

**State of California
CalRecycle**

**Proposed Regulation for Short-Lived Climate Pollutants:
Organic Waste Methane Emissions**

Standardized Regulatory Impact Assessment (SRIA)

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1. Summary

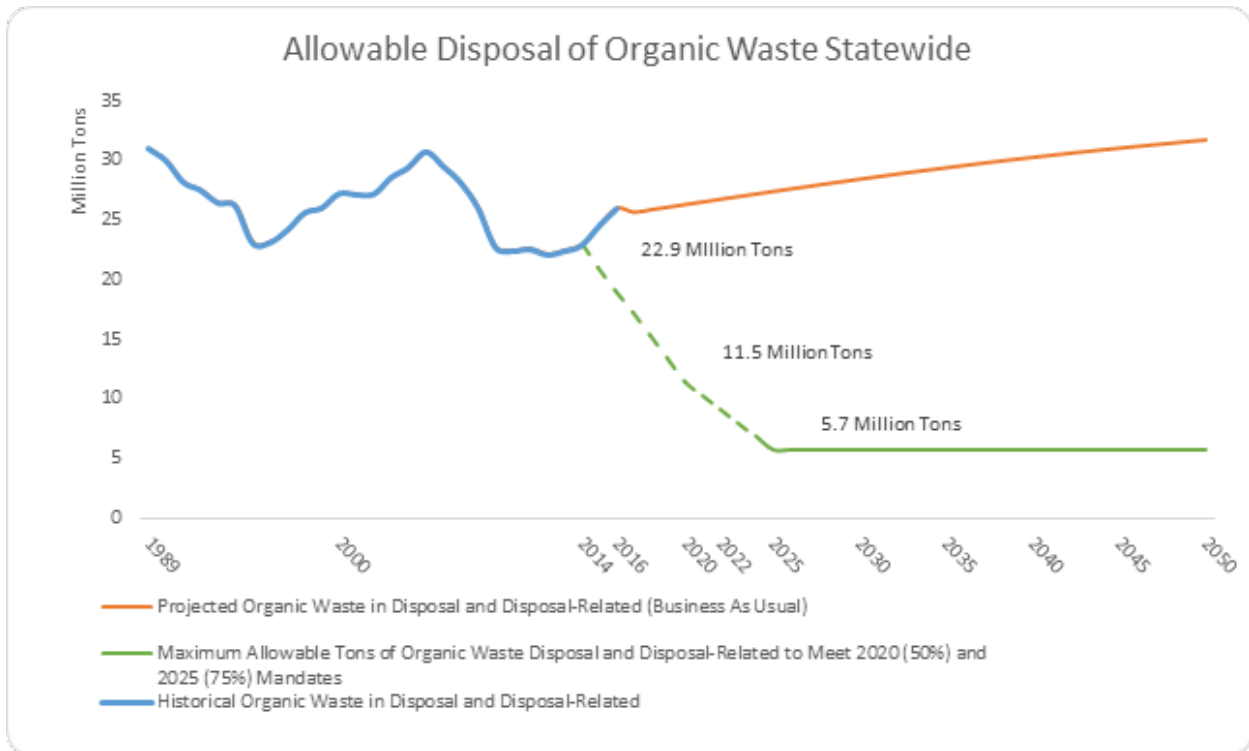
Implementation of SB 1383 (Lara, Chapter 395, Statutes of 2016) and the Short-Lived Climate Pollutant Strategy is an integral part of the state's overall climate blueprint as outlined in the California 2017 Climate Change Scoping Plan. The SLCP Strategy requires immediate reductions of the most potent greenhouse gases, and is expected to provide 35 percent of the greenhouse gas emission reductions needed to meet the state's 2030 targets (as established in SB 32, Pavley, Chapter 249, Statutes of 2016). The success of the SLCP Strategy relies on a portfolio of policies and measures across various sectors of the economy. The measures required for the waste sector will foster the development of a more sustainable economy, reduce global emissions, reduce hunger, and improve public health.

The SLCP Strategy requires California to reduce organic waste disposal 50 percent below 2014 levels by 2020 and 75 percent by 2025. Removing organic waste from landfills prevents the generation of methane from the anaerobic breakdown of the material. Achieving these targets will reduce emissions by at least 4 Million Metric Tons of CO₂ equivalent (MMT_{CO₂e}) annually by 2030. In addition, one year of waste diversion prevents 14 MMT_{CO₂e} of emissions over the lifetime of waste decomposition.

The legislation further requires actions that will reduce poverty-induced hunger by redirecting 20 percent of edible food that is currently disposed to help feed the 1 out of 8 Californians who go hungry every day, including 1 in 5 children. These targets require California's 40 million residents, businesses, local governments, and the state to restructure the waste management system of the world's fifth largest economy and reduce 20 million tons of organic waste disposal annually by 2025. (see Figure 1 below).

This effectively requires the state to more than double organic waste collection and recycling infrastructure and capacity in less than 10 years. Achieving these new statutory mandates is a challenge demanding a collective response by many entities (including the state, jurisdictions, haulers, recyclers, businesses, consumers, and residents) along with significant capital investments to expand the state's edible food recovery and organic waste recycling infrastructure.

