduce greenhouse gas (GHG) emissions. Using the California Air Resources Board (ARB) estimate that ocean-going vessels

emit 19 g CO_2 equivalents per net-ton mile, the export of 18.6 million tons of recyclables by vessel releases approximately 2.3 million metric tons of CO_2 equivalents annually.[3]

Mandatory Commercial Recycling

According to the 2008 waste characterization study, the commercial sector accounted for 67 percent of the disposed waste stream in California.[4] According to the Legislature, local governments have faced greater challenges in reducing disposal from commercial sources than in reducing disposal from single-family residential sources. In 2012, AB 341 initiated mandatory commercial recycling (MCR), which requires businesses that generate four cubic yards or more of commercial solid waste per week and multifamily residential dwellings of five units or more to arrange for recycling services. According to CalRecycle estimates, MCR impacts 250,000 businesses and 220,000 multifamily dwellings; this accounts for 75 percent of business waste and 60 percent of multifamily dwelling waste.

Businesses can comply with AB 341 either by source-separating recyclable materials from solid waste and subscribing to a service to collect the recyclables, self-hauling, arranging for the pick-up of recyclables, or subscribing to a recycling service that may include mixed waste processing that yields diversion rates comparable to source separation. The MCR requirement that mixed waste processing yield diversion rates comparable to source separation poses difficulties. In developing the regulations for MCR, a working group determined that there were numerous challenges for defining this requirement. As a result, CalRecycle currently does not have a quantitative threshold for what constitutes "comparable to source separation."

Mandatory commercial recycling went into effect on July 1, 2012. The introduction of mandatory commercial recycling is expected to have an impact on the amounts and types of materials that are processed by the existing recycling infrastructure in California and the amount of exported recycling.

Based on initial data collected from the 2013 Electronic Annual Report, all 413 reporting jurisdictions had commercial recycling of some type. At this time, however, CalRecycle does not have a more detailed picture of the quality or extent of commercial recycling efforts.

Mandatory Commercial Organics Recycling

In 2014, a new mandatory statewide organics program (Chesbro, AB 1826, Chapter 727, Statutes of 2014) was established. This program introduces a phased expansion of organic recycling services for businesses and multifamily residential dwellings beginning in 2016 and will be discussed in greater detail below.

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[3] Value for ocean-going emissions obtained from "Method for Estimating Greenhouse Gas Emission Reductions from Recycling," November 14, 2011. Assumes all exports travel from Los Angeles to Shanghai (6497 miles). 18.6 million tons x 6497 miles x 19 g CO_2E/ton-mile = 2.3 $MMTCO_2E$. The 2014 ARB Climate Change Scoping Plan projects that if the 75 percent recycling goal is met by 2020, this will result in a 20 to 30 $MMTCO_2E$ reduction in GHG per year.

[4] This includes commercial and commercial self-haul loads.

How Is Recycling Tracked and Quantified in California?

Tracking Requirements

Within California, recycled materials are not broadly tracked or quantified. However, certain material management programs and operations do have mandatory tracking components. For example, EPR programs have mandatory tracking requirements in order to ensure that manufacturers meet recycling goals set by CalRecycle. Consumer fee and reimbursement programs, including covered electronic waste and the Beverage Container Recycling Program, track overall quantities of materials in order to keep an accurate account of money coming into and out of the program. However, these programs account for a small portion, by weight, of recycling efforts in California.

Reporting Mechanisms

Currently, there is no mandatory statewide reporting mechanism for recycling activities in California.

Under AB 2494 (Sher, Chapter 1292, Statutes of 1992), CalRecycle has statutory authority to require recycling and composting facilities to submit periodic information to counties on the types and quantities of materials that are disposed of, sold to end users, or sold to exporters or transporters for sale outside the state, by county of origin (Public Resources Code §41821.5(b)). While regulations have not been implemented, CalRecycle is exploring implementation options.

The FacIT database allows for voluntary reporting of material throughput by recycling facilities; however, as discussed previously, the voluntary and unverifiable data contained in this database does not provide a complete picture of the recycling infrastructure.

CalRecycle does track the amount of waste that jurisdictions send to permitted landfills in California through the Disposal Reporting System (DRS). DRS also provides information on the movement and quantity of disposal-related materials, such as ADC, AIC, and beneficial reuse at landfills (see "State of Disposal in California" for additional information).

Information from DRS is used to calculate the per capita disposal rate for individual jurisdictions under AB 939 and SB 1016 (Wiggins, Chapter 343, Statutes of 2008). Jurisdictions are required to provide an annual report on diversion program implementation to CalRecycle through the Electronic Annual Report (EAR), including information on the number of local programs aimed at improving diversion and recycling. CalRecycle formally reviews jurisdiction performance in two- and four-year cycles. However, the data collected in the EARs contains limited quantitative information; based on that information, it is not always clear how effective the programs are or how widely they are used. CalRecycle staff gather information from many additional sources when evaluating overall program effectiveness.

Although their management falls outside the scope of AB 341, the passage of SB 498 (Lara, Chapter 746, Statutes of 2014) requires biomass conversion facilities to annually report to CalRecycle, beginning in 2016, on the source and quantities of processed and rejected materials and the destination of ash and other byproducts. This reporting could serve as a general model for recycling facilities.

Diversion and Recycling Rates

The per capita disposal rates are calculated based on the amount of disposed material and the jurisdiction's reporting year population and industry employment.

Importantly, diversion and recycling rates are not directly calculated based on the amount of recycled or diverted material, because diversion and recycling are not systematically tracked in California. Instead, diversion and recycling rates are determined based on the measured amount of disposed waste and the calculated amount of generated waste. Without direct measurement of recycling, it is impossible to estimate the relative impact of the economic downturn and improved recycling programs on the statewide recycling rate.

Waste Characterization Study

California periodically conducts statewide waste characterization studies in order to update information on the types and amounts of materials in California's waste stream. Studies were conducted in 1999, 2004, 2006, and 2008; CalRecycle's 2014 study is being finalized and will be released in May 2015.

Although the waste characterization study focuses on disposed material, it provides important information for understanding the amount of recyclable materials that enter the disposal stream.

The "California 2008 Statewide Waste Characterization Study" was commissioned by the California Integrated Waste Management Board to assess the types and amounts of materials disposed of at solid waste facilities throughout the state. The study estimates the composition of the commercial, residential, and self-hauled waste streams in California and aggregates the data to estimate the statewide overall composition of the solid waste stream. Figure 15 shows the composition of California's overall disposed waste stream.

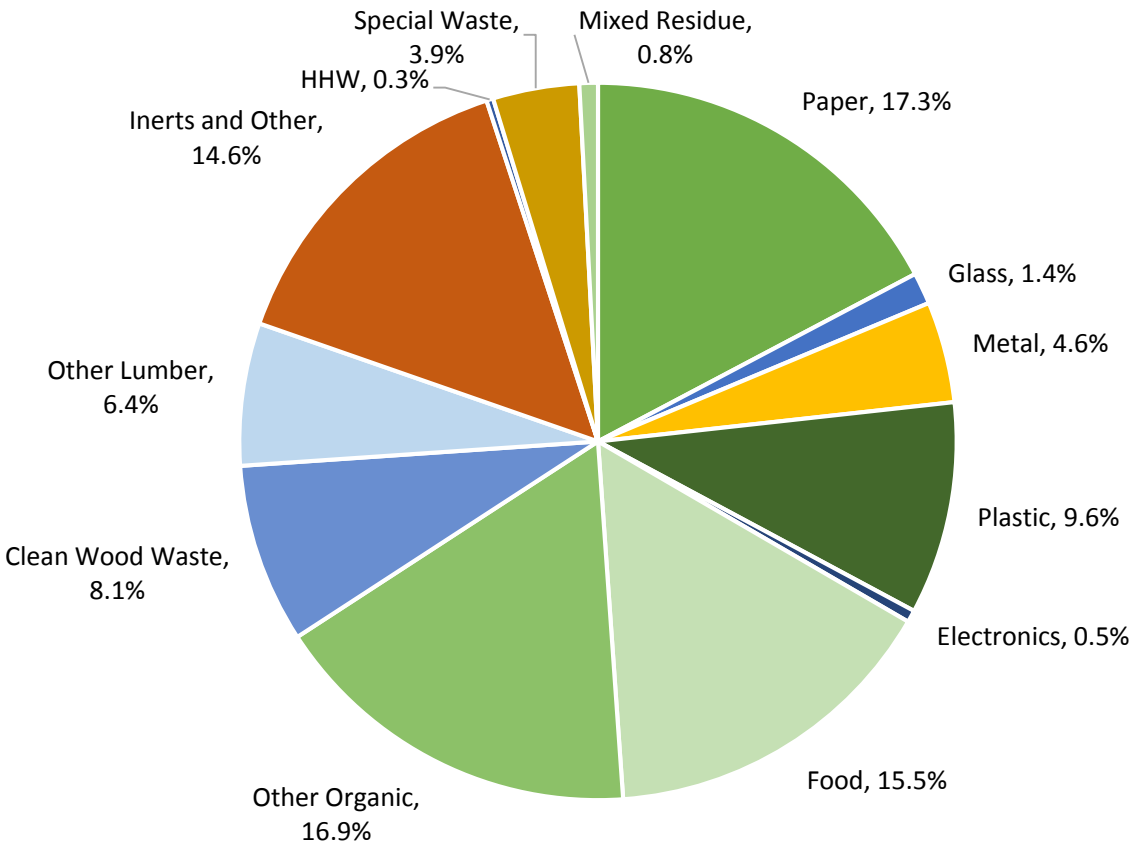

Figure 15. Composition of California's overall disposed waste stream. Data from the "California 2008 Statewide Waste Characterization Study." Most categories shown here are the same as those defined in the study. Clean wood waste is a subset of lumber that includes clean dimensional lumber, clean engineered wood, and clean pallets and crates. Values may not add up to 100 percent due to rounding.

In addition to characterizing the waste stream composition, the study used divertibility analysis to determine the amount of commonly recoverable paper, plastic, and metal materials in the state's total disposed solid waste stream. The divertibility analysis evaluated 194 waste samples for a general contamination assessment to determine the extent of contamination of commonly recoverable materials in the waste stream. The analysis also determined the level and point at which contamination occurred, either before the material was disposed of or during transport in a solid waste vehicle.

According to the 2008 waste characterization study, the state's overall disposed waste stream consists of 17.3 percent paper, 9.6 percent plastic, 4.6 percent metal, and 1.4 percent glass (or 13.0 million tons of material for these four material types, see Figure 15). The divertibility analysis indicates that 62.9 percent of the commonly recycled types of paper, plastic, and metal materials found in the waste stream are uncontaminated at the time they arrive at disposal facilities and can therefore be recycled. Table 5 uses data from the divertibility analysis and states that the estimated percentage of the recyclable material in the overall disposed waste stream that

is easily recyclable is approximately 12.7 percent. Glass was not included in the 2008 divertibility analysis; however, for the purposes of this report, glass bottles and containers found in the disposed waste stream are considered to be 100 percent recyclable. The actual recycling rate of glass can vary based on the level of contamination and the mixing of glass types.

Table 5. Divertibility analysis of commonly recoverable paper, plastic, metal, and glass materials found in California's total disposed waste stream (39.7 million tons in 2007).

Material	Estimated Tons	Estimated Tons Recoverable/Clean	Estimated Percent of Total Waste Stream Easily Divertible
Paper	6,859,000	4,021,000	10.1%
Glass	566,000	425,000*	1.1%
Metal	1,810,000	222,000	0.6%
Plastic	3,808,000	383,000	1.0%

Data is generated from the 2008 waste characterization study and the Divertibility Analysis presented in the study.
* Assumes that glass from bottles and containers is 100% recoverable.

Additionally, organic material that is typically compostable is composed of food, leaves and grass, prunings and trimmings, branches and stumps, manure, clean dimensional lumber, clean engineered wood, and clean pallets and crates, and accounts for 30.8 percent of the state's total disposed waste stream (see Figure 15). Based on this data, the total amount of easily divertible material that ends up in California's disposed waste stream is an estimated 43.5 percent of total statewide disposal.

According to the 2008 waste characterization study, the commercial sector produces the greatest amount of waste in California with 67 percent of the total disposed waste stream (26.5 million tons).[5] The residential sector produced 30 percent, or 11.9 million tons, of municipal solid waste in 2008. Self-hauled waste from residential sources accounted for the remaining 3 percent of the disposed waste stream. The divertibility analysis of the commercial sector (excluding self-haul) indicates that 60.9 percent of the commonly recoverable types of plastic, paper, and metal arrive clean and can be recycled. Using data from the divertibility analysis, it can be estimated that the paper, glass, plastic, and metal materials in the commercial waste stream that are uncontaminated upon arrival at solid waste disposal facilities and can be recycled comprise 14.3 percent of the commercial waste stream. Additionally, compostable organic material represents 32.5 percent of the commercial waste stream. Accounting for recyclable plastic, metal, paper, and glass, and compostable organic material, approximately 46.8 percent of the total disposed waste stream of the commercial sector can be recycled and composted. Again, glass was not considered in the divertibility analysis; however, for the purposes of this report, glass bottles and containers from the commercial disposed waste stream are included and are assumed to be 100 percent recyclable. Mandatory Commercial Recycling was introduced through AB 341 to address the large quantity of waste that the commercial sector produces by requiring businesses and public entities that generate four cubic yards or more of waste per week, and multifamily dwellings with five or more units, to source-separate recyclable materials from solid waste and subscribe to a service to

[5] This includes commercial loads picked up by collection programs or private haulers (50 percent of the total waste stream) and commercial self-haul loads (17 percent of the total waste stream).

collect the recyclables, self-haul, arrange for the pick-up of recyclables, or subscribe to a recycling service that yields diversion rates comparable to source separation.

AB 341 also sets a statewide goal for 75 percent recycling by 2020 through source reduction, recycling, and composting. Based on the data from the 2008 waste characterization study, in 2013, an estimated 3.8 million tons of the non-organic material sent to landfills could have been recycled. If compostable organic material is also included, this would account for another 9.3 million tons. This represents an incredible potential recycling and composting resource to help the state achieve its 75 percent goal. It is important to note that this value takes into account the state of the materials as they arrive at the landfill or transfer station and likely under-represents the total amount of material that could be recycled if individuals were to separate out materials for recycling at the source of generation. Furthermore, this number does not account for all recyclable materials as the divertibility analysis only took into consideration the most commonly recycled plastic, paper, and metal materials; therefore, the amount of recyclable material that is disposed could be even greater.

The 2014 study will provide an updated look at the amount and types of materials in California's waste stream. In addition, the 2014 study will evaluate materials recycled and composted by businesses through blue bin, or source-separated, programs. This will allow for a general assessment of the statewide average amount and composition of recycled and diverted material originating from California businesses.

How Is the California Recycling Infrastructure Supported?

California has a broad range of programs and practices that support recycling in the state. Programs such as the Recycling Market Development Zone program and associated efforts to provide business assistance to manufacturers are aimed at creating business practices to support the recycling infrastructure through grants, loans, and technical assistance. CalRecycle also promotes recycled content products through programs directed at rigid plastic packaging containers, newspapers, and trash bags. Other programs are maintained at the jurisdiction level and are focused on local policy incentives or educational practices for recycling.

Rather than focusing on individual programs, this section will instead provide an overview of practices that directly impact recycling capacity and infrastructure. These elements directly relate to some of the challenges and successes associated with handling and quantifying California's recycling. Specifically, this section will cover permitting, funding mechanisms at the state level, and post-consumer recycling markets.

Permitting

CalRecycle regulates solid waste handling, processing, and disposal activities; these include landfills and transfer stations as well as material recovery facilities, compost facilities, and waste-to-energy facilities. CalRecycle identifies five tiers for facilities: full, standardized, registration, notification, and excluded. The first three tiers require a solid waste facility permit, whereas the latter two do not. Placement within a tier is dependent on the type of activity and the type and amount of solid waste handled at the facility.

By statute (Public Resources Code §40200(b)(2)), CalRecycle does not have jurisdiction over facilities whose primary function is to process wastes that have already been separated for reuse and are not intended for disposal. CalRecycle's permitting procedure, developed by regulation, applies a three-part test in order to determine whether an operation qualifies as a solid waste facility, which is subject to permitting by CalRecycle, or as a recycling center, which is not. If a facility fails any of the three-part test, then it falls under CalRecycle's permitting jurisdiction.

The three-part test stipulates:

1. An activity shall only receive material that has been separated for reuse prior to receipt.
2. The monthly average of the residual amount of solid waste left after processing the material received at the facility is less than 10 percent by weight.
3. The amount of putrescible wastes in the material is less than 1 percent of the amount of separated reuse material received by weight, and the putrescible wastes shall not cause a nuisance.