Figure 1: Estimated Reduction in Landfill Disposal Needed To Achieve SB 1383 Targets



Note: The lower green line shows that achieving the 75 percent reduction target in 2025 requires the state to dispose no more than 5.7 Million tons of organic waste annually

The Legislature required CalRecycle to adopt regulations designed to reach the SB 1383 statewide disposal reduction and edible food recovery targets. Notably, the bill specifically prohibits CalRecycle from imposing the 50 percent and 75 percent recycling mandates on individual jurisdictions. This is a significant departure from the regulatory framework that has been in place under AB 939 (Sher, Chapter 1095, Statutes of 1989), which mandated that each jurisdiction in the state divert 50 percent of its solid waste from landfills and that also allowed each city and county to select and design its own programmatic components.

There are several other important distinctions between these two key solid waste statutes. AB 939's 50 percent mandate necessitated diverting about 24 million tons of solid waste, but in many instances much of this was paper, glass, and plastic material that was easier to recycle—both in terms of collecting and processing and in terms of finding ready overseas markets. In contrast, organic materials (particularly putrescible organic waste, such as food waste) are much harder to collect, process, and clean to market expectations, and markets for them must be primarily domestic (exceptions are fibers) due to the weight and bulk of the materials. Finally, there is a significant contrast regarding timeframes. The timeframe for achieving AB 939's goal was a decade, but it actually took about 15 years to achieve the 50 percent diversion mandate on a statewide basis. SB 1383 has a shorter timeframe of nine years to achieve the more difficult 75 percent organic waste target and 20 percent edible food recovery target.

The SB 1383 reduction mandate also departs from the mechanics of the AB 939 mandate in two fundamental ways. First, the SB 1383 reduction mandate is tied to a 2014 baseline, which effectively caps organic waste disposal at no more than 25 percent of the amount of organic waste disposed in 2014 (5.7 million tons) on and after 2025. This creates a target that will become increasingly harder to achieve as population increases through the years. The AB 939 mandate, by comparison, only requires diversion of 50 percent of waste generated annually, which allows flexibility for the diversion target to contract or expand with generation and allows for increasing amounts of disposal. Second, the SB 1383 mandate is not singularly tied to tonnage. The organic waste reduction targets must comply with the methane reduction mandate of the Short-lived Climate Pollutant Strategy. This additional environmental metric requires CalRecycle to monitor the end uses of organic waste. This departs from the mechanics of AB 939's landfill diversion mandate, which is essentially agnostic to non-landfill end uses.

Accordingly, CalRecycle (in consultation with the California Air Resources Board [CARB]), pursuant to the statute) has developed a regulatory approach that requires jurisdictions and other regulated entities to implement a broader and more prescriptive suite of programs in order to achieve the statute's statewide mandates. The regulations include provisions on the following types of activities:

- Collection, with a focus on mandatory source-separated collection of organic materials.
- Edible food recovery, with a focus on medium and large generators, such as larger grocers and restaurants with more than 5,000 square feet of floor space.
- Solid waste facilities, including recovery standards at facilities processing mixed organic waste and including methods for assessing contamination of in-bound and recovered organic waste.
- Infrastructure planning, with a focus on regional coordination to plan for future organic waste recycling capacity and edible food recovery systems.
- Procurement at the local level of compost and renewable natural gas.
- Reporting requirements, building on existing systems for reporting to CalRecycle.
- Enforcement, with the primary requirements for mandatory enforcement being placed at the local level but with CalRecycle also having an expanded enforcement role.

The regulation will affect all of the approximately 540 jurisdictions in California¹; millions of households; thousands of businesses; hundreds of haulers and food recovery organizations; hundreds of material recovery facilities, processors, recyclers and landfills; dozens of local government environmental enforcement agencies; and all schools, federal agencies and state agencies.

CalRecycle conducted seven rounds of informal, public pre-regulatory workshops with various stakeholders in 2017 and one round in May 2018. Through this workshop process, CalRecycle has identified and validated that the wide range of programmatic activities described above will be necessary to achieve the statute's mandates. CalRecycle and workshop participants also realized that program implementation will need to vary from jurisdiction to jurisdiction, depending on many factors. Thus, as CalRecycle has been conducting these workshops and drafting regulatory language, the department has been exploring the least burdensome approaches to achieve the statutory mandates, including providing flexibility in the regulations for regulated entities to implement programs and be in compliance.

CalRecycle plans to initiate the formal rulemaking in 2019. Although the regulations will not take effect until January 1, 2022 (per statute), adopting them in 2019 allows regulated entities several years to plan

¹ As of the year 2016, pursuant to the AB 939/SB 1016 mandated jurisdiction annual reporting cycle, these jurisdictions currently comprise 419 reporting entities that consist of California's incorporated cities, unincorporated counties, and CalRecycle-approved regional agencies designed to meet AB 939 Integrated Waste Management Act requirements.

and implement necessary budgetary, contractual, and other programmatic changes so that they can be in compliance with the regulations in 2022. Early adoption will also send a clear market signal to the recycling industry to make new capital investments so that additional organic waste recycling infrastructure can be established during this timeframe.

1.1. Statement of the Need of the Proposed Regulation

SB 1383 established methane emissions reduction targets in a statewide effort to reduce emissions of short-lived climate pollutants in various sectors of California's economy. In SB 1383, the Legislature specifically directed CalRecycle, in consultation with CARB, to adopt regulations to reduce the disposal of organic waste by 50 percent by 2020 and 75 percent by 2025, with both targets tied to a 2014 baseline organic waste disposal amount.² The Legislature granted broad authority to adopt regulations and included guidance on provisions that must be included, may be included, or shall not be included. While the regulations cannot be enforced until 2022, it is incumbent on the department to adopt the regulations prior to the first 2020 target of 50 percent. CalRecycle developed the SB 1383 regulations that accompany this SRIA in compliance with the legislative direction.

The legislation directed the adoption of this regulation, as well as other actions to reduce short-lived climate pollutants, in recognition of the many impacts these pollutants have on climate change, human health, and the environment, especially in California's most at-risk communities. The purpose and need of this regulation is to reduce the environmental damage associated with the disposal of organic waste. Specifically, the organic waste reduction targets are required to achieve the 40 percent methane emission reduction target codified in SB 1383.³

The financial cost of landfilling organic waste does not reflect the true environmental, social, or public health costs associated with disposal. This analysis quantifies many of the costs of landfilling organic waste, including air pollution and greenhouse gas (GHG) emissions.

Landfilling organic waste leads to the anaerobic breakdown of these materials into methane, which can work its way out of the landfill as a fugitive emission. Methane emissions resulting from the decomposition of organic waste in landfills are a significant source of greenhouse gas emissions and constitute 21 percent of California's total methane emissions. SB 1383 reduction targets require the state to reduce organic waste disposal to no more than 5.7 million tons by 2025. This requires the reduction, reuse, or recovery of approximately 20 million tons of organic waste per year by 2025, with the amount that must be diverted from landfills increasing as population increases.

California must take a holistic approach to comply with the legislative direction and effectively divert and manage this material. This means not only keeping organic waste out of landfills—either through source reduction, reuse, or recovery—but also improving the infrastructure for minimizing and recovering edible food waste and for fostering more composting and anaerobic or in-vessel digestion.

To achieve the goals in SB 1383, California must focus on decreasing the generation of organic waste. Additionally, the state must expand and build infrastructure, such as in-state composting and in-vessel digestion or other organic waste processing and recycling capacity, to maximize the benefits from this waste stream and effectively minimize the spreading of unprocessed organic waste on open lands, which can have adverse environmental impacts. The state must also have the necessary programs and infrastructure to capture and distribute edible food. Meeting these targets through regulations obliges CalRecycle to place requirements on a variety of stakeholders—including jurisdictions, haulers, solid waste facilities, generators, food recovery organizations, and other entities—in a manner that will spur

² Public Resources Code Section 42642.5

³ Health and Safety Code Section 39730.5 and 39730.6, and Public Resources Code Section 42652.5

market development, investments, and other necessary actions. The holistic approach taken in developing the SB 1383 regulations reflects the statutory direction to adopt regulations to achieve the organic waste reduction targets by the required dates.

1.2. Major Regulation Determination

The anticipated implementation costs noted in the analysis are not substantively new. In fact, these costs are currently borne by all Californians in various forms, such as negative public health and environmental impacts. The SB 1383 regulations will remedy this by transferring these hidden costs to more direct and visible costs for ratepayers. The cost of recovering edible food and collecting organic waste for recycling and composting will increase waste collection rates, but it will eliminate other costs associated with disposal.

The proposed regulations will be a Major Regulation under the provisions of the State Administrative Manual §6602. A wide range of programmatic activities, as well as significant recycling infrastructure expansion, will be required to meet the statute's mandates. Because of the multiple organic waste reduction targets and timelines in statute and the need for flexibility in implementation, the complete estimate of economic costs and benefits of the proposed regulation is complex. Various provisions in the regulation will affect cities and counties, residents and businesses, waste collectors and haulers, waste processors and recyclers, landfills, and members of the edible food recovery network.

1.3. Baseline Information

The baseline is used to compare “business-as-usual” (BAU), with the proposed regulations and alternatives

For purposes of the baseline definition, and to ensure CalRecycle does not underestimate the financial impacts of these regulations, CalRecycle is using a conservative assumption to define BAU (i.e., without these regulations being promulgated) in this analysis. For BAU, CalRecycle assumes that the state will not achieve the goal of reducing organic waste disposal by 50 percent by 2020 as required in the statute, and instead will only maintain the current organic waste recycling level of around 30 percent.

CalRecycle considers it likely that the state will meet the 50 percent goal in 2020; however, our decision to conduct the baseline analysis with the more conservative assumption is based on the following reasoning. CalRecycle estimates that the current level of organic waste recycling is around 30 percent (based on information from its last composting infrastructure survey, 2014 Waste Characterization study, and Disposal Reporting System). CalRecycle does expect this recycling level to increase by 2020, based on the level of efforts of jurisdictions such as San Francisco, Alameda County, City of Los Angeles, and others who will be fully implementing and enforcing organic waste recycling programs in response to AB 341 (Chesbro, Chapter 476, Statutes of 2011) and AB 1826 (Chesbro, Chapter 727, Statutes of 2014). (AB 341 established a statewide goal that not less than 75 percent of solid waste be source reduced, recycled, or composted by 2020. It also required commercial and public entities to arrange for recycling services on or after July 1, 2012. AB 1826 established mandatory commercial organics recycling for businesses that generate more than 6 cubic yards of organic waste by April 1, 2016, more than 4 cubic yards of organic waste per week by January 1, 2017 and will include businesses generating 4 cubic yards of *solid* waste per week). Some of these same jurisdictions also are implementing extensive food recovery programs and some have zero waste goals. However, AB 341 and AB 1826 do not require that jurisdictions undertake enforcement, and AB 1826 only applies to commercial properties, so the aforementioned jurisdictions are voluntarily implementing more extensive programs than is required by these statutes. In addition, these statutes do not include any requirements regarding edible food recovery. Accordingly, for this BAU analysis, CalRecycle cannot assume that the majority of jurisdictions

in the state will be implementing expansive programs in 2020 that include enforcement, residential collection, or edible food recovery programs.