Under this classification scheme, "clean" MRFs that receive source-sorted recyclables may not require a permit. Mixed waste MRFs, which separate recyclables from disposed materials, would require a permit. Recycling facilities, such as dedicated metal, fiber, resin, or glass recycling facilities, do not require permits if they meet the three-part test. Since these facilities may not have permits from the state, it is challenging to continuously determine if they should be operating without a permit. Local enforcement agencies typically evaluate facilities in order to

determine whether they need permits. Facilities associated with the Beverage Container Recycling Program are required to register with CalRecycle, but this is not a formal permitting process.

In addition, there are several activities that are excluded from regulatory requirements provided they do not accept solid waste that has not been separated for reuse. The activities include buy-back and drop-off centers, reuse salvage operations, and scrap metal recyclers and dealers.

Siting Challenges

There are several siting issues associated with new facilities and the expansion of existing facilities. First, residents are increasingly demanding that facilities not be located near their neighborhoods. Odor and noise complaints can be routine, resulting in a limited number of urban locations where facilities can continue to operate. This is a particular challenge for composting and AD facilities, which can be more odorous than recycling facilities. When facilities near population centers close, this can result in longer transportation distances of materials to appropriate processing facilities. One recent example of a composting facility that closed due to odor complaints is California Bio-Mass.

Another challenge for siting composting facilities is that alternate management of organic material can be more profitable. For example, green material ADC may require less processing and be subject to no or lower local tipping fees at landfills than at composting facilities. This creates an uneven playing field between landfills and composting facilities regarding material.

AD facilities have a unique set of siting challenges because they are a relatively new technology in California. Currently, AD facilities are classified and evaluated as composting facilities or transfer stations by CalRecycle. CalRecycle is in the process of developing AD-specific requirements.

In addition, waste facilities in general are regulated by multiple governmental agencies, including regional water quality control boards and air quality management districts. This can create challenges in complying with a myriad of requirements. For example, stringent air quality regulations may only allow for fully-enclosed composting in a region, and concerns regarding groundwater contamination may require expensive measures to control wastewater at composting facilities.

Funding Mechanisms

CalRecycle's recycling programs, grants, and loans are funded entirely through special funds. Table 6 lists the revenue sources for the Department in 2012-2013. The Integrated Waste Management Account is funded through a tipping fee on landfilled materials (see below). Product fees on beverage containers, tires, oil, and covered electronic waste are used to fund programs directly associated with those materials. Since fiscal year 2014-2015, CalRecycle received money through the Greenhouse Gas Reduction Fund (see below).

Table 6. Revenue sources for CalRecycle in fiscal year 2012-2013.

Fund	2012/13 Revenue
Integrated Waste Management Account	$40,910,000
California Tire Recycling Management Fund	$51,967,000
California Used Oil Recycling Fund	$28,763,000
Electronic Waste Recovery and Recycling Account	$86,884,000
California Beverage Container Recycling Fund	$1,162,265,000
Glass Processing Fee Account*	$6,459,000
Bimetal Processing Fee Account*	$1,533,000
PET Processing Fee Account*	$5,216,000
Total	**$1,383,997,000**

* These funds are from processing fees paid by beverage manufacturers to cover recycling costs for material types whose scrap value is too low to cover the cost of handling.

Integrated Waste Management Fee

The majority of CalRecycle's waste management programs are funded through a tipping fee collected on landfilled materials. The fee is statutorily set at $1.40 per ton and is collected through the Integrated Waste Management Account. When the tipping fee was first established in 1989, the intent of the fee was to fund the overall operations of CalRecycle (then the Integrated Waste Management Board), including regulating solid waste, permitting, financing, establishing a system for jurisdictions to reach their diversion mandates, and reviewing compliance with programs. In the 25 years since the tipping fee was established, the fee on landfilled materials continues to support many of CalRecycle's general disposal, diversion, and recycling programs.

There is currently no general fee structure for recycled materials at the state level. As a result, efforts within CalRecycle to develop the growing general recycling infrastructure are financially supported by the landfill tipping fee and specialty fees on individual materials, such as electronics, tires, oil, and beverage containers. Since fiscal year 2013-2014, CalRecycle has received additional income from the carpet and paint EPR programs, which is used to support oversight of those efforts.

AB 1594 (Williams, Chapter 719, Statutes of 719) specifies that as of 2020, green material used as ADC will no longer count toward diversion for local jurisdictions. However, jurisdictions can still use green material as ADC and, importantly, it will not be subject to the $1.40 per ton tipping fee. This fee exemption creates a situation in which materials that count as disposal can be landfilled without paying the disposal fee. The precedence established under this law may have unintentional consequences by further incentivizing disposal of green waste in landfills rather than composting at the state level.

In 2013, it appears that the public was charged about $39 per ton of green waste accepted at landfills and about $30 per ton for green waste accepted for composting, on average (see "Tipping Fees in California 2013"). It is unclear what the impact of AB 1594 will be on local fees charged by landfills on green material. Additionally, if state-level fees were ever extended to recycling and composting facilities, green material ADC would be the lone material exempt from a fee.

Since the $1.40 per ton landfill tipping fee funds CalRecycle's general operations, the long-term stability of tipping fees as a funding structure is a growing concern. As the amount of disposed and landfilled materials decreases, there will be less revenue available to support California's increasing recycling efforts and to finance CalRecycle's reasonable regulatory oversight of these efforts. If in 2020, 22 million tons of additional material is diverted from landfills as projected under the 75 percent statewide recycling goal, then the state fund will have a net revenue loss of about $30 million.

Product Fee Programs for Specific Items

In some cases, California uses product fees for items to encourage recycling and fund associated programs. The fee is assessed on consumers or manufacturers when the product is sold in California. In some cases, the fee is then recovered by consumers when the item is recycled, and uncollected recycling payments are used to administer the programs and provide other incentives. This is particularly the case for California's largest product fee program: the California Redemption Value (CRV) that is placed on bottles and cans through the Beverage Container Recycling Program. A complete list of product fees collected in fiscal year 2012-2013 is shown in Table 6.

Greenhouse Gas Reduction Fund

The California Global Warming Solutions Act of 2006 (AB 32, Núñez and Pavley, Chapter 488, Statutes of 2006) established the world's first comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of greenhouse gases (GHG). In response to AB 32, the California Air Resources Board (ARB) developed the Climate Change Scoping Plan, which contains the main strategies California will use to reduce the GHGs that cause climate change.

According to ARB's updated scoping plan, approximately 8 million tons of carbon dioxide equivalent are released annually by California landfills, generally in the form of methane. Recycling organic waste provides significant reductions in GHGs compared to landfilling. Other types of recycling efforts can also lead to dramatic reductions in the release of greenhouse gases. As a result, the 2014-2015 budget allocated $20 million in grants from the Greenhouse Gas Reduction Fund to fund shovel-ready recycling programs.

On November 18, 2014, CalRecycle announced the first eight facilities to receive $19.5 million under the Organics Grant Program and the Recycled Fiber, Plastic, and Glass Grant Programs. Funds were awarded on a competitive basis for projects that contributed to the state's greenhouse gas reduction targets and advanced California's 75 percent recycling goal.

Post-Consumer Recycling Markets

One major driver of California's recycling efforts is the broader market for recyclable materials. In order for recycling to be economically viable, the cost of processing and using the recycled material must be less than that of virgin material.[6] One complication is that prices for materials can fluctuate wildly, leading to dramatic variations in the monetary reward for recycling.

[6] Virgin and recyclable materials may receive government subsidies in order to increase their profitability.

Prices for secondary plastic, metal, paper, and glass react to market influences just as other commodities do and can swing wildly over both short and long time intervals. Table 7 shows the value per ton of scrap for various recyclable materials in July 2013 and 2014; during that period, aluminum and plastic prices showed substantial growth, whereas glass stayed relatively even. In contrast, the historical market trends for secondary materials, shown in Figure 16, show much larger fluctuations. It is important to note that market prices for secondary materials dropped significantly around 2008 and 2009 due to the recession, which is reflected in the data from the sources used.

Table 7. Scrap value per ton for various materials in 2013 and 2014.

Material Type	Commodity Price July 2013	Commodity Price July 2014
Aluminum	$1576	$1,709
Plastic (PET)	$593	$650
Plastic (HDPE)	$668	$1,005
Paper (Mixed)	$96	NR
Paper (White)	$264	NR
Old Corrugated Cardboard	$143	$135
Glass (Flint)	$30	$30
Glass (Amber)	$25	$25
Glass (Green)	$6.50	$6.50

Data was generated by averaging the commodity price listed in the Southwest USA Los Angeles Market Region on RecyclingMarkets.net for the month of July in each year. NR: Not reported.

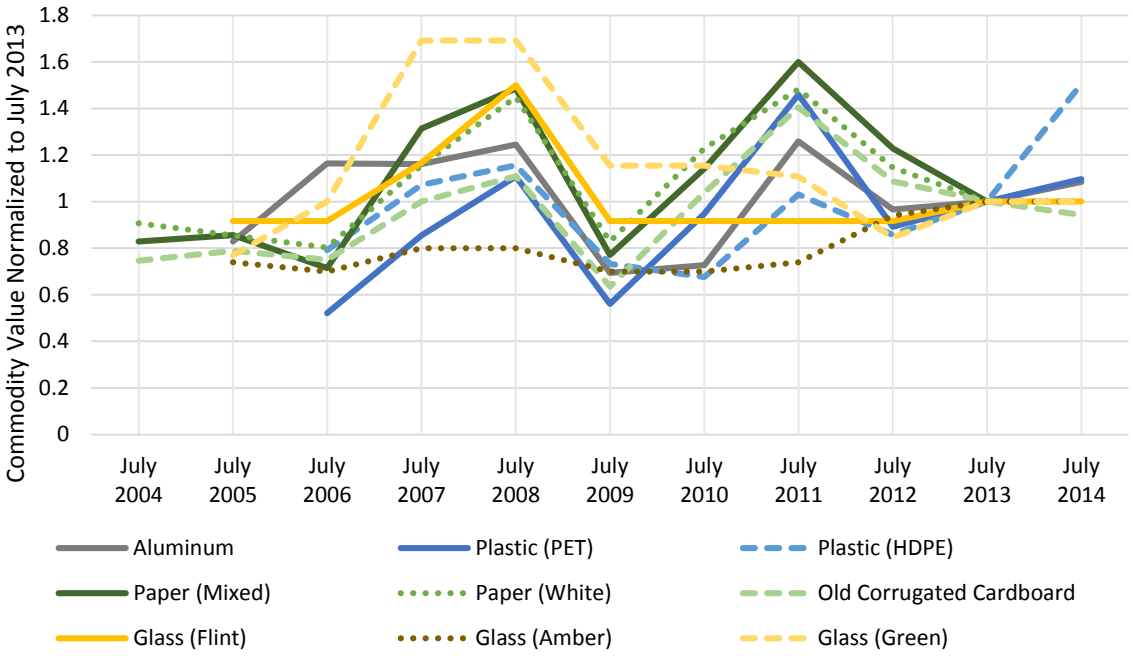

Figure 16. Normalized recycling material prices. Data was generated by averaging the price listed in the Southwest USA Los Angeles Market Region on RecyclingMarkets.net for the month of July in each year.

The prices of individual commodities are based on a range of factors, including global supply, demand, inventories, and facilities to process recycled materials. This is particularly true for plastics, whose prices are highly influenced by international trade factors and oil. Aluminum prices are highly reflective of global factors, energy costs, beverage consumption, and the demand for automobiles and housing. Glass prices depend on the quality and cleanliness of the raw material. For example, some curbside pick-up programs reduce the quality of glass in the recycling stream and make it expensive and difficult to clean and process the material.

In addition to the inherent volatility of market prices for secondary materials, small changes in prices can have strong impacts on determining how profitable secondary materials are in comparison to virgin material. For example, falling oil prices, which as of December 2014 were at their lowest prices since May 2009, and other factors have reduced the price of virgin plastic and made recycling plastics less economically feasible. Market prices of secondary materials also affect whether the materials are exported from the state; exporting further increases their price and decreases their quality in the United States. In order to help promote secondary material markets, governments often provide subsidies and incentives to increase the profitability of reusing materials.

A more robust California processing infrastructure would be a significant source for these materials and could help reduce some of the volatility for California recyclables by reducing transportation costs and uncertainty related to availability in foreign markets. To completely close the loop, California would need significant growth in the infrastructure for manufacturing new products from recyclable materials.

How Does California's Recycling System Operate for Different Material Types?

Source Reduction

Calculating statewide source reduction is challenging. Although jurisdictions report avenues for source reduction in their EARs, direct quantification of the extent or quality of source reduction is almost impossible. In addition, total statewide generation of waste is calculated based on the 1990-2010 baseline multiplied by the statewide population without accounting for any decreases in generation due to source reduction. As a result, source reduction is grouped with recycling when accounting for the fate of estimated generated waste in California (as in Figure 5). Although calculating the extent of source reduction is challenging, the practice of source-reducing waste is important for achieving California's recycling and diversion goals.

Local Programs

Under AB 939, jurisdictions must provide CalRecycle with a source reduction and recycling element (SRRE). Within this document, source reduction is prioritized for managing solid waste. Jurisdictions must include a program and implementation schedule showing how the jurisdiction will reduce the creation of solid waste, thereby preventing it from entering the waste stream.

In order to evaluate the contribution of source reduction to California's management of solid waste, it would be necessary to have firm, verified data on the quantities of materials handled through all of the state's other recycling and disposal activities. Then, material removed from the waste stream by source reduction could be estimated over time relative to the calculated statewide generation.

Based on the data collected through the EARs, it is possible to evaluate how many jurisdictions are encouraging source reduction as described in their SRRE. Figure 17 shows that many jurisdictions have at least one source reduction program in place, and that the number of these programs has not changed significantly since 2000.

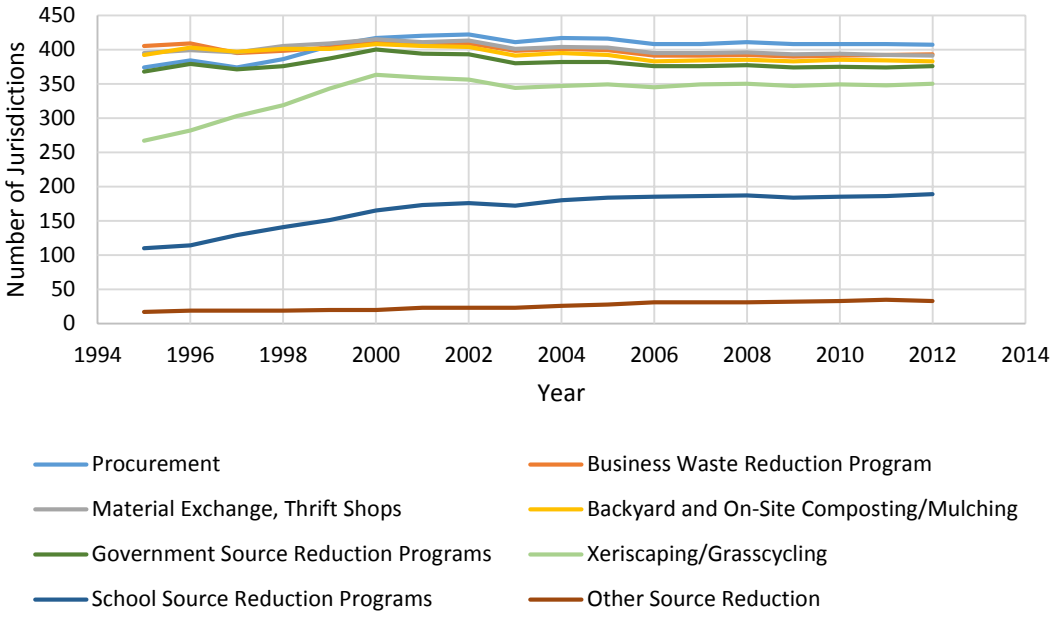

Figure 17. Jurisdiction-level source reduction programs. Number of jurisdictions implementing various source reduction programs to encourage diversion between 1995 and 2012. Data from the Diversion Programs System (DPS), as reported in the EARs.

Source reduction programs can involve a number of different material types. For example, backyard composting, food rescue programs, or xeriscaping (landscaping with drought-tolerant plants to conserve water and reduce yard trimmings) all reduce the amount of organic waste that enters the composting infrastructure. Other programs, such as material exchanges and thrift shops, provide opportunities to reuse old materials rather than throwing items away and purchasing brand new replacements.