This baseline analysis thus will result in higher cost estimates compared with an analysis based on 50 percent recycling in 2020, with corresponding higher benefits spread over a longer period. However, CalRecycle will also conduct a sensitivity analysis that assumes a higher level of compliance with AB 1826 and AB 341 by 2020, such that the statewide goal of reducing organic waste disposal by 50 percent by 2020 is met. The sensitivity analysis that assumes 50 percent for the baseline (BAU without the proposed regulations in place) is presented in Section 5 of this report.

1.4. Time Horizon for Analysis

The time horizon for this analysis is January 1, 2019 through December 31, 2030. The primary purpose of a SRIA is to inform the public, policymakers, and stakeholders of economic and fiscal impacts of a new regulation and the tradeoffs the agency promulgating the major regulation is making. CalRecycle expects these regulations to be fully implemented in calendar year 2025 in response to the statutorily mandated goals of 75 percent reduction in organic waste disposal and 20 percent edible food recovery by January 1, 2025. Therefore, the time horizon for this economic analysis will include the 12 months of calendar year 2025, bracketed by several years on both sides. Since the regulations will not be finalized until 2019, CalRecycle does not expect regulated entities to begin implementing changes in response to the regulations until then. However, CalRecycle does anticipate that jurisdictions and other regulated entities will begin implementing programs prior to 2022, when regulations become effective.

Section 2002 of the State Administrative Manual indicates that SRIA costs and benefits due to a proposed regulatory change should be “calculated on an annual basis from estimated date of filing with the Secretary of State through 12 months after the estimated date the proposed major regulation will be fully implemented.” Based on discussion with the Department of Finance, the time horizon for a SRIA can include a regulatory impact period longer than 12 months after full implementation, if the department expects impacts from the regulation to extend further into the future and can estimate them with reasonable accuracy. Therefore, CalRecycle starts the analysis beginning in January 2019 (i.e., the year the regulations will be adopted). CalRecycle also needs to consider the long lead times for organic waste recycling infrastructure development. Therefore, CalRecycle will conduct this analysis beginning with the year 2019 and extend it through to 2030 (i.e., a full year after the initial 12-month analysis at full implementation, plus five additional years).

This timeline for this baseline analysis should NOT be confused with the need to measure overall progress towards the 2020 50 percent goal and the 2025 75 percent goal relative to the 2014 baseline, as required by statute⁴.

1.5. Public Outreach and Input

CalRecycle requested input from stakeholders and the public regarding provisions in the proposed Short-Lived Climate Pollutants : Organic Waste Methane Emissions Reductions Regulation. In 2017, CalRecycle conducted a series of six of workshops in northern and southern California, each webcast live for remote participation, on the proposed regulatory concepts and draft regulatory language. CalRecycle conducted an additional round of workshops in 2018. CalRecycle maintains information regarding these workshops and the associated materials on CalRecycle’s SLCP web pages. CalRecycle and the Air Resources Board distribute them through multiple public listservs, that total more than 6,000 recipients. CalRecycle also sent information out regularly via listservs for cities, counties and state

⁴ Public Resources Code 42653

agencies/facilities. Other networks and program partners, such as the California Resource Recovery Association and Governor's Office of Planning and Research, have distributed workshop details through their listservs.

In addition to these workshops, CalRecycle has engaged with and requested input from multiple affected stakeholder groups via e-mail, teleconference, and face-to-face meetings. These include:

- State agencies (e.g., Governor's Office, California Environmental Protection Agency, Government Operations Agency, Air Resources Board, State Water Resources Control Board, California Energy Commission, California Department of Public Health, Governor's Office of Planning & Research, Building Standards Commission, Department of General Services, Governor's Office of Business and Economic Development, California Department of Education, California Department of Food and Agriculture, and State Agency Green Employees, California State University of San Francisco, University of California, Irvine and Davis),
- Schools (e.g., California Department of Education, California School Boards Association, Association of California School Administrators, California Association of School Business Officials, California School Nutrition Association, Small School Districts' Association, and Coalition for Adequate School Housing),
- Industry associations (e.g., California Association of Food Banks, Retail Industry Leaders Association, California Restaurant Association, California League of Food Processors, California Hotel & Lodging Association, California Grocers Association, etc.),
- Materials management industry (e.g., Air and Waste Management Association, Association of Compost Producers, California Compost Coalition, California Association of Sanitation Agencies, American Forest & Paper Association, Solid Waste Association of North America, California Refuse and Recycling Association, California Organics Recycling Council),
- Regional agencies (e.g., California Air Pollution Control Officers Association, Regional Water Quality Control Boards),
- Local governments (e.g., League of California Cities, Rural County Representatives of California, California State Association of Counties, County Engineers Association of California, Los Angeles Regional Agency, Orange County Recycling Coordinators, California Conference of Directors of Environmental Health, Local Enforcement Agencies, Local Task Forces, as well as many individual cities and counties).

CalRecycle has also worked directly with specific businesses that requested information (about 25 individual companies).

2. Benefits

Organic materials comprise two-thirds of the waste stream and even the best-managed landfills only capture 50 to 80 percent of the methane gas generated while the landfills are active and operational. Diverting organic waste from landfills and into beneficial uses will not be easy, but it will have enormous environmental, public health, and economic impacts. When these same materials are managed outside of landfills, the benefits are significant and contribute to many portions of California's urban, agricultural, and manufacturing landscape. Some of the currently landfilled organic waste is actually recoverable edible food that can provide food to millions of food-insecure people in California, and the remainder can be made into valuable soil amendments and biogas. These soil amendments will result in sequestering carbon from the atmosphere, improving the health of agricultural soils including increased soil water holding capacity, preventing soil erosion, and reducing the need for synthetic

fertilizers. Biogas can be made into renewable natural gas that can be used in medium- and heavy-duty trucks. Diverting organic waste from landfills and into beneficial uses will require the development of new organic waste recycling facilities that will generate new jobs in California and will meet air and water quality standards and minimize impacts on disadvantaged communities.

In addition to reducing short-lived climate pollutants, diverting organic wastes can provide a variety of environmental and economic benefits. Edible food recovery is the practice of collecting edible foods that would otherwise go to waste from restaurants, grocery stores, dining facilities, food packing facilities and produce markets, and instead distributing it to local food programs. The main benefit of edible food recovery programs is that they provide healthy foods to those in need, but they also reduce organic waste disposal. In particular, these programs assist Californians who are unable to secure adequate, healthy food by diverting edible food to food banks and pantries. Another benefit is that compost (a recovered organic end-use product) returns nutrients to the soil, builds soil organic matter, improves water-holding capacity, increases carbon sequestration in the landscape, and reduces the use of fossil-fuel-intense inorganic fertilizers. Anaerobic digestion of organic materials (also referred to as in-vessel digestion) can support the state's efforts to obtain at least 50 percent of its electricity from renewable resources, aid in reducing the carbon intensity of transportation fuels, and displace fossil natural gas consumption.

The regulations also will support jurisdictions that have implemented mandatory organic waste recycling programs. For example, San Francisco and Alameda County require that food waste be separated and kept out of landfills. Both Los Angeles and San Francisco, along with other cities, have plans in place to achieve zero-waste.

The regulations also build upon California's leading commitments to reduce greenhouse gas emissions and air pollution statewide. Governor Brown identified reductions of short-lived climate pollutant emissions, including methane emissions, as one of five key climate change strategy pillars necessary to meet California's target to reduce greenhouse gas emissions 40 percent below 1990 levels by 2030, as established in SB 32 (Pavley, Chapter 249, Statutes of 2016). SB 1383 will further support California's efforts to achieve the statewide 75 percent recycling goal by 2020 established in AB 341 and strengthen the implementation of mandatory commercial organic waste recycling established in AB 1826.

This effort thus supports four of the five pillars in Governor Brown's climate change strategy: increasing renewable bioenergy and biofuels, reducing petroleum use in vehicles, reducing short-lived climate pollutants, and improving soil health and increasing carbon storage in farms, rangelands, and forests.

2.1. Benefits to Individuals

SLCPs are much more potent greenhouse gases than carbon dioxide and can have dramatic and detrimental effects on human health and climate change. . Reducing emissions of these pollutants will have beneficial impacts not only on climate, but also on public health. According to the World Health Organization, SLCPs contribute to ambient levels of ozone and PM2.5 and are directly associated with heart and pulmonary disease, respiratory infections, and lung cancer.⁵ CalRecycle, in consultation with the Air Resources Board, estimated the health impacts of criteria pollutants, specifically volatile organic chemicals and PM2.5; see Section 4 for the results and details of this analysis.

In addition to avoiding landfill methane emissions, the recovery of edible food otherwise destined for landfills provides an increased opportunity to feed millions of food-insecure Californians. The United States Department of Agriculture (USDA) defines food insecurity as a household-level economic and

⁵ World Health Organization, "Reducing global health risks through mitigation of short-lived climate pollutants," accessed April 1, 2016. http://www.who.int/phe/health_topics/outdoorair/climate-reducing-health-risks-faq/en/

social condition of limited or uncertain access to adequate food⁶. The overall food insecurity rate in California is 12.5 percent, meaning that approximately one out of every eight Californians does not know where their next meal will come from. The rate for children is much higher, around one in five children in California may go to bed hungry each night.⁷ This places California with the 19th highest child food insecurity rate in the nation. Edible food rescue programs resulting from these regulations will increase the recovery of edible food for human consumption resulting in decreased food insecurity and healthier communities.

The SLCP Strategy indicates that many of these benefits can positively impact disadvantaged communities. For example, using ultra-low-NOx vehicles and renewable natural gas in the transportation sector can help improve air quality. In addition, during the course of CalRecycle's meetings with stakeholders in 2017 on the draft SB 1383 regulations, stakeholders stated that another key health benefit is reduced exposure of farmworkers to pesticides and fertilizers, the use of which can be reduced when compost is used in agriculture. This is in addition to associated reductions in methane emissions at landfills along with carbon sequestration in soils.