Organic Materials

Organics Management Programs

Local programs to incentivize composting and organics management have been in place for decades. As shown in Figure 18, numerous jurisdictions adopted additional composting and green waste programs in preparation for AB 939's 50 percent diversion goal in 2000. Unlike other recycling and diversion initiatives, jurisdictions have continued to adopt new food waste composting programs since 2000. CalRecycle's program database indicates that 210 jurisdictions had programs in 2012, as compared to 127 jurisdictions in 2000. However, CalRecycle does not believe that these numbers reflect the number of jurisdictions with composting sites or actual food waste collection programs available to the whole jurisdiction. This total includes fats, oil, and grease collection, grocery store programs, on-site composting at specific businesses, pilot food waste collection programs, and backyard composting programs. With respect to food waste collection programs for the residential and commercial sectors, there are between 35 and 40 such reported food scrap collection programs, depending on the sector targeted. Commercial on-site green waste pick-up, including food waste, has seen moderate levels of additional adoption by

jurisdictions. Overall, the number of jurisdictions with programs directed at residents has held steady since 2000.

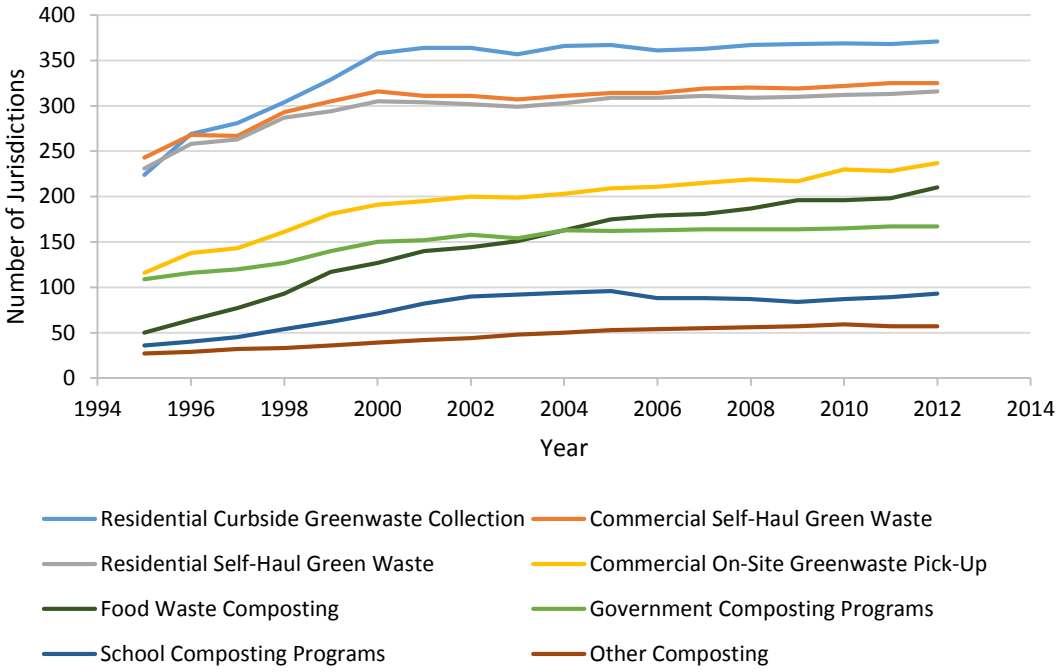

Figure 18. Jurisdiction-level organics management programs. Number of jurisdictions implementing various organics management policies to encourage diversion between 1995 and 2012. Data from DPS, as reported in the EARs.

Composting Facilities

In California, large composting facilities that accept material from off-site locations receive permits from CalRecycle. This excludes home-composting operations and large on-site agricultural composting facilities; the state does not track the quantity of materials handled in this fashion. In addition, CalRecycle does not track what happens to the compost after it has been processed and leaves the composting site.

There are currently 169 active permitted composting facilities in California that process approximately 5.7 million tons of material per year (see Figure 19). Due to updated Department estimates, the throughput of composting facilities is slightly smaller than what is reported in FacIT. The 12 largest composting facilities in California account for 50 percent of the current throughput, while roughly a third of active facilities manage 5,000 tons or less of organic material each year. Most of the high-throughput facilities are located in the Central Valley and are distant from population centers that can generate large amounts of compostable material. It is likely that some of these composting facilities also accept feedstock from agricultural sources.

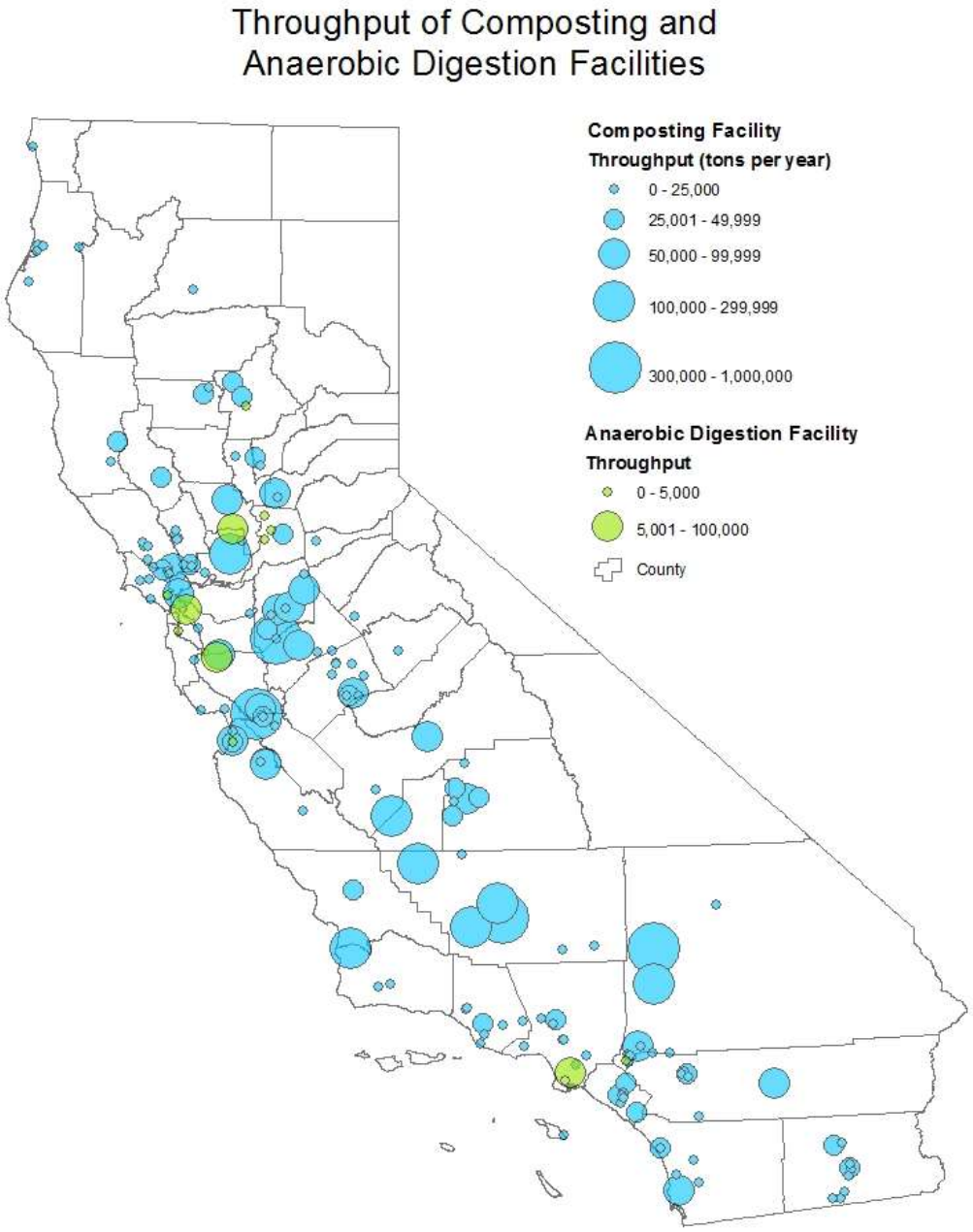

Figure 19. Throughput (tons per year) at composting and AD facilities. Data is from CalRecycle estimates of annual throughput.

The number of jurisdictions using composting facilities grew from 213 in 1995 to 310 in 2000. Since then, the number of jurisdictions has stayed relatively constant, with 298 jurisdictions reporting the use of composting facilities in 2012.

The total number of permitted composting facilities in California has grown substantially from fewer than 10 in 1995 to almost 250 in 2014 (only 169 of these facilities are actively operating). This growth has been steady except for around 2006 and 2008, when existing facilities were closing at the same rate that new facilities were being added. However, it is difficult to track exactly when the composting facilities closed or to identify the reason behind their closure.

Mulch Processors, or Chip and Grind Facilities

There are also more than 150 chip and grind operations in California, which separate, grade, and resize woody green wastes or used lumber to be sent to a composting facility, used at a landfill for ADC, AIC, or erosion control, or sent to other end markets such as feedstock at biomass plants. Since chip and grind operations are not generally permitted by CalRecycle, the total capacity, consistency of handled material, and end use of the produced material is not known.

Current CalRecycle estimates of chip and grind capacity and throughput vary widely. Voluntary reporting on FacIT (see Table 4) reports a total capacity of 11.3 million tons per year and a current throughput of 7.3 million tons per year. In contrast, the 2010 contractor's report "Third Assessment of California's Compost- and Mulch-Producing Infrastructure – Management Practices and Market Conditions" reports only 3.6 million tons per year of throughput based on facility surveys.

The wide disparity in these numbers reflects a key challenge in assessing operations based on voluntarily provided data. Surveys can provide more accurate information, but they are time-intensive to complete and rely on participation from the facilities. Voluntarily provided data requires less effort to compile, but it is more likely to contain errors or inaccuracies. Not all chip and grind facilities have permits, so CalRecycle does not have a clear picture of the total number of facilities in California. In evaluating organics processing for the purposes of this report, the smaller estimate of 3.6 million tons/year has been used.

Anaerobic Digestion

A form of organics management is anaerobic digestion (AD). Anaerobic digestion is a specific type of composting in which biological decomposition of organic wastes occurs in a low- or no-oxygen environment. AD facilities can both divert organic materials from landfills and produce low-carbon fuels, thereby making them attractive for achieving the dual goals of AB 341 and AB 32. AD systems have been used in Europe, Canada, Japan, Australia, and the United States.

California currently has 13 permitted, active facilities that process approximately 187,000 tons of material annually (see Figure 19). Another dozen or more AD facilities are planned or in the permitting process. The choice between traditional composting and AD is dependent on local regulations for facilities, type of organic material, and cost.

Flow of Organic Waste

Although the movement of materials for composting and organics management may appear straightforward, there is a large amount of interplay between the various processing facilities and among participants, as depicted in Figure 20. Organic waste originates from a number of sources,

including distributors, markets and restaurants, and consumers (both individuals and businesses). Depending on the type of organic material (food waste, green waste, or yard waste), the waste may go toward composting, chipping and grinding, or anaerobic digestion. Material from AD may be additionally sent to composting facilities or other uses, and processed material from chipping and grinding may also be sent to composting, landfill ADC, direct land application, and other uses. This movement between facilities and to a variety of end uses makes it challenging to fully quantify the amount of organic material that is composted or otherwise recycled under AB 341.

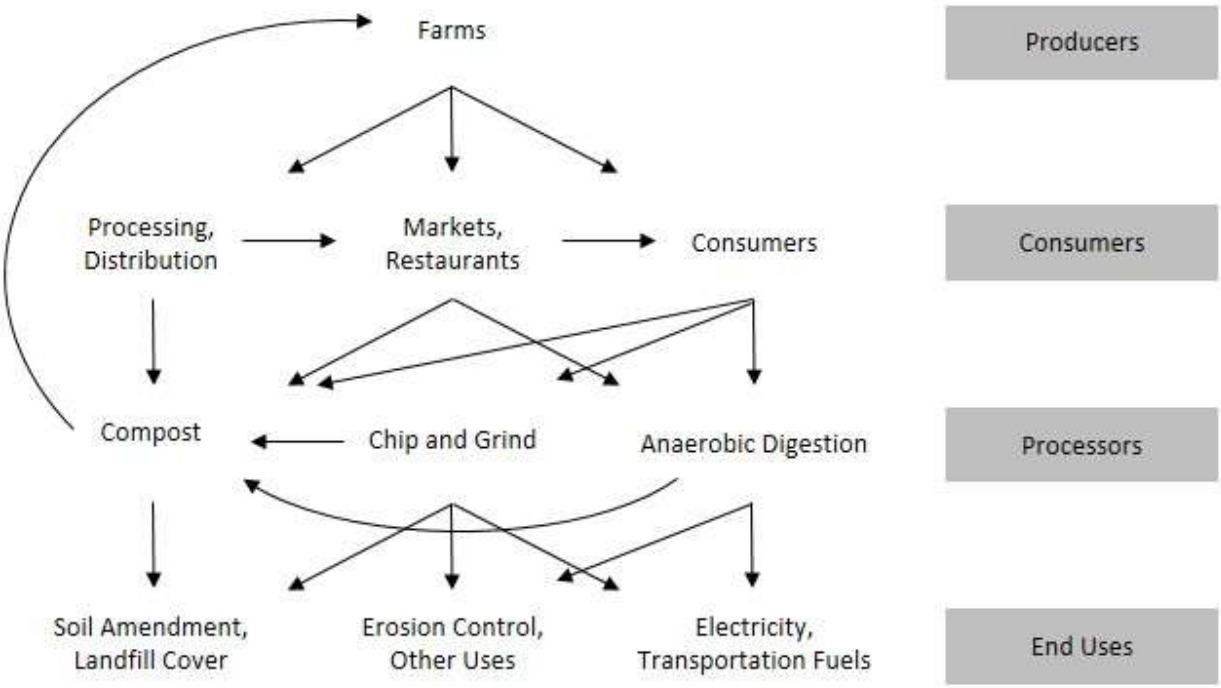

Figure 20. General waste management flow of food, green material, and other organics. Flow of materials from producers (farms and others), consumers (distributors, markets, restaurants, and consumers), waste processors (composting, chipping and grinding, and AD), and end uses (soil amendment, erosion control, landfill cover, electricity, transportation fuels, reuse at farms, and other uses). Consumers may also generate organic wastes, such as yard waste.

Mandatory Organics Program

The management of organic wastes has been an important component of diversion under AB 939 and recycling under AB 341. Based on the 2008 waste characterization study, 6.2 million tons of food waste, 2.8 million tons of green waste, and 3.2 million tons of clean lumber were landfilled; this is material that could instead be composted, mulched, digested, or otherwise processed for reuse. Although CalRecycle has supported education and outreach for organic management techniques, the majority of efforts to encourage composting and related activities has occurred within jurisdictions.

In 2014, a new mandatory statewide organics program (Chesbro, AB 1826, Chapter 727) was established to reduce the amount of organics waste disposed in 2014 by half. AB 1826 details a phased expansion of organic recycling services for businesses and multifamily residential dwellings with five units or more according to the following schedule:

- April 1, 2016: Businesses generating eight cubic yards or more of organic waste per week.
- January 1, 2017: Businesses generating four cubic yards or more of organic waste per week.
- January 1, 2019: Businesses generating four cubic yards or more of commercial solid waste per week.
- January 1, 2020: Businesses generating two cubic yards or more of commercial solid waste per week, if statewide disposal of organics has not reached 50 percent of 2014 levels, unless CalRecycle determines that this requirement will not result in significant additional reductions.

Although there has been some growth in the number of jurisdictions with commercial on-site green waste pick-up programs since 2000, the continued presence of large quantities of organic material in the waste stream suggests that additional measures are necessary. Local jurisdictions are required to provide a plan for diverting organic waste and to provide updates on their progress through the Electronic Annual Report.

If all of the currently disposed organic material were instead recycled, the state's composting, chip and grind, and AD facilities would have to process an additional 12 million tons of organic material each year. As California moves toward greater organics processing, it is critical to consider whether the state has sufficient physical infrastructure to process this additional material. Most organics processing facilities run at levels close to capacity; at most, current facilities could support an additional roughly 1.5 million tons of material per year. Figure 21 shows the estimated available capacity of composting and AD facilities across the state. Not only is capacity limited, but most of the facilities with moderate levels of additional capacity (more than 60,000 tons per year) are not located near population centers.