The World Health Organization noted that reducing SLCP emissions might also provide health benefits such as improved diets and more opportunities for safe travel and physical activity.

2.2. Benefits to California Businesses

The types of businesses subject to these proposed regulations varies widely, so it is reasonable to expect that the benefits they might accrue from implementation of the regulations will also vary. CalRecycle has estimated the economic impacts of these proposed regulations on a range of businesses; see Section 4 for results and details of this analysis. CalRecycle expects businesses to benefit in numerous ways, including but not limited to:

- New job creation associated with organic materials collection and recycling.
- Increased revenues from sales of products including recycled content paper, cardboard, compost, and renewable gas. For example, application of compost can help farmers improve soil health, reduce water use, and reduce use of pesticides and fertilizers, resulting in lower costs to produce higher yields of produce. Production of renewable gas can reduce reliance on foreign oil; one study estimates that existing organic waste could supply more than 15 percent of our current natural gas demand if converted to biogas.⁸
- Increased revenues from sales of equipment.
- Reduced landfill disposal collection costs.
- Fewer lost workdays and increased productivity due to health benefits (e.g., reduced incidence of asthma, reduced exposure of farmworkers to pesticides and fertilizers), which may also help businesses improve recruitment and retention of workers.

⁶ USDA ERS, "Definitions of Food Security", accessed October 27, 2017. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security/>

⁷ California Association of Food Banks, "Hunger Fact Sheet", accessed October 27, 2017. <https://www.cafoodbanks.org/hunger-factsheet>

⁸ Southern California Gas Company, "SoCalGas Commends Governor Brown and Senator Ricardo Lara for SB 1383," 2016. <http://www.prnewswire.com/news-releases/socalgas-commends-governor-brown-and-senator-ricardo-lara-for-sb-1383-300330363.html>

2.3. Benefits to Small Businesses

CalRecycle expects small businesses (e.g., small retailers, restaurants, farmers markets, etc.) to accrue the same benefits described above for businesses in general. As with businesses in general, CalRecycle has estimated the economic impacts of these proposed regulations on small businesses; see Section 4 for results and details of this analysis.

3. Direct Costs

CalRecycle estimated direct impacts of the proposed regulations in an extensive, custom spreadsheet, henceforth termed the Direct Impact Model. The Direct Impact Model has multiple cost data worksheets that estimate the costs for the various regulated entities in the proposed regulations. Meeting the requirements in SB 1383 will result in significant expansion of California's organic waste recycling infrastructure and the establishment of a wide range of programmatic activities. As such, there are three major areas of focus in the Direct Cost Impact Model:

1. Direct Cost Impact of Expanding Organic Waste Management Infrastructure
2. Direct Cost Impact of Organic Waste Collection/Processing and Edible Food Collection
3. Direct Cost Impact of Requirements related to Education, Enforcement, Contamination Monitoring, Reporting, Capacity Planning, and Procurement

The estimated direct statewide cost for these three major areas is approximately \$20.9 billion over the effective time span of the analysis, which is from 2019 through 2030. Direct benefits include estimated revenues from the sale of compost, transportation fuel, and recyclables, along with avoided disposal. The estimated direct economic benefit is approximately \$17 billion over the same time span. (Figures are derived from Tables 2,3,4 and 5).

Based on this analysis, the average net cost per year is approximately \$330 million. Ultimately, the costs of implementing these regulations will be passed on to ratepayers, both commercial businesses and households. To avoid double-counting, CalRecycle allocated the cost 50/50 between businesses and households based on the waste stream distribution between commercial and residential. As a result, 50 percent of the costs would be distributed among businesses and 50 percent would be distributed among households. Approximately 380,000 businesses that would be regulated, the majority of which are small businesses, the average cost per business would be approximately \$662 annually. Assuming the other half of these costs would be passed on to households, the average increased cost per household would be approximately \$17 per year. Note that actual increases in rates may vary among jurisdictions and may reflect other factors specific to that jurisdiction, including the existing level of program implementation the jurisdiction is already performing without a statutory mandate. For example, lower costs will result if the city or county has already implemented mandatory food waste collection for residential and/or commercial, and other programmatic activities, such as edible food recovery programs, education, and/or contamination monitoring. And larger cities and counties will have higher costs, e.g., they will have a larger number of inspections to conduct, etc. Rural cities and counties may have lower costs as they will have fewer inspections and they may be able to phase in implementation due to a lack of recycling infrastructure.

3.1. Direct Cost Impact of Expanding Organic Waste Management Infrastructure

Meeting the SB 1383 organic waste disposal reduction targets requires developing infrastructure and markets to optimize the economic and environmental value of California's waste streams across sources. SB 1383 requires the state to cut organic waste disposal by 75 percent and more than double

organic waste management infrastructure and capacity in less than 10 years. Organic waste can be diverted to solid waste facilities with existing excess capacity, including composting facilities, stand-alone anaerobic digesters (AD), and wastewater treatment anaerobic digesters. . The direct cost impact analysis for expanding organic waste management infrastructure relies on the Air Resources Board’s Economic Analysis, which was conducted for the Short-Lived Climate Pollutant Reduction Strategy report in March 2017 (SLCP Econ Analysis)⁹. As a part of the SLCP Economic Analysis for the SLCP Strategy, the air board considered three scenarios for organic waste recycling infrastructure expansion to achieve the organic waste reduction targets. Each scenario projects a potential pathway to achieve the disposal reduction targets, and each one includes economic data and assumptions. The scenarios are:

1. New anaerobic digestion facilities (“Scenario 1”)
2. Existing excess capacity at wastewater treatment anaerobic digestion facilities (“Scenario 2”)
3. New compost facilities (“Scenario 3”)

Scenario 1 assumes that infrastructure development to achieve the organic waste reduction targets will rely on a combination of new anaerobic digestion (AD) and new compost facilities. Scenario 1 assumes that all food waste would be sent to new AD facilities. Scenario 2 assumes that all food waste would be sent to existing wastewater treatment facilities for AD, and that only new compost facilities would be built (i.e., no new AD facilities would be built) to handle all other additional compostable material. Scenario 3 assumes that only new compost facilities would be built to handle all additional compostable material, including food waste, and that no new AD facilities would be built.

CalRecycle anticipates 1383 implementation will include a combination of new in-vessel digestion (stand-alone anaerobic digesters and wastewater treatment plant digesters) and composting facilities. Significant amounts of highly putrescible food waste are included in the organic waste stream that will need to be diverted from landfills and these will likely be managed with in-vessel digestion technologies. In-vessel digestion technologies may also be able to more readily address the siting challenges and land availability issues that face composting technologies. Therefore, CalRecycle has evaluated the economic impacts of the infrastructure expansion for organic materials requiring in-vessel technologies, using the economic impact analysis work done by CARB for Scenario 1 above and assuming deployment of the more expensive technology of in-vessel digestion in stand-alone anaerobic digesters and compost facilities. CalRecycle has adjusted the the air board’s analysis to account for the expanded definition of organic waste and is utilizing the cost impact data for Scenario 1. Using this information for the regulation’s baseline will provide the upper bound cost for organic waste recycling infrastructure expansion.

The resulting cost impact analysis for the proposed regulations (Scenario 1) includes the following assumptions:

- Organic waste tonnages are based on the definition of organic materials in the proposed regulations and the 2014 Waste Characterization Study¹⁰.

⁹ California Air Resources Board, “Short-Lived Climate Pollutant Reduction Strategy.” Appendix F: Supporting Documentation for the Economic Assessment of Measures in the SLCP Strategy. <https://www.arb.ca.gov/cc/shortlived/meetings/03142017/appendixf.pdf>

¹⁰ Department of Resources Recycling and Recovery, “2014 Disposal-Facility-Based Characterization of Solid Waste in California,” 2015. <http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf>

- Anaerobic digestion facilities will be local, located within the same air basins where the organic materials are currently being landfilled (e.g., within the same or lesser transport distances to landfills in the areas).
- Based on the CARB Scenario 1 analysis¹¹, the data in Tables 25 and 26 in the SLCP Economic Analysis (Appendix F) were slightly modified to achieve 50 percent organic disposal reduction in 2020 and 75 percent reduction in 2025.
 - The following assumptions from Scenario 1 were used:
 - Existing excess compost capacity is fully utilized.
 - New compost facilities are constructed to handle all materials listed under the ‘compost’ heading in SLCP Tables 25 and 26.
 - Each new compost and AD facility will have a throughput of 100,000 wet tons per year.
 - Existing chip & grind facilities have capacity to handle all materials projected to be diverted to “Chip & Grind” in SLCP Tables 25 and 26.
 - All “Compost or AD” food waste, grass and leaves in SLCP Tables 25 and 26 are handled by new centralized anaerobic digestion treatment facilities, the methane is injected to pipelines, and a modest market is assumed for anaerobic digestion digestate, which represents 36 percent of the digested waste.
 - CalRecycle modified several assumptions from CARB Scenario 1 as follows:
 - The management options for the various material types in SLCP Tables 25 and 26 were modified to achieve 50 and 75 percent organic disposal reduction using the proposed “organic waste” definition, which includes more material types than Tables 25 and 26. The proposed “organic waste” definition includes compostable paper, food, leaves & grasses, prunings & trimmings, branches & stumps, lumber, remainder/composite organic, and alternative daily cover, as well as other paper, textiles, carpet, and manure (not included in Tables 25 and 26 but are included in this analysis).
 - The SLCP Strategy assumes 20 percent of total food waste will be recovered or prevented in 2025. SB 1383 requires recovery of 20 percent of all “edible food” rather than 20 percent of “total food waste.” CalRecycle therefore assumes a smaller portion of total food waste will be recovered or prevented, which results in the need for more composting and AD infrastructure and increased total costs.
 - In 2020, CalRecycle assumes that 60 percent of digestate will be disposed of in landfills and 40 percent composted. In 2025, CalRecycle assumes that 35 percent of digestate will be disposed of in landfills and 65 percent composted. This tonnage is included in the compostable fraction.
- One of the types of organic materials included in the proposed regulation is biomass, which is predominantly wood waste.
 - It is possible that some wood waste could be used as feedstock at biomass conversion facilities. Based on data from CalRecycle’s biomass reporting system (pursuant to AB 498, Chapter 746, Statutes of 2014), the 22 biomass facilities in the state that reported

¹¹ California Air Resources Board, “Short-Lived Climate Pollutant Reduction Strategy.” Appendix F: Supporting Documentation for the Economic Assessment of Measures in the SLCP Strategy. Scenario 1 – New Centralized AD Facilities. Scenario 3 – New Compost Facilities,” 2017.
<https://www.arb.ca.gov/cc/shortlived/meetings/03142017/appendixf.pdf>

for 2016 used about 3.7 million tons (bone dry) of woody material. Of this, about 1.3 million tons (bone dry) came from the urban sector.