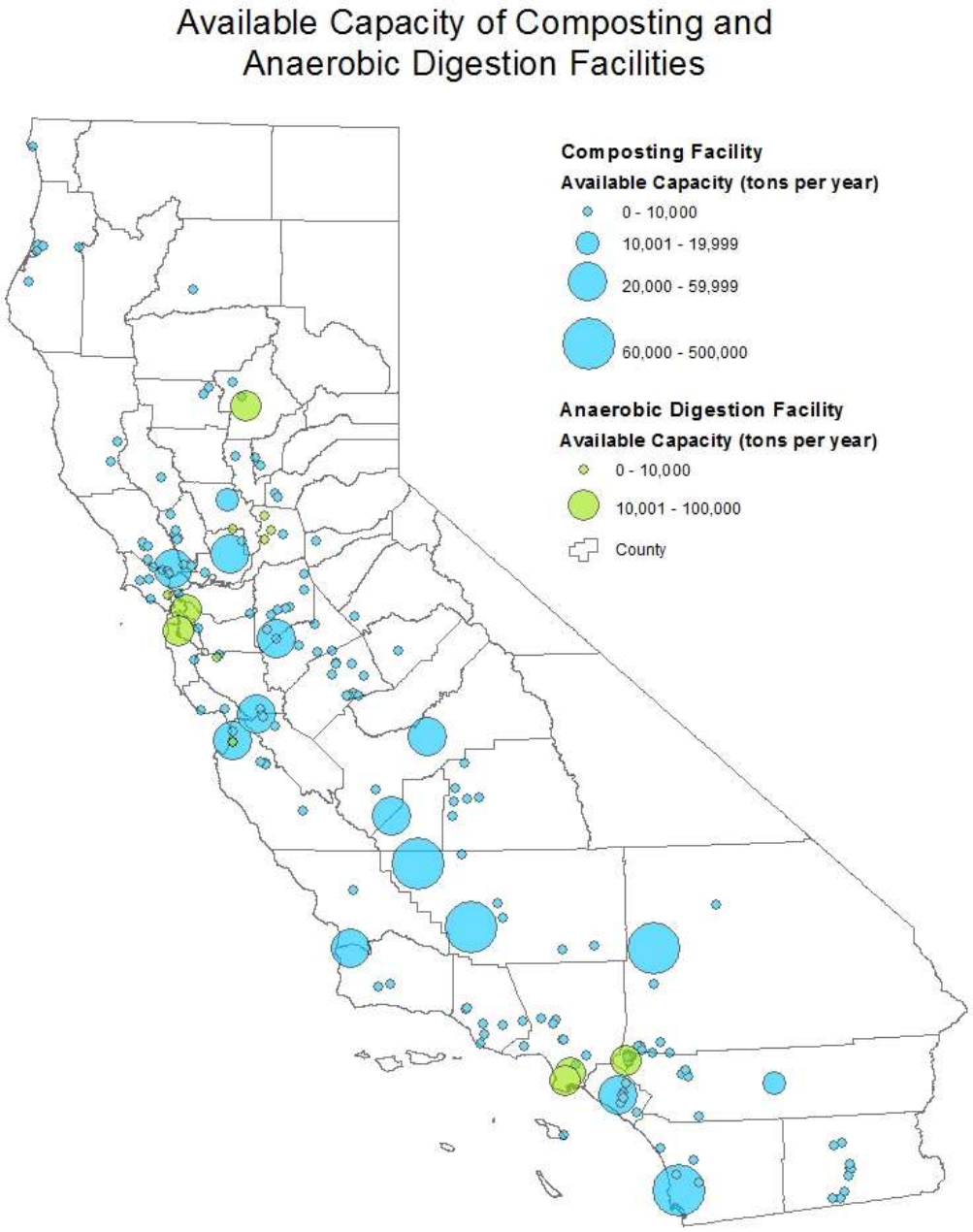

Figure 21. Additional capacity (tons per year) at composting and AD facilities. Data is from CalRecycle estimates of annual capacity and throughput.

Current Infrastructure Grants

One current funding source for expanding the available capacity for processing organic materials is CalRecycle's Organics Grant Program, which uses funds from the Greenhouse Gas Reduction Fund. The purpose of the grant is to lower overall GHG emissions by expanding existing capacity or establishing new facilities in California to reduce the amount of organic materials that are sent to landfills. In the first wave of grantees, which were announced in November 2014, five entities were selected for funding via a competitive scoring process from among 51 applicants requesting a total of $119 million:

- CR&R Incorporated (Perris, Calif.) will receive $3 million to expand its current AD facility, adding 229 tons of capacity per day (>80,000 tons annually).
- Colony Energy Partners, LLC (Tulare and Fresno, Calif.) will receive $2.9 million to build a high-solids anaerobic co-digestion facility with more than 110,000 tons of annual capacity. The Fresno Food Recovery Network will also be expanded to divert 65 tons of food per year from landfills and provide it to those in need.
- Mid Valley Disposal, Inc. (Kerman, Calif.) will receive $3 million for a new covered, aerated, static-pile composting operation with 42,100 tons of annual capacity.
- Recology East Bay Organics (Oakland and San Francisco, Calif.) will receive $3 million for processing equipment to extract organic material from mixed solid waste, which will then be sent to an AD facility. The project is expected to send 20,400 tons of material annually to the AD facility.
- Burrtec Waste Industries, Inc. (Victorville, Calif.) will receive $2.5 million to build a covered, aerated, static-pile composting operation and a mixed-waste processing facility with an annual capacity of 30,800 tons.

Although these five facilities are not sufficient to address California's anticipated gap in organic management infrastructure (the facilities only account for 1.5 percent of the needed capacity to handle approximately 12 million tons of currently disposed organics), they do provide an avenue for adding new facilities.

Resin, Glass, Metal, and Fiber

Resin (or plastic), glass, metal, and fiber (or paper) materials account for a large portion of the recycling infrastructure in California. In many areas, residential curbside services accept all four materials through mixed recycling, or "blue bin," programs that rely on users separating these recyclable materials from disposed items. Other communities collect recyclables alongside disposed items. Once the materials have been collected, the waste is sent to MRFs (if separated from disposed material) or MWPFs (if collected with municipal solid waste) for further processing and separation of recyclables. Material-specific manufacturing facilities in the recycling market can then purchase separated components in order to manufacture or sell new products or raw material. The number of jurisdictions with various types of recycling programs, including residential and commercial pick-up, scrap metal collection, and wood waste collection, has leveled off since 2000.

The collection of recyclables is strongly tied to the broader solid waste stream. As shown in Figure 22, many of the facilities that send material to recycling facilities are key components in

the disposal stream. Waste generators, haulers, transfer stations, and MRFs may all send material directly into recycling markets. In addition, transformation facilities and landfills may also send material for recycling. This flow chart, adapted from CalRecycle's website, is also reflective of the historic view of "recycling" being a simple end process, rather than a complex network itself.

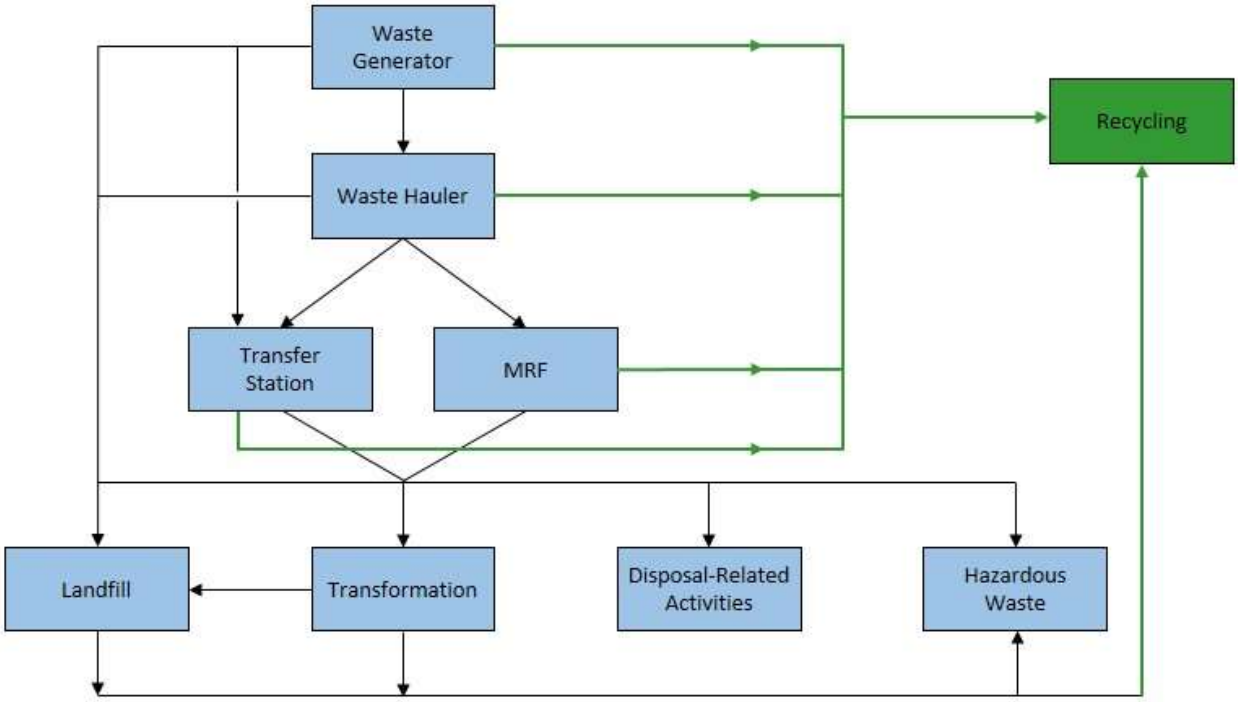

Figure 22. Solid waste system flow chart. Waste streams entering the recycling market are colored green. Image adapted from www.calrecycle.ca.gov/lgcentral/WasteStream/SWSFlwChart.htm.

The complex recycling process for a generic recyclable is shown in Figure 23. Processors may handle material originating from a number of sources, including raw material, in-plant scrap, new scrap, and old scrap. The movement of material within a processor and across other facilities creates additional complexity in tracking the total quantity of recycled material in the system. Once a material is processed, it generally proceeds to a fabricator or manufacturer. After a consumer introduces a product to the waste stream, recycling collection points will take the material for material consolidation and processing. In addition, commodities and final products also enter and leave California through import and export at various stages within the pathway.

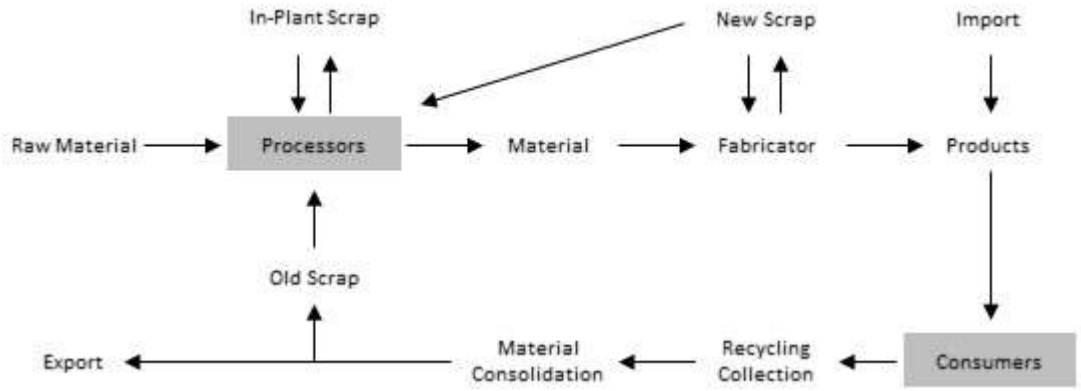

Figure 23. Flow of recyclable materials through processors, fabricators, and consumers. Figure based on the 2011 United States Geological Survey paper "Overview of Flow Studies for Recycling Metal Commodities in the United States."

It is clear that a substantial amount of resin, glass, metal, and fiber are still being disposed: The 2008 waste characterization study identified that these four materials accounted for almost a third of the disposed waste stream (more than 13 million tons). As California moves toward its 75 percent statewide recycling goal, programs to collect and efficiently process these materials will be important.

Quantifying the amount of plastic resin, glass, metal, and fiber materials that are collected and recycled in California is challenging. Many manufacturing facilities, such as glass benefaction operations or clean MRFs, do not require permits from CalRecycle. There is also no mandatory statewide reporting requirement for recycling, so data that has been collected by CalRecycle is incomplete. The data the Department does have suggests that the processing capacity in California is not sufficient to handle growth in the number of recyclables collected in the state.

Manufacturing Grants

In order to expand the manufacturing of recycled-content products in California and to lower overall GHG emissions, CalRecycle established a Recycled Fiber, Plastic, and Glass Grant Program in 2014 using money from the Greenhouse Gas Reduction Fund. The first three grantees were selected via a competitive scoring process from among 20 applicants requesting a total of $37 million:

- Command Packaging (Vernon, Calif.) will receive $3 million to upgrade its facility equipment to produce reusable plastic bags with higher recycled content, and to expand its capacity at Encore Recycle, which diverts plastics.
- Peninsula Plastics Recycling, Inc. (Turlock, Calif.) will receive $1 million for equipment to recover its current recycling process by-product and recycle it into landscaping material.
- Sonoco Products Company (City of Industry, Calif.) will receive $1 million for new equipment to recover and process more recycled fiber and increase production. In

February 2015, the grant was declined, and CalRecycle is in the process of identifying the next grantee.

Beverage Container Recycling Program

The California Beverage Container Recycling and Litter Reduction Act (AB 2020, Margolin, Chapter 1290, Statutes of 1986) established a system for financial incentives and convenient return systems to help ensure the efficient and large-scale recycling of beverage containers. In the intervening three decades, the program has been amended by more than 75 bills. These include changes to processing and handling fees, enforcement authority, and eligible beverage containers. The original goal of the Act was to achieve an 80 percent recycling rate for all aluminum, glass, plastic, and bimetal beverage containers sold in California, thereby reducing the beverage container component of litter in the state.

Since its authorization, the core mechanism for the Beverage Container Recycling Program (BCRP) has remained the same. Consumers pay a California Redemption Value (CRV) fee when they purchase beverages from a retailer. The CRV is refunded when a consumer, or a collection center, redeems the containers at a recycling facility. Most beverages packaged in aluminum, glass, plastic, and bimetal containers are eligible for CRV; notable exceptions are milk, wine, distilled spirits, and large 100 percent juice bottles. CRV is currently set at 5 cents for each beverage container that holds less than 24 ounces and 10 cents for each container that holds 24 ounces or more.

Beverage Container Collection Infrastructure

The flow of materials in the BCRP is shown in Figure 24. Containers under this program are first collected by recyclers, who refund CRV to consumers. In California, recycling collection programs fall into five categories: curbside programs (CS), drop-off and collection programs (CP), community service programs (SP), recycling centers (RC), and reverse vending machines (RVM, which are a subset of RCs). After collection, recycling collection programs transfer the containers to BCRP-certified processors. Certified processors reimburse the programs and consolidate the loose material into bales. This makes it less likely for the materials to go through the system more than once. Material handled by BCRP-certified processors is either exported or sold to in-state material processors, which convert the bales to intermediate materials. Those products are then sent to manufacturers or other end users in order to make new products.

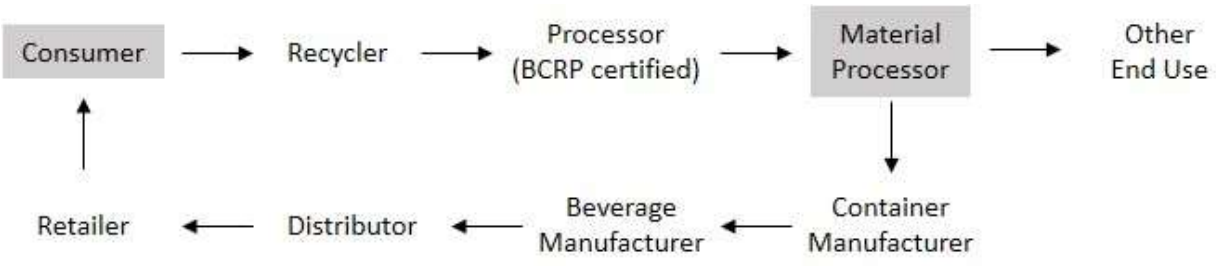

Figure 24. Flow of materials through the Beverage Container Recycling Program.

Under the Beverage Container Recycling Program, CalRecycle receives more than $1.1 billion in CRV payments from beverage distributors and pays out approximately $1 billion in CRV to certified processors; these facilities must be certified to receive payment. In addition, beverage manufacturers must register their products with CalRecycle in order to ensure that the labeling is

compliant with state law. As a result, CalRecycle has detailed, accurate information on certified recycling centers, drop-off and collection programs, community service programs, processors, and the CRV material handled by registered curbside programs. CalRecycle also requires reporting of specific information from registered beverage manufacturers and distributors.

As of January 2, 2015, there were 3,408 operational collection programs for beverage containers in California (see Table 8). The majority of collection programs by count are recycling centers, and RCs also collected almost 80 percent of all returned CRV containers statewide in 2013. Curbside programs collected 16 percent of returned CRV containers, and CPs and SPs account for the remaining 4 percent of collected CRV containers.

Table 8. Collection programs for beverage containers in California.

Facility Type	Active Facilities	Processed CRV (tons)	Percent of CRV Material Processed
BCRP Certified Processors	218		
Curbside Program (CS)	604	171,116	16.1%
Collection Program (CP)	220	39,351	3.7%
Community Service Program (SP)	155	3,122	0.3%
Recycling Centers (RC and RVM)	2,211	846,444	79.9%
Total	**3,408**	**1,060,033**	**100%**

Data reflects facility counts on January 2, 2015, and reported tons of CRV materials in 2013. Percent of CRV material processed reflects the percentage of CRV containers collected at each facility type.

Collecting and Counting Beverage Containers

Under the Beverage Container Recycling Program, CRV is collected based on the number of eligible containers sold, but the fee may be refunded by count or by weight. Consumers must be paid by count for up to 50 containers of each material type, unless requested otherwise, and RCs may choose to only reimburse by count; RVMs always refund consumers by count. When more than 50 containers of a material type are returned, the CRV is refunded based on the weight of the containers; this accounts for the majority of container redemption. In order to calculate the conversion rate between the weight of returned containers and their per-unit CRV for a given material type, CalRecycle performs biannual surveys of recycling collection programs.

In 2013, Californians returned 1.06 million tons of CRV containers. This translates into approximately 50 million beverage containers recycled each day, or 18.2 billion beverage containers for the year. CalRecycle calculates that the beverage container program has achieved an 85 percent recycling rate for all materials statewide in 2013.[7]

One metric for understanding the efficiency of the Beverage Container Recycling Program is the ratio of CRV containers to all containers received, which is directly related to the quality of the material collected. Ideally, this program would only accept CRV containers; however, many consumers return non-CRV recyclable containers alongside valid CRV containers. Statewide,

[7] As of January 1, 2014, recycling centers only pay CRV on segregated loads (loads that solely contain CRV containers). As a result, the recycling rate for fiscal year 2013-2014 decreased to 81.2 percent.

only 73.4 percent of all containers returned through the Beverage Container Recycling Program in 2013 were CRV by weight; this corresponds to more than 380,000 tons of material ineligible for redemption that may otherwise be recyclable. Although the CRV is only paid on eligible containers, non-CRV containers that are returned will also enter the recycling stream through these facilities as scrap material or donations.

The quality of containers collected is highly variable depending on the type of collection program. As shown in Figure 25, curbside programs accept the most non-CRV materials (only 38 percent of containers are CRV by weight), while reverse vending machines almost exclusively collect CRV containers (96 percent by weight). Calculated redemption rates take into account this variability in the amount of CRV containers in a returned load.

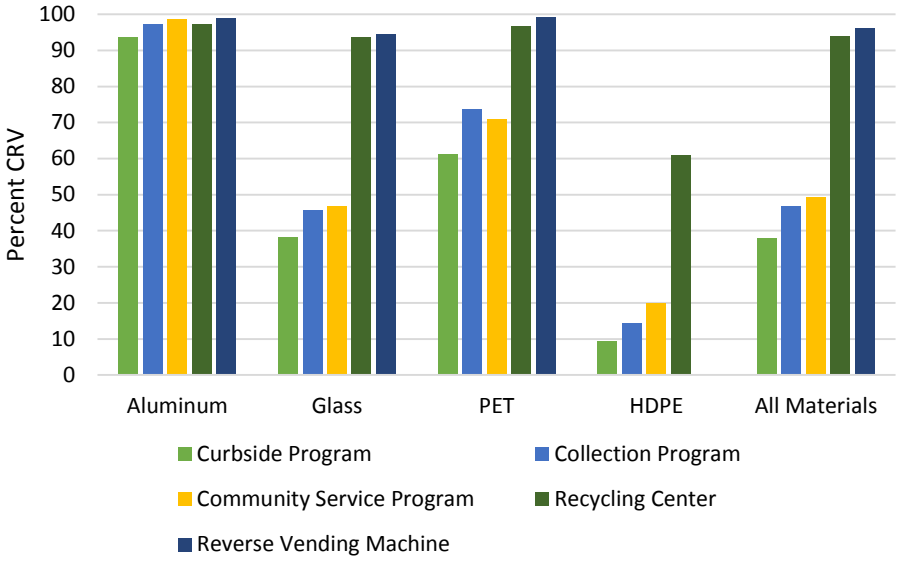

Figure 25. Percentage by weight of CRV containers redeemed at various collection programs as a function of returned containers, broken down by material type, in 2013.

In addition, different material types have a range of collection efficiencies. For example, almost all aluminum containers that are returned to certified collection programs and reported to CalRecycle are CRV, whereas most HDPE containers returned are not CRV. Data collected during the biannual rate determination survey allows for a detailed evaluation of what types of containers (both CRV and non-CRV) are returned under BCRP (see Figure 26).

Based on the 2013 rate determination study, almost all collected aluminum containers are CRV (less than 1 percent of all containers by weight are non-CRV pet food containers). PET plastic is primarily CRV (85 percent by weight), but large 100 percent juice containers and domestic food containers account for 12 percent of collected PET material. A majority of the glass returned is CRV, but 20 percent of glass received at collection programs comes from wine bottles. HDPE has the most variability in the type of containers that are received at collection programs. Less than 10 percent of HDPE received is CRV, whereas 62 percent of HDPE material by weight comes from milk jugs (which are not eligible for CRV). Laundry products, cleaning products, and domestic food containers also contribute to non-CRV HDPE containers that are returned.

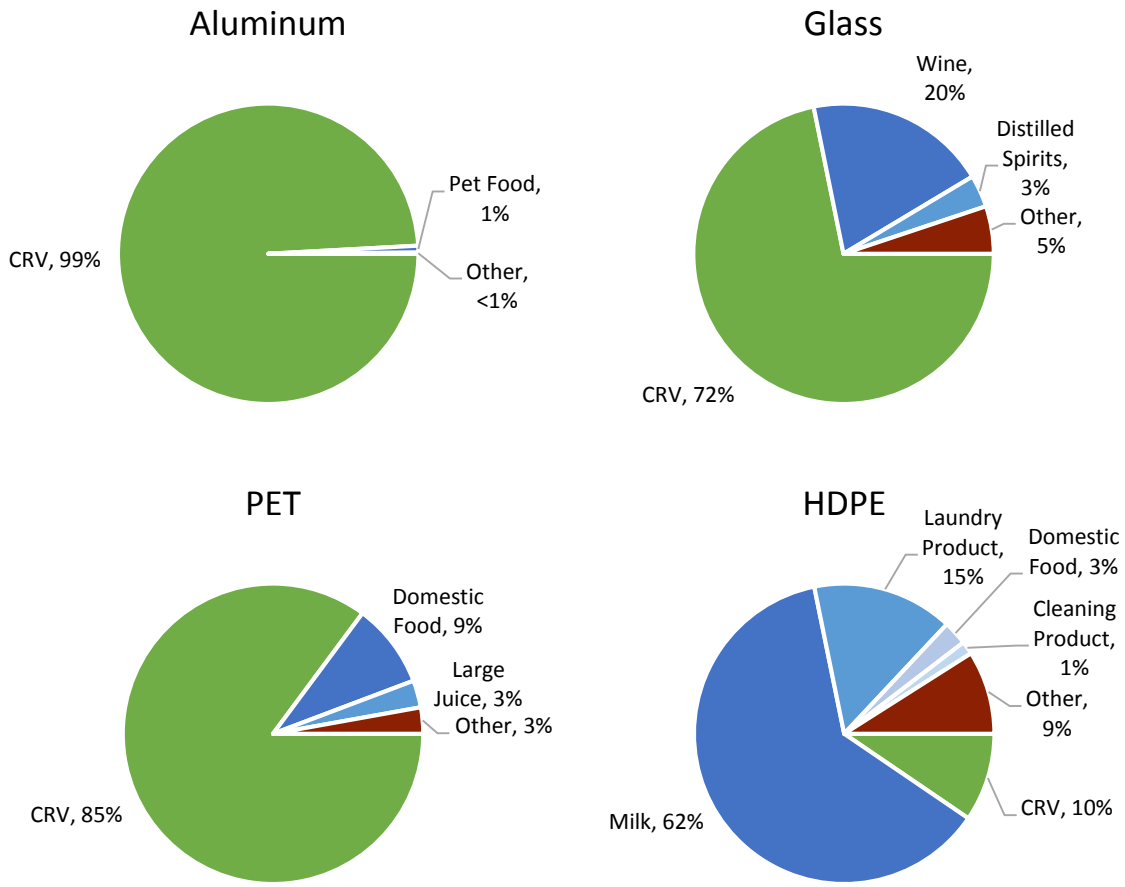

Figure 26. Types of containers returned, by weight, for aluminum, glass, PET, and HDPE. Data from 2013 rate determination survey aggregated over all collection program types.

This information is critical for understanding California's recycling habits. For example, based on the 2013 rate determination survey, more than 75 percent of all containers received at collection programs in the wine country are wine bottles, which are not in the program. As of January 1, 2014, recycling centers only pay consumers CRV on segregated loads (loads that solely contain CRV containers separated by material type), and the 2014 rate determination study found that more than 99 percent of the material collected at RCs was composed of qualified CRV containers. Non-CRV material is still accepted at other certified recycling facilities and can receive payments based on a commingled rate for CRV and non-CRV containers.[8] Loads with a high percentage of non-CRV containers will ultimately pay out more than has been paid into the program.

The substantial presence of milk and wine containers suggest that consumers may want to return these materials for CRV, or that consumers don't understand the difference between the Beverage

[8] Other types of recycling facilities may accept non-CRV containers for scrap or donation.

Container Recycling Program and broader recycling initiatives. Over the course of the program, CalRecycle has held discussions on whether to include or exclude milk, wine, and other commodities. It is important to note that non-CRV materials accepted by BCRP-certified facilities still count toward recycling under California's broader initiatives.

In-State Processing of Beverage Containers

As discussed earlier, once containers have been collected through the program, they are sold to processors for consolidation. The material is then exported or sent to in-state material processors and manufacturers. In order to promote in-state recycling markets, CalRecycle offers financial incentives to plastic reclaimers and manufacturers who handle CRV containers and to glass beneficiators who clean and color-sort the material. These incentive payments allow for a more detailed picture of how CRV plastic and glass is handled in the downstream recycling infrastructure (see Table 9).

Table 9. In-state processing of CRV plastic and glass in 2013.

Material	CRV Collected (Tons)	Material Processed or Manufactured in CA (Tons)	Percent Handled in CA with Processing Payments
Plastic	233,564	54,332	23.3%
Glass	683,051	152,247	22.3%*

Data reflects tons of material collected in 2013. Plastic handled reflects the tons of PET and HDPE that were processed and manufactured in California. Glass handled reflects the tons of glass from curbside programs, collection programs, and community service programs that is cleaned and color-sorted at glass beneficiators. * Percent of glass handled in California only reflects the amount of glass that receives incentive payments. The amount of glass handled in California is likely higher.

Almost a quarter of plastic and glass containers received through the Beverage Container Recycling Program are at least partially processed in California. Plastic containers that receive incentive payments must be processed and manufactured in California, and CRV containers account for more than 75 percent of the estimated capacity for plastics manufacturing in the state (see Table 3). This suggests that the incentive program has been successful at promoting the recycling infrastructure within California for CRV containers. However, since there is only limited additional processing capacity for plastics in California, this suggests that most CRV containers, as well as plastics in general, are exported for final handling.

The incentive program for glass is intended to increase the quality of glass for downstream applications. As a result, it is likely that substantially more glass is handled in California but does not receive the incentive payment. In addition, the estimated processing capacity in California for beneficiation is much higher than the total amount of glass collected in the Beverage Container Recycling Program (see Table 2), so there is sufficient infrastructure in place to handle glass processing and manufacturing in California.

Challenges for Collection

In recent years, the Beverage Container Recycling Program has experienced various challenges. First, some materials, such as HDPE, have a recycling rate greater than 100 percent. This may be the result of higher levels of returned non-CRV containers, such as milk jugs, or it could result from fraud, where containers sold outside the state are imported and redeemed, thereby collecting a CRV that was never paid. The Department and Legislature have proposed some reforms to limit

defrauding of the program, such as increasing enforcement authority and changing redemption practices, but it is unclear to what extent existing reforms will address this challenge.

In addition, audits conducted by CalRecycle, and later confirmed by the California State Auditor's office, identified structural deficits in the program's fund, suggesting that more dramatic efforts may be needed in order to sustain the Beverage Container Recycling Program.

Construction and Demolition

In CalRecycle's 2008 waste characterization study, typical materials from C&D (such as inerts, roofing, and gypsum) accounted for 9.1 percent of the total waste stream; lumber accounted for an additional 14.6 percent of the total waste stream. Many C&D materials can be reused or recycled; this type of mindful materials management is one component of a larger practice called sustainable or green building construction. C&D recycling is typically managed locally because the materials are heavy and expensive to ship.

Not all C&D facilities require a solid waste permit in order to operate. Thirty-seven C&D recycling facilities have voluntarily reported to the state through FacIT. However, this underrepresents the actual recycling that occurs. For example, concrete yards may reuse material on-site rather than ship it to an independent facility.

The throughput of C&D materials at recycling facilities is also difficult to track. Permitted facilities are not required to provide their actual throughput to CalRecycle, and the permits often cite the maximum possible throughput at the facility.

The number of jurisdictions with concrete, asphalt, and rubble collection programs peaked in 2000 with 427 jurisdictions; in 2012, there were only 404 jurisdictions reporting this type of collection program. This is likely due to smaller jurisdictions consolidating into regional agencies, each of which counts as a single jurisdiction.

Extended Producer Responsibility (Paint, Carpet, and Mattresses)

EPR programs aim to reduce the overall amount of waste generated throughout a product's lifetime by placing responsibility on the producer to manage the waste after the product is sold. California currently has statutory EPR programs for paint, carpet, and mattresses.

Paint

The California Paint Stewardship Law (AB 1343, Huffman, Chapter 420, Statutes of 2010) created an EPR program for paint to reduce its generation, promote its reuse, and properly manage unwanted leftover paint. Although paint is considered a hazardous waste, rather than a solid waste, its management under the EPR program provides an interesting example of how recycled waste is handled and tracked.

Within California, post-consumer paint is collected at household hazardous waste (HHW) facilities and at participating drop-off locations organized by PaintCare, the EPR stewardship organization. As of June 30, 2014, there were 673 permanent collection sites in California, and there is a site within 15 miles of 98 percent of the population. Not all jurisdictions participate in the PaintCare program; as a result, paint collected in these areas would likely go through a HHW facility or other collection outlets.

For the 2013-2014 fiscal year, 65.6 million gallons of paint were sold in California. PaintCare assumes that approximately 10 percent of purchased paint will be left over and has set a stewardship goal of recovering 7 percent of the total paint sold each year (7 percent recovery rate). In 2013-2014, 2.1 million gallons of paint (3 percent overall recovery, approximately 10,250 tons) were processed through PaintCare. Roughly half of this volume was collected at HHW facilities, and HHW facilities also collected an additional 1.2 million gallons of paint outside of the stewardship program.

Once the paint has been collected, it can be reused, recycled, turned into alternative products, processed for energy recovery, or landfilled; the fate of collected paint varies depending on a variety of factors, including its base composition, quality, and color. Of the 1.7 million gallons of latex paint collected, 4 percent was reused, 70 percent was recycled, 22 percent was turned into alternative products or beneficially reused (such as retaining wall blocks or ADC, respectively), and 4 percent was dry, unusable paint that was landfilled. In contrast, of the 0.4 million gallons of oil-based paint processed by PaintCare, 97 percent was managed by fuel blending or fuel incineration and 3 percent was reused. There are no requirements to process the paint in-state, although PaintCare reports that most latex paint is recycled in California and all of the paint collected is processed within the United States.

Currently, the program has sufficient processing capacity to achieve PaintCare's 7 percent recovery goal. The amount of paint collected is expected to increase over the next few years, but if source reduction efforts are effective in reducing the amount of excess paint sold, then less paint would be available for collection and PaintCare may need to modify its 7 percent recovery goal.

Carpet

According to the 2008 waste characterization study, discarded carpet accounted for approximately 3.2 percent of the waste by volume disposed of in California and was one of the 10 most prevalent waste materials identified in landfills. The Carpet Stewardship Program (AB 2398, Perez, Chapter 681, Statutes of 2010) was the first carpet EPR program established nationally and is run by Carpet America Recovery Effort (CARE). Currently, CARE has a goal of recycling 16 percent of post-consumer carpet by 2016, and 24 percent by 2020.

In 2013, CARE reported that of an estimated 181,800 tons of post-consumer carpet generated in California, 44,000 tons were collected by the stewardship program and 22,150 tons (12 percent) were recycled. While the recycling rate increased in the program's first year, it has remained essentially flat in the last two years. CARE's annual report only reflects data that is provided by approved collection facilities, so the numbers provided in the report may not accurately reflect all carpet management. In addition, the amount of generated carpet is based on the amount of new carpet sold and does not account for market shifts in flooring types.

In the annual report, CARE also sought to have a portion of exports count toward the recycling rate. According to the 2013 annual report, exported carpet accounts for only 1.2 percent of all discards. CARE estimates that an additional 4,000 to 6,000 tons of carpet were collected independently and shipped out of the country for handling. Due to several factors, including difficulty in verifying that exported carpet was recycled rather than disposed, transported, or managed in an environmentally safe manner, CalRecycle determined in 2014 that exported carpet would not count toward CARE's recycling rate.

In September 2014, CalRecycle found that CARE's annual report was out of compliance because it did not meet the minimum requirements described in regulation, and it was unclear if the program was making continuous and meaningful improvements. In January 2015, CalRecycle agreed to changes in CARE's stewardship plan, including increasing the incentive payment made to recyclers and increasing the fee paid by consumers when they purchase carpet, to bolster carpet recycling.

Additionally, the amount of post-consumer carpet generation calculated by CARE is an order of magnitude smaller than the amount of carpet in the disposal stream estimated in the 2008 waste characterization study. This suggests additional opportunities for evaluating the flow and management of carpet in California; this is an ongoing area of research that will be informed by the 2014 waste characterization study.

Mattresses

The California Used Mattress Recovery and Recycling Act (SB 254, Hancock and Correa, Chapter 388, Statutes of 2013) aims to reduce illegal dumping and increase recycling of mattresses through an industry-run statewide program. CalRecycle is currently finalizing regulations for this program, and the industry stewardship organization, the Mattress Recycling Council, is developing the take-back procedures.

Other Collected Materials

CalRecycle manages several recycling efforts involving specific materials. For some materials, such as sharps, other household hazardous waste, and used oil, information on their management is not used to calculate the statewide recycling rate because the materials cannot be disposed in a solid waste landfill. Others, such as waste tires, can be disposed after processing; thus, any recycling would count toward the 75 percent recycling goal.

Sharps

According to CalRecycle, 936 million needles are used by self-injectors in California each year, and 80 percent of self-injectors are diabetics. Unfortunately, 31 percent of all self-injectors throw needles in the trash. This creates a health hazard for waste management workers that may have an accidental needle stick. California law prohibits the disposal of home-generated sharps waste in the trash or recycling containers.

SB 486 (Simitian, Chapter 591, Statutes of 2009) requires pharmaceutical manufacturers that sell or distribute self-injected medications to create a plan that supports the safe collection and proper disposal of sharps. Sites that collect sharps are regulated by the California Department of Public Health (DPH). CalRecycle and DPH list between 600 and 750 locations that collect sharps, but neither department tracks the quantity of sharps collected. As a result, it is impossible to quantify the effectiveness of this program. Once collected, sharps are managed as medical waste and handled under federal hazardous waste laws.

Pharmaceuticals

In 2002, the U.S. Geological Survey found that 80 percent of 139 streams tested in 30 states had measurable concentrations of prescription and nonprescription drugs, steroids, and reproductive hormones. Follow-up reports have confirmed the presence of a variety of pharmaceutical agents in the water supply. In addition, numerous studies have shown that even low levels of drug

exposure to fish and other aquatic species can have negative effects, and it is possible that these levels may also negatively affect human health. Although contamination of waterways may occur from natural excretion or improper disposal, advocacy organizations have suggested that formal collection points for pharmaceutical waste would reduce environmental contamination.

In 2007, SB 966 (Simitian, Chapter 542, Statutes of 2007) required CalRecycle to develop guidelines for the collection and disposal of pharmaceutical drug waste. CalRecycle evaluated local efforts within the state on their management of pharmaceutical wastes and published a series of model guidelines. Currently, CalRecycle identifies 318 locations statewide that accept home-generated pharmaceutical waste, but the Department does not track the quantity of medication collected. As a result, it is impossible to quantify the effectiveness of this program. In addition, SB 966 sunsetted on January 1, 2013, so there is currently no statewide directive for the safe collection of pharmaceutical waste. Once collected, pharmaceutical waste is managed as medical waste and is handled under federal hazardous waste laws.

Used Oil

The Used Oil Recycling Program aims to avoid illegal disposal of used oil by establishing a statewide collection network. Currently, there are more than 2,700 certified used oil collection points in California, which robustly cover the collection of lubricating oil in the state. The amount of lubricating oil sold and collected in California is reported to CalRecycle in connection with the used oil fee.

In 2013, facilities in California collected approximately 81 million gallons of lubricating oil (approximately 303,000 tons), a 67 percent recycling rate. Figure 27 shows the changes in lubricating oil sold and recovered over the 20 years of the used oil program. The amount of recycled lubricating oil has remained relatively steady over the last 10 years. However, lubricating oil sales dipped dramatically in 2008, leading to a collection rate of more than 70 percent. The drop in oil sales was attributed to the recession, but the subsequent lack of a rebound can be attributed to a number of factors, including less frequent oil changes, slightly lower spending in general, and fewer miles driven.

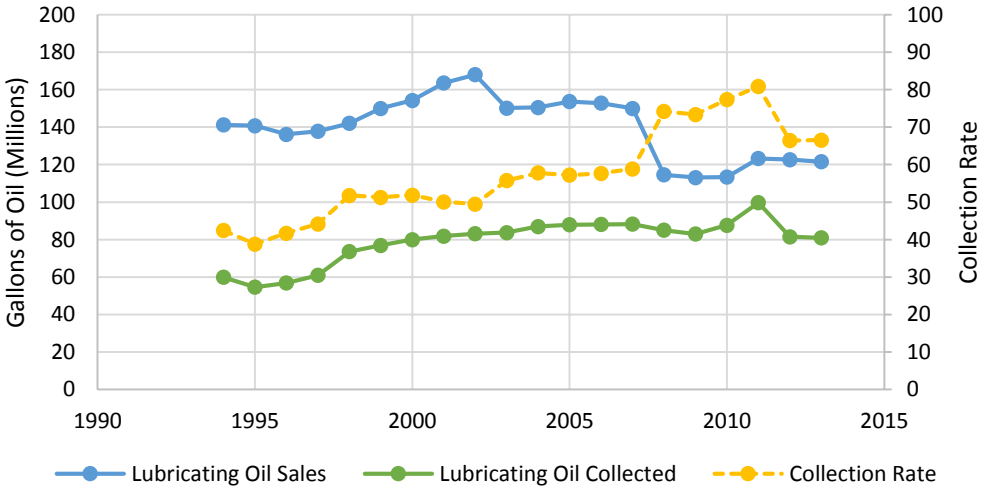

Figure 27. Sales, collection, and recycling rate for used lubricating oil.

The Used Oil Collection Program also collects industrial oil; overall, 100.2 million gallons of used oil were collected in 2013. Of that, roughly 20 million gallons of oil were exported; it is likely that most of this oil is used as fuel for other processes. The remaining oil is processed in state, where it may be re-refined into lubricating oil, converted into fuel stock, or incorporated into other products. Importantly, CalRecycle is not able to track how much of the collected oil is rerefined and recycled into new lubricating oil once it is sent out of state.

Covered Electronics

The Electronic Waste Recycling Act of 2003 (AB 20, Sher, Chapter 526) established a program in which fees paid by consumers at the time of purchase for covered electronic wastes are used to offset the cost of waste recovery, processing, and recycling activities. CalRecycle staff verify processing claims prior to repaying electronic waste processors, which helps to reduce fraud and accidental errors in reimbursements. Covered electronic devices include cathode ray tube devices; televisions and computer monitors containing cathode ray tubes (CRTs); televisions, computer monitors, laptop computers, and personal portable DVD players containing liquid crystal displays (LCDs); and plasma televisions. Through this program, CalRecycle works with the Department of Toxic Substances Control (DTSC) to ensure that the materials are handled appropriately.

The growing awareness of electronic waste as a problem is shown by the number of jurisdictions implementing general programs to address electronic waste since 2000 (see Figure 28). This is one of the few program types to have continuous growth in the number of jurisdictions with programs over the last 15 years. However, it is important to note that not all of these electronic waste programs collect the waste.

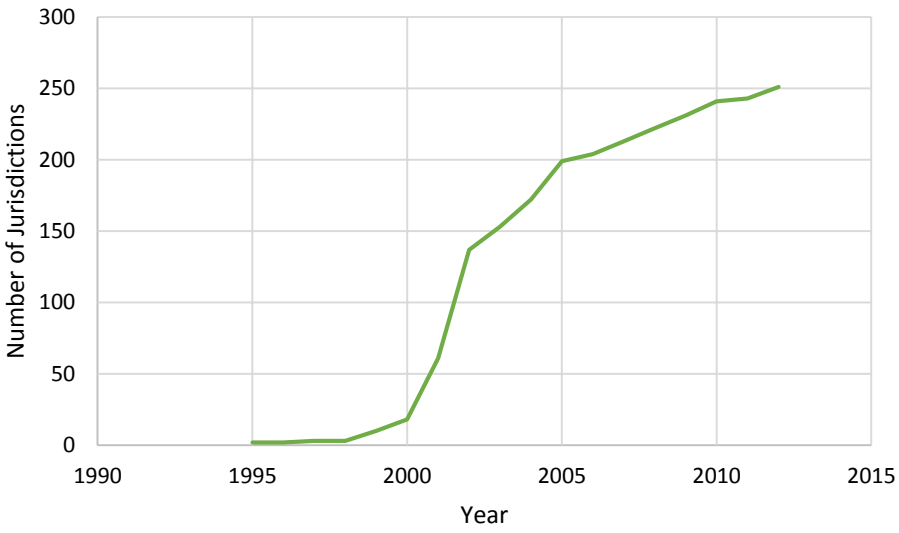

Figure 28. Jurisdiction-level general electronic waste programs. Number of jurisdictions implementing electronic waste programs to encourage diversion between 1995 and 2012. This includes collection programs as well as broader initiatives. Data from DPS, as reported in the EARs.

As of December 2014, there were 500 approved collectors and 36 approved recyclers in California. Between 2007 and 2013, recyclers collected on average 200 million pounds of

covered electronics annually, or 1.7 billion pounds since the start of the program in 2005. By weight, approximately 98 percent of the collected devices by weight contain CRTs. However, modern LCD devices that become waste are a growing fraction of recovered material that presents both material market and regulatory challenges.

The majority of material collected through the covered electronic waste program is shipped out of the state or out of the country; this includes CRTs and CRT glass, as well as plastics, metals, and other materials. CalRecycle works with DTSC to track the destination of shipments of CRTs and CRT glass. In 2013, almost 83 percent of the 53,000 tons of generated CRTs and CRT glass were sent, directly and indirectly, to Videocon in India for final processing; however, questions have been raised by various organizations as to whether Videocon has sufficient capacity or infrastructure to accommodate the CRTs it receives. The remaining 17 percent of collected CRTs were sent to facilities in Arizona and Missouri, but the two Arizona facilities have since been abandoned or cited by the Arizona Department of Environmental Quality for speculative accumulation.

Tires

Under the Tire Recycling Act of 1989 (AB 1843, W. Brown, Chapter 974), California has worked to divert tires from landfills; CalRecycle has a goal of reaching 90 percent diversion of tires by 2015. In 2013, an estimated 42 million passenger tire equivalents (PTEs) were managed and tracked in California. Tires can be recycled to produce crumb rubber for products, rubberized asphalt concrete, and tire-derived aggregate and related civil-engineering applications, or they can be combusted as fuel (e.g., cement kilns, cement manufacturing plants, or EMSW). Unlike other recycling programs in California, almost all of the end-use destinations for tires are tracked, permitted, and quantified. The "California Uniform Waste and Used Tire Manifest" provides monitoring information to CalRecycle on tire loads and movement within the state. The waste tire manifest system ensures that almost all waste tires generated and transported in California have been accounted for and are delivered to permitted end-use facilities. However, there are some gaps in the collected data, as some facilities provide inconsistent responses or have failed to respond to surveys, and some flows are not manifested.

CalRecycle also conducts an annual market survey to determine the distribution of tire end-use activities, which has had minor variations since 2011 (see Figure 29). The total diversion rate has hovered near the targeted 90 percent over the last three years, when diversion is calculated based on all non-landfill disposal activities. However, ADC and tire-derived fuel do not count as recycling under the statewide 75 percent recycling goal. In addition, the management of exported waste tires can be variable, as described earlier. In 2013, 29 percent of all collected tires were exported. When tire management through ADC, tire-derived fuel, and export are instead counted as disposal-related activities, the California tire recycling rate would be closer to 40 percent.

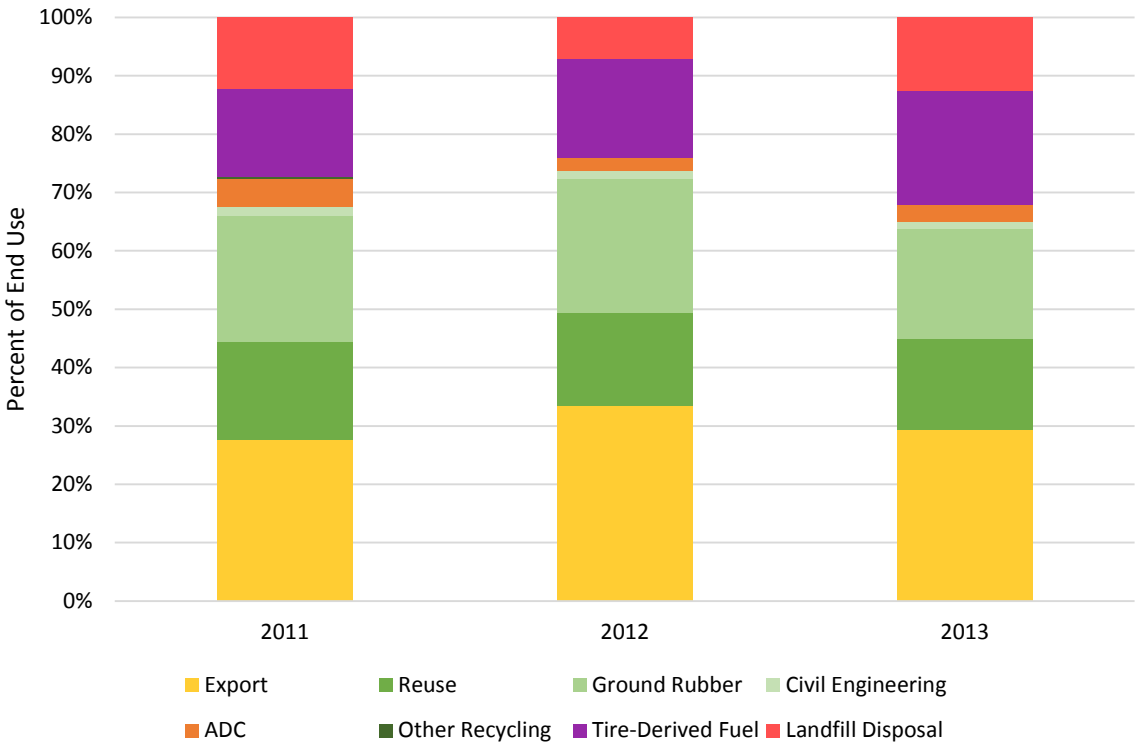

Figure 29. Estimated end-use of California-generated waste tires. Data from "California Waste Tire Market Report: 2013."

Disposal-Related Activities

Several types of material flows that are labeled as disposal-related activities under the 75 percent recycling goal count toward diversion under AB 939. These include ADC, AIC, beneficial reuse at landfills, transformation, and waste tire-derived fuel. All five of these processes were determined to not be recycling under the intent of the law.

ADC, AIC, beneficial reuse at landfills, and transformation are all tracked at the county level through the Disposal Reporting System (see "State of Disposal in California" report for more detail). As a result, CalRecycle has fairly detailed information on the quantity of materials handled under these four processes. Waste tire-derived fuels are tracked as described above. Table 10 highlights the amount of material managed by these activities in 2013.

Table 10. Material managed through disposal-related activities in 2013.

Activity	Tons
ADC	3,308,011
AIC	273,386
Beneficial Reuse at Landfills	2,292,608
Transformation	855,943
Waste Tire-Derived Fuels	82,000

Overall Evaluation of California Statewide Data

Overall, CalRecycle only tracks a small portion of 37.2 million tons of recycling calculated under AB 341. Figure 30 shows the distribution of total estimated recycling relative to programs with tracking or reporting requirements. The Beverage Container Recycling Program accepted more than 1 million tons of recyclable material in 2013, which accounts for 2.8 percent of the recycling stream. EPR programs, which have a strong reporting requirement, only collected 32,401 tons of material. In addition, used paint is a hazardous waste, so paint collected under the EPR program does not count as solid waste recycling. As a result, from the EPR programs, only the 22,150 tons from the carpet program add to the amount of recycled solid waste, or 0.06 percent of the recycling stream. The 273,000 tons of waste tires that were exported, reused, ground for rubber, or applied in civil engineering programs account for 0.7 percent of the recycling stream. *CalRecycle does not have firm tracking data for an estimated 35.8 million tons of recyclable materials, or 96.4 percent of all estimated recyclables.*

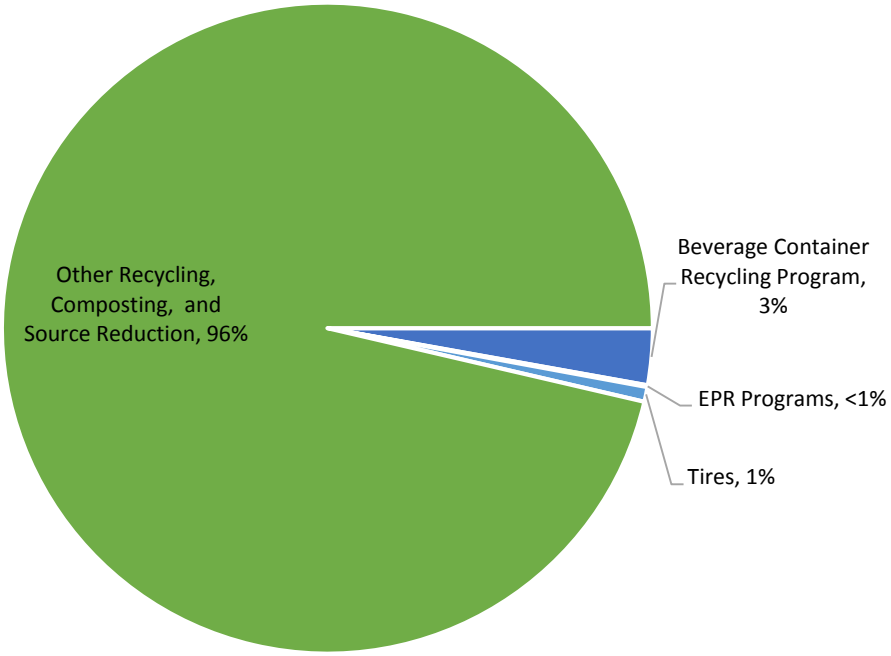

Figure 30. Tracked recycling in 2013, as a percentage of the estimated recycling waste stream. Programs shown in blue (beverage container recycling, EPR, and tire programs) are tracked, whereas the remaining recyclables collected in California, shown in green, are not. Data based on 37.2 million tons of recycling projected under AB 341.

As described above, CalRecycle manages a number of programs for the collection and disposal of sharps, medications, covered electronic waste, and used oil. Of these, only covered electronic waste, used oil, and general household hazardous waste are tracked. In 2013, roughly 500,000 tons of material was collected in these categories, which is only a fraction of the total recycling

infrastructure. In addition, as all of these items are household hazardous or medical waste, none of the materials collected under these specialty programs are counted toward the state's overall solid waste recycling program.

Similar deficits exist in directly tracking diversion under AB 939. Although ADC, AIC, beneficial reuse, transformation, and waste tire-derived fuels are all tracked, as described above, they accounted for only 12 percent of the estimated statewide diversion in 2013. This means that, under the AB 939 base year estimates for diversion, 48.9 million tons of divertible materials are not tracked by CalRecycle.

Although CalRecycle does not track the majority of recycled materials in the state, it is possible to roughly assign what materials are being recycled by using estimates of facility throughput from FacIT and internal estimates of composting throughput. One challenge of attempting to assign materials in the recycling market is that one material may be processed by multiple facilities or be handled many ways. As discussed earlier, the movement of materials among facilities can be complex. Without any required tracking, it is nearly impossible to avoid double- or triple-counting material.

Figure 31 shows CalRecycle's best estimate for what materials were recycled in 2013, based on an estimated 37.2 million tons of recycled items. It is important to note that this is strictly a rough estimate and *does not reflect the actual distribution of materials in the recycling stream*.

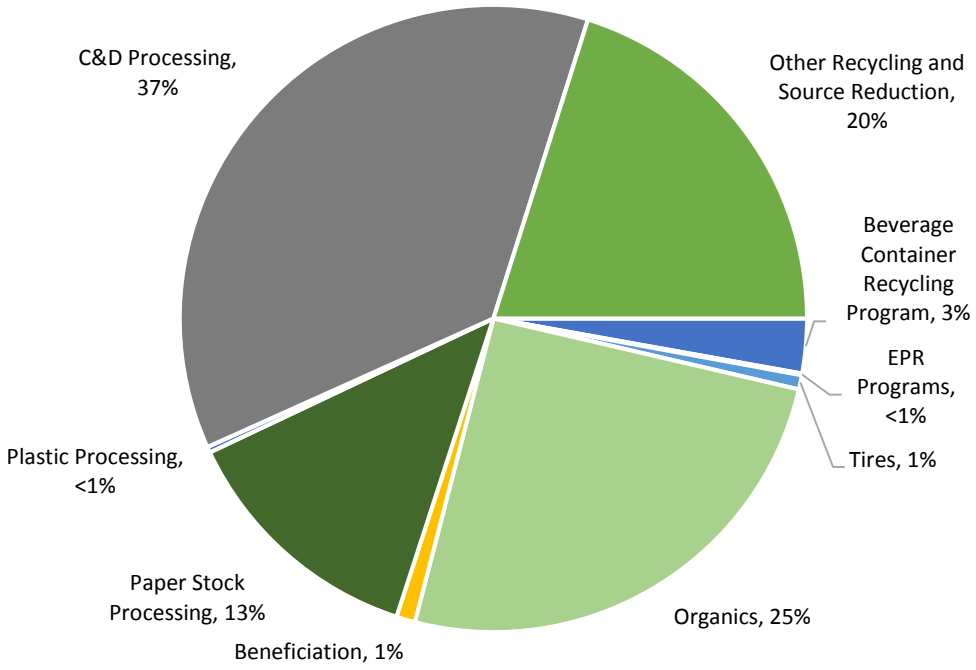

Figure 31. Estimates of materials in recycling stream. Data based on 37.2 million tons of recycling under AB 341 for 2013. See text for a description of how the portions of the chart are determined.

As described above, the Beverage Container Recycling, carpet EPR, and waste tires programs are the only tracked components in the solid waste recycling arena; these accounted for 1.4 million tons of material in 2013. Covered electronic waste and used oil are tracked, but they do not count as solid waste, so are excluded from this analysis. The organics portion of recycled materials is calculated based on the estimated tons of material processed at composting, chipping and grinding, and AD facilities, as detailed in the organics section above. Assuming that organic materials only pass through one of these facilities, this accounted for an estimated 9.4 million tons in 2013, or 25 percent of the material in the recycling stream.[9]

Resin, glass, metal, and fiber are more difficult to quantify, because they each pass through multiple facilities during their collection and processing. Based on FacIT estimates, 15.3 million tons of material were processed by MRFs in 2013, and it is likely that a large portion of those items were resin, glass, metal, and fiber. However, depending on the type of MRF, anywhere from 6 to 81 percent of the material processed ends up as residual that is sent to a landfill. As a result, it is more appropriate to focus on the quantity of materials arriving at glass, paper, and resin processing facilities.[10] After accounting for bottles collected through the Beverage Container Recycling Program to avoid double-counting, glass, paper, and resin processors handled an estimated 5.3 million tons of materials based on annual throughput at facilities listed in FacIT.[11]

Recycled construction and demolition waste is also very difficult to quantify. FacIT lists the processing throughput for C&D facilities as 24.6 million tons annually. If all of this material were being recycled, this would account for two-thirds of California's estimated recycling.[12] In order to adjust the C&D processing volume, the assumption was made that all C&D materials are processed prior to being sent to landfills, used in disposal-related practices, or recycled. By accounting for disposed and disposal-related C&D use,[13] it is estimated that 13.6 million tons of C&D were recycled in 2013.

The remaining material in the estimated 2013 recycling stream accounts for all other recyclables and source reduction, and is calculated based on subtraction from the projected 37.2 million tons of statewide recycling in 2013. Since this analysis uses a subtractive method from an estimated

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[9] This is likely an overestimate, as chip and grind facilities may also feed to composting, which would lead to double-counting, or to ADC, which does not count toward recycling under AB 341. In addition, any material that is sent to biomass facilities does not count toward recycling under AB 341 but may be reflected in this analysis.

[10] Scrap metal facilities are excluded from this analysis because statute excludes these facilities from the base generation calculation.

[11] This value does not reflect glass, paper, or resin that is exported before it reaches processors.

[12] Assuming that organics management accounts for 25 percent and the tracked programs account for 4 percent, this estimate would only allow for 1.9 million tons of fiber, resin, glass, and metal in the recycling stream – a likely under-assessment.

[13] A calculated 9.7 million tons of inerts/other and carpet were disposed in 2013, based on the 2008 waste characterization study. Reporting through DRS details that 0.57 million tons of C&D waste was used for ADC, 0.02 million tons for AIC, and 0.65 million tons for beneficial reuse.

generation quantity, it is possible that California recycled more (or less) than the projected 37.2 million tons. Without direct tracking of recycling, it is impossible to firmly state how much of what materials are recycled.

How Does California's Recycling System Compare with Other States and Countries?

In 2014, the Columbia University Earth Engineering Center released its report "Generation and Disposition of Municipal Solid Waste (MSW) in the United States – A National Survey." This report builds on the biannual "State of Garbage in America" survey performed in 2002-2010. The Columbia University report compiled waste management data collected in 2013 to explore national trends. Overall, the survey showed that the United States generated 389 million tons[14] of municipal solid waste: 29 percent was recycled or composted, 7.6 percent was sent to waste-to-energy facilities, and 63.5 percent was landfilled. In comparison, California generated 66.3 million tons of waste and recycled 41.8 percent, composted 11.5 percent, combusted 1.3 percent, and landfilled 45.3 percent.[15] Based on this data, California generates 17.0 percent of all waste nationally; however, California only accounts for 12 percent of the national population and the gross domestic product.

Although California compares favorably with other states in terms of its recycling and composting rate, it is important to consider how other states manage their recycling efforts. By evaluating how California's recycling infrastructure compares to other states, new opportunities may appear for accessing and tracking California's 75 percent recycling goal.

The U.S. EPA is launching an effort to aggregate recycling and disposal information across all 50 states through its Sustainable Materials Management tool with the goal of creating a national data clearinghouse that allows for comparisons across states and regions. Over the last year, CalRecycle has collected some of this information in-house and participated in this effort by submitting its first report to the U.S. EPA in January 2015.

Tracking and Reporting Recyclables

California directly tracks several material streams beyond their initial collection, including some glass and plastic through the Beverage Container Recycling Program, waste tires and oil, and covered electronics. However, as described previously, this is only a small portion of the total recycling performed within California.

To determine whether California had similar levels of tracking to other states, CalRecycle staff evaluated which other states had reporting programs described on their websites. Based on that information, staff determined that many states track commonly recycled materials that California

[14] The U.S. EPA projection of generated MSW was only 251 million tons in 2012. This value is generated using "a materials flow methodology that relies on a mass balance approach. […] Using data gathered from industry associations, business, and government sources, such as the U.S. Department of Commerce and the U.S. Census Bureau, we estimate tons of materials and products generated, recycled, and discarded." This differs from the methodology used in the Columbia University study, which sums estimates of waste generation and disposal from the states.

[15] The discrepancy in numbers between this paragraph and other sections of the report is due to a difference in definitions. The Columbia University study uses U.S. EPA definitions of MSW and recycling, which excludes C&D and other materials that are included in California's definitions.

does not. For example, at least 30 states track office paper and steel recycling; California does not track either of these materials. At least 24 other states track yard waste; California does not. Other materials are tracked by very few states. For example, CalRecycle staff found only six states that tracked mixed recyclables. However, it is difficult to determine how comprehensive this tracking is.

The Columbia University study also identified that California could provide only limited information on the commodities recycled in the state. According to the study, 22 states "provided relatively accurate and comprehensive recycling data." This included larger states, such as Florida and New York, as well as smaller states, such as Delaware and North Dakota. Other Western states, including Washington, Oregon, and Nevada, were also able to provide comprehensive recycling data.

California currently only requires reporting of recycling through its Beverage Container Recycling Program and at disposal facilities. At least 33 states track recycling at broader recycling collection points (see Figure 32) in addition to materials tracked through beverage redemption programs (11 other states) and disposal facilities (22 other states). By tracking recycling at broader collection points, other states have more flexibility in the kinds of data they can collect on the flow of recyclable materials. At least 18 of the 22 states identified in the Columbia study as providing extensive recycling data track recycling beyond beverage redemption and disposal facilities. This suggests that California has room to grow in understanding how the recycling infrastructure operates for individual recyclables.

Figure 32. Facility types where recycling is tracked nationally. Map showing states with recycling tracking programs through beverage redemption and collection programs (red star), disposal facilities (green dot), and broader recycling collection (blue fill). Data based on an analysis of state websites. Blank states indicate that CalRecycle staff could not find any information on whether information on recycling is collected.

Funding Mechanisms

The majority of California's waste and recycling efforts are funded through a fee on landfilled materials and specialty items. The 2014 Columbia University study evaluated the average tipping fee collected at individual landfills for each state, as well as the percentage of MSW that was landfilled. As shown in Figure 33, there is a correlation between the tipping fee and the amount of material landfilled. Higher tipping fees may serve as a disincentive to landfilling. However, other state policies, such as recycling goals and mandates, also contribute to the amount of landfilled waste in each state. California has a lower percentage landfilled than would be expected, given the average tipping fee at landfills: The average tipping fee nationally is $2 less than California's, yet the percent of waste landfilled nationally is 63.5 percent, as opposed to 45.3 percent in California.

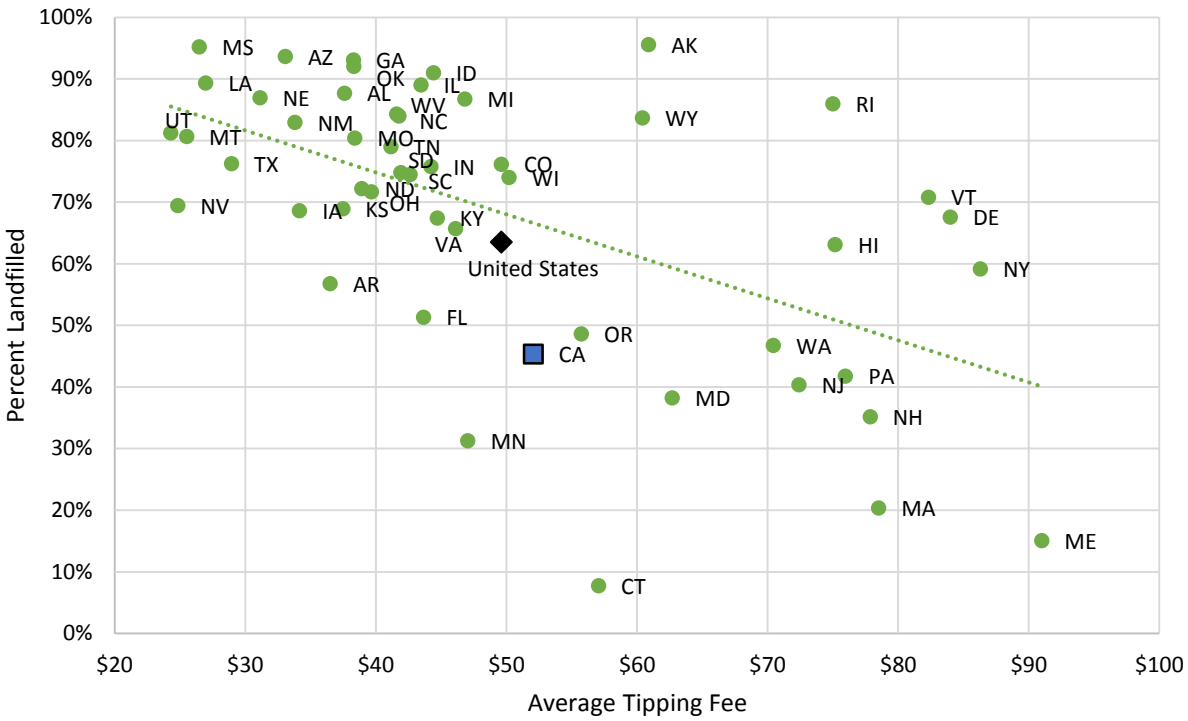

Figure 33. Relation between average landfill tipping fee and percent landfilled, by state. California is shown in blue. The correlation between tipping fee and percent landfill is mild ($R^2 = 0.32$). Data from 2014 Columbia University study.

In addition, other states use fees on specific items, such as tires or beverage containers, to fund larger portions of their waste management programs. In contrast, the California tire and beverage container fees go back into those programs and cannot be used to fund CalRecycle's overall operations.

Comparison to European Union

The European Union (EU) has ambitious recycling and solid waste reduction policies and collects a large quantity of data on the waste management of its member states. Data for this section is aggregated from the Environment Directorate General of the European Commission and Eurostat, the statistical office of the European Union.

Solid waste treatment options in the EU include landfilling, recycling, composting, and incineration for disposal and energy recovery. The EU also exports waste, including recyclables, to Asia. The increase in waste exports comes as rapid economic growth in Asia has created demand for raw materials and offers lower environmental and financial costs for waste management. EU waste management policies have forced member states to find new approaches for treating and diverting waste, and moving waste across borders allows access to recycling and disposal opportunities that are unavailable or more expensive in the source country.

In 2010, the EU produced approximately 2.76 billion tons of waste across all sectors (including construction and demolition, and mining and quarrying). Almost half of this waste (45 percent)

was disposed of at solid waste facilities, while the remainder was recycled (36 percent), incinerated (6 percent), or otherwise recovered (13 percent). Based on EU estimates, 661 million tons of the waste that was landfilled and incinerated could have been reused or recycled.

The EU municipal waste sector, which primarily consists of waste generated by households but may also include small businesses and public institutions, generated approximately 271 million tons of waste in 2012, or 2.9 pounds per person per day. This is substantially less than the projected generation of waste per person per day in California (10.7 pounds); this disparity is likely due to differences in waste management policies and the exclusion of various industries from the EU's definition of municipal waste, including C&D waste. Since the EU began tracking the fate of its generated waste in 1995, there has been a steady decrease in the percentage of waste that is landfilled and a steady increase in composting, recycling, and incineration (see Figure 34). In 1995, 67 percent of waste was landfilled, 7 percent was composted, and 12 percent was recycled; in 2012, only 33 percent was landfilled, while 15 percent was composted and 28 percent was recycled. During this same period, incineration of waste has increased substantially (15 percent to 24 percent), which is consistent with the EU's emphasis on incineration as a waste management strategy.

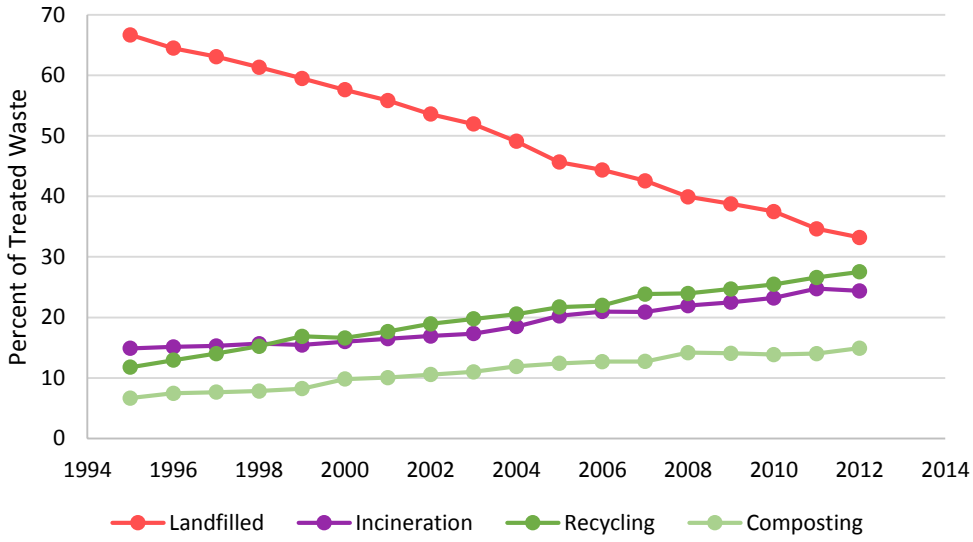

Figure 34. Fate of municipal waste in the European Union between 1995 and 2012. Data from Eurostat "Municipal waste generation and treatment, by type of treatment method."

The European Union has several key pieces of legislation for waste policy. The Waste Framework Directive establishes a legal framework for the treatment of waste and sets targets for member states to achieve 50 percent recycling of municipal waste and 70 percent recycling of construction waste by 2020. Additionally, the landfill directive mandates member states to reduce the amount of organic waste sent to landfills to 35 percent of 1995 levels by 2016. In July 2014 the EU adopted a legislative proposal that set waste management targets, including increasing recycling and re-use of municipal waste to 70 percent by 2030; increasing recycling and re-use of packaging waste to 80 percent by 2030; reducing food waste by 30 percent by 2025; and phasing out landfilling of recyclable materials by 2025.

The EU's Waste Statistics Regulation established a framework to produce statistics on waste generation, recovery, and disposal. Member states are required to report on the achievement of various targets for waste collection, reuse, recycling, and recovery either annually or bi-annually to Eurostat. Data on the amount of waste generated, disposed, and recycled is housed in public databases. The EU also tracks data on single waste streams and sets waste management targets for individual streams through waste management legislation and directives. Single streams that are tracked include batteries, end-of-life vehicles, biodegradable waste, electrical and electronic equipment waste, construction and demolition waste, mining waste, polychlorinated biphenyls and polychlorinated triphenyls, persistent organic pollutants, polyvinyl chloride, sewage sludge, ships, titanium dioxide, waste oil, and packaging. Member states are required to prepare implementation reports to the European Commission to report on how waste legislation is being implemented in each country.

The EU has much more extensive data on solid waste treatment and recycling than California does, since the EU requires member states to track and report the treatment of waste, including recycling. However, it is difficult to compare the waste management data of a single state to a conglomeration of 28 countries. In 2013 California source reduced, recycled, and composted 50 percent, or 37.2 million tons, of an estimated 74 million tons of waste generated, while the European Union recycled 36 percent, or approximately 1 billion tons, of 2.76 billion tons of its total waste. Both California and the European Union have set lofty goals to reduce waste and increase recycling and have innovative policies in place to try to meet those target goals.

Conclusions

California has redefined what counts toward recycling under AB 341's 75 percent statewide recycling goal (as compared to what counts toward the diversion mandate for jurisdictions). This narrower definition removes several well-tracked waste streams that count toward local diversion, including alternative daily cover, beneficial reuse, and waste tire-derived fuel. As a result, less than 4 percent of the 2013 estimated recycling stream was tracked by the state. California collects detailed information on containers returned through the Beverage Container Recycling Program, waste tires, and carpet EPR; however, California cannot specify how much of the recycling stream is composed of paper, plastic, metal, or glass. Many of the other material-specific recycling efforts managed in part or in whole by CalRecycle track small quantities of hazardous waste that does not count toward AB 341's recycling goal (for example, covered electronic waste, used oil, and paint).

In addition to the lack of material-specific tracking, California does not require reporting from recycling facilities. In contrast, more than 30 other states track recycling at a broader array of facilities, and at least 20 states can provide a more precise accounting of the types of materials that are also recycled in California. In California, estimates for facility throughput and capacity are based on permitting records and often do not reflect the actual recycling processing levels. CalRecycle solicits additional information on facility capacity, but this information is voluntarily reported and is of variable quality. For example, voluntarily provided data on the annual throughput of chipping and grinding facilities is double the amount estimated in a contracted report. This high variability between projected throughput and actual processing levels makes it difficult to evaluate how well the current infrastructure will support additional recycling and composting needed to reach the 2020 goal. Finally, not all recycling facilities are permitted by the state, and unpermitted facilities are very difficult for the state to track.

Despite these limitations, California has made significant strides in recycling over the last 25 years. Jurisdiction-level efforts have led to the adoption of thousands of local recycling and diversion programs. Statewide initiatives have increased the number of life cycle-based approaches for material managements, including extended producer responsibility programs for paint, carpet, and mattresses. Sweeping measures, including mandatory commercial recycling and mandatory organics management, are poised to have a strong positive impact on the amount and variety of recycled materials. Although California may not track its recycling as well as other states, the overall estimated recycling, diversion, and disposal rates compare favorably at the national level.

California will achieve its 75 percent recycling goal when statewide disposal reaches 2.7 pounds per person per day. California's landfills are tracked with relatively high efficiency (see "State of Disposal in California" for additional information), and this metric can be easily determined from that data. However, in order to understand whether the 2.7 pounds per person per day target accurately reflects 75 percent recycling from the amount of waste generated in given year, it is critical to have a more nuanced view of the overall recycling infrastructure.

Without additional, better data, it will be difficult, or impossible, to verify whether any reduction in disposal is due to additional recycling and composting. It will also be difficult to independently confirm whether the state actually meets its mandatory commercial recycling goals, mandatory organics recycling goals, or AB 32 goals.

Other Questions

Data-Based Questions

What are the impacts of mandatory commercial recycling on what waste is sent to landfills or recycled?

What are the impacts of mandatory commercial organics recycling on what waste is sent to landfills or composted?

How many recyclables are imported to California, and how many of those are immediately exported at the ports?

How many MRFs are in California, and how much of what materials do they process?

How much material do chip and grind facilities process annually? Where does that material go?

How much carpet is thrown away in California? Why is there a discrepancy between the 2008 waste characterization study and CARE's estimate?

Broader Policy Questions

What facilities would need to report to CalRecycle in order to provide a reasonable reflection of the recycling infrastructure?

What additions or changes to the current system for managing organics would be necessary in order to accommodate increased composting?

Is there an alternative method to determine statewide waste generation that more accurately reflects the amount of material consumed in the state?

What policies and systems are in place in other states that facilitate tracking of recycling at a broader array of facilities and for a wider range of materials than in California? Could they be applied in California?

Is the current model that allows exported recyclables to be counted as recycling the best reflection of either the recycling potential or the overall environmental impact of recycling those commodities?

What changes may be needed to provide sufficient funding for California's recycling efforts?

What fees, mechanisms, and systems are in place in other states that facilitate funding of recycling programs? Could they be applied in California?

What level and composition of infrastructure will be needed to reach 75 percent statewide recycling? What can CalRecycle do to promote this growth? How much should CalRecycle be involved in guiding, incentivizing, influencing, and regulating this development?

What do others states do to promote and support recycled-content manufacturing? Could this be applied in California beyond the current rigid plastic packaging container, newsprint, and trash bag programs?

Abbreviations and Acronyms

AB – Assembly Bill

AD – Anaerobic Digestion

ADC – Alternative Daily Cover

AIC – Alternative Intermediate Cover

ARB – California Air Resources Board

BCRP – Beverage Container Recycling Program

C&D – Construction and Demolition

CalRecycle – California Department of Resources Recycling and Recovery

CARE – Carpet America Recovery Effort

CP – Drop-off and Collection Program

CRT – Cathode Ray Tube

CRV – California Redemption Value

CS – Curbside Program

DORIIS – Division of Recycling Integrated Information System

DPH – California Department of Public Health

DPS – Diversion Program System

DRS – Disposal Reporting System

DTSC – Department of Toxic Substances Control

EAR – Electronic Annual Report

EMSW – Engineered Municipal Solid Waste

EPR – Extended Producer Responsibility

EU – European Union

FacIT – Facility Information Toolbox

GHG – Greenhouse Gas

HDPE – High-Density Polyethylene

HHW – Household Hazardous Waste

IMR – Imported Material Report

LCD – Liquid Crystal Display

MCR – Mandatory Commercial Recycling

MRF – Material Recovery Facility

MSW – Municipal Solid Waste

MWPF – Mixed Waste Processing Facility

PET – Polyethylene terephthalate

PTE – Passenger Tire Equivalent

RC – Recycling Center

RVM – Reverse Vending Machine

SB – Senate Bill

SP – Community Service Program

SRRE – Source Reduction and Recycling Element

SWIS – Solid Waste Information System

U.S. EPA – United States Environmental Protection Agency

WTE – Waste to Energy

Glossary of Terms

Alternative daily cover (ADC)/Alternative intermediate cover (AIC): The use of materials to cover disposed waste in a landfill cell at the end of the landfill operating day (daily cover) or at some other interval (intermediate cover) to control odors, fire, vectors, litter, and scavenging.

Anaerobic digestion (AD): The process of biologically decomposing organic matter with little or no oxygen in a fully enclosed structure (in-vessel digestion) to produce biogas, liquid fertilizer, and compost.

Beneficial reuse: The use of a waste byproduct or other low-value material for a productive use, other than ADC/AIC, at a landfill within regulatory guidelines.

Beneficiation: The process of upgrading the value or utility of glass, typically by sorting, removing contaminants, and crushing so it can be used as an industrial feedstock for glass manufacturing facilities.

Biomass conversion: The process of using controlled combustion of specified types of organic materials (essentially wood, lawn, or crop residue) to produce electricity.

Chipping and grinding: The process that separates, grades, and resizes woody green wastes or used lumber to be sent to a composting facility, a landfill to be used for ADC, or miscellaneous end markets such as feedstock at biomass to energy plants.

Construction and demolition (C&D) materials: Materials generated in the course of construction and demolition activities that include, but are not limited to, concrete, wood, and drywall.

Disposal Reporting System (DRS): The system used to track disposal information in California. For more information go to: http://www.calrecycle.ca.gov/LGCentral/DRS/default.htm

Disposal: The process of collecting municipal solid waste and transferring it to a transfer station, landfill, or transformation facility.

Facility Information Toolbox (FacIT): Informational database on disposal and recycling activities in the state of California. For more information go to: http://www.calrecycle.ca.gov/FacIT/

Food waste: All surplus food scraps.

Green waste: Urban landscape waste generally consisting of leaves, grass clippings, weeds, yard trimmings, wood waste, branches and stumps, home garden residues, and other miscellaneous organic materials.

Household hazardous waste (HHW): Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients, other than used oil. HHW is not considered to be municipal solid waste material.

Inerts: Waste that includes concrete, asphalt, asphalt roofing, aggregate, brick, rubble, and soil.

Landfill: A permitted facility that provides a legal site for final disposal of materials including mixed solid waste, beneficial materials used for landfill construction, ADC, and specialized material sites such as waste tires and construction and demolition waste.

Material recovery facility (MRF): An intermediate processing facility that accepts source-separated recyclables or mixed waste from an initial collector and processes them for wholesale distribution.

Municipal solid waste (MSW): Refuse that may be mixed with or contain nonorganic material, processed industrial materials, plastics, or other recyclables with the potential for recovery. It includes residential, commercial, and institutional wastes.

Organic materials management: Processes that grind, chip and/or decomposition organic wastes in a controlled process for intermediate or final use as a landscape material or soil amendment.

Per capita disposal: A numeric indicator of reported disposal divided by the population (residents) specific to a county, region or statewide.

Residue: Unusable waste byproducts remaining after recyclables are processed.

Self-hauler: A person who hauls their own residential or business waste themselves to a solid waste facility.

Solid Waste Information System (SWIS): The database that tracks solid waste facilities in California. For more information go to:
http://www.calrecycle.ca.gov/SWFacilities/Directory/Default.htm

Tipping fee: The amount of money per ton of waste charged at the gate of a landfill.

Transfer station: A facility that receives, temporarily stores, and ships unprocessed waste and recyclables.

Transformation: The use of incineration, pyrolysis, distillation, or biological conversion (other than composting) to combust unprocessed or minimally processed solid waste to produce electricity.

Waste tire-derived fuel: Waste tires used as fuel in a power plant or cement kiln.