- In general, though, the number of active biomass facilities has declined. A decade ago, approximately three dozen biomass facilities used urban wood. Most of these relied on power purchase agreements to stay in operation, but some of the power purchase agreements have ended and several facilities have closed. The UC Davis Biomass Collaborative’s Biomass Facilities Database indicates that 29 facilities are currently in operation that accept solid fuel such as woody material. CalRecycle’s database had 29 reporting in 2015 and 22 in 2016. The California Compost Coalition suggested in early 2017 that another ten could close by 2020. In addition to this trend, SB 859 (Chapter 368, Statutes of 2016) will make it harder to find markets in this sector for urban wood. SB 859 requires publically owned electric utilities to procure 125 megawatts of bioenergy per year from existing bioenergy plants beginning in December 2016, with financial commitments of at least 5 years. At least 80 percent of the feedstock of an eligible facility is to be from forest feedstock, including dead and dying trees removed from specified hazard zones.
- As a result of these trends and the statutory preference for forest feedstock, CalRecycle does not expect there to be any increased capacity available at the existing biomass facilities to take any of the additional urban organic materials that will be collected as part of these regulations.

3.1.1. Descriptions of CARB Scenario 1 – Expansion of Organic Waste Management Infrastructure via New Anaerobic Digestion Facilities and New Composting Facilities

Scenario 1 assumes that food waste and some leaves and grass are handled through new centralized anaerobic digestion facilities and the resulting methane is pipeline-injected. New anaerobic digestion facilities are assumed to accept 100,000 tons per year of organic waste. The costs of Scenario 1 include facility construction and permitting, operating and maintenance (O&M), waste and digestate processing and transportation, and pipeline injection of renewable natural gas (the costs associated with injection include pipeline, interconnection, and biogas upgrading). Potential revenue streams include tipping fees, the sale of biogas, Low Carbon Fuel Standard (LCFS) credits, and Renewable Identification Number (RIN) credits, as outlined in the SLCP Strategy Report, Appendix F.

Scenario 1 also assumes that all other compostable materials are composted at new facilities with an assumed throughput of 100,000 tons per year. Costs within the scenario include facility construction, O&M, and transportation of organic materials to the compost facility. Compost facility revenues are estimated in Scenario 1 by only including tipping fees and not revenues associated with the sale of compost. This conservative approach represents the lower bound estimate for composting. However, these revenues vary depending on a number of factors such as seasonality, organic certification, and compost blend type.

3.1.2. Estimated Number of New Facilities

By 2019, 41 compost facilities and 25 anaerobic digestion facilities will be online and achieving the baseline 30 percent reduction in organic waste disposal. Table 1 below shows the number of new anaerobic digestion and compost facilities that CalRecycle estimates will be built each year between 2019 and 2024 to meet the 2025 organic waste disposal reduction goal of 75 percent.

Table 1: Estimated New Facilities to be Built Each Year, 2019-2025

Year				
2019	41	6	25	0
2020	47	11	25	4
2021	58	10	29	6
2022	68	11	35	5
2023	79	11	40	6
2024	90	11	46	5
2025	101		51	
Total New Facilities		60		26

3.1.3. Cumulative Estimated Costs and Revenues

CalRecycle recognizes that there is uncertainty regarding the costs, savings, and potential revenue streams associated with organic waste reduction and recovery. Additional uncertainty related to existing infrastructure and technology development may also create economic impacts that are not evaluated in this analysis. This analysis relies on available data from California agencies, academic researchers, and industry, as well as the work done by CARB for the SLCP Economic Analysis, to estimate the direct economic impacts (including costs, fuel and energy savings, and potential revenue streams).

Table 2 shows the annualized capital and O&M costs and revenue for the 60 compost facilities and 26 AD facilities that will be built during the years 2019 through 2024. Table 2 also includes O&M costs and revenue for facilities that will be built prior to 2019. Also included is the 12-year net present value (2019-2030).

Table 2: Cumulative Costs and Revenues for Proposed Regulations Over 12-Year Accounting Period (Million Dollars)

Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
Compost	60	\$807	\$1,519	\$2,854
12-Year Net Present Value (2019-2030)		\$528		
Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
AD	26	\$1,194	\$3,471	\$7,842
12-Year Net Present Value (2019-2030)		\$3,177		

*O&M and Revenue for all facilities

Markets for products from organic waste recycling rely on many variables, and revenue estimates in the above analysis are conservative. Potential revenues from sale of compost and biogas products depend on many factors that influence demand, including regional factors, prices for substitute products, and seasonal fluctuations. CalRecycle expects compost markets to remain localized, since transportation costs prohibit long-distance product distribution, and for revenues to remain relatively stable. Revenues for biogas are highly dependent on renewable markets and fluctuate with LCFS credits and market prices for low carbon alternative fuel products. Recent upward trends in LCFS credit prices can help stabilize the market for biomethane fuel. At the federal level, the Renewable Fuel Standard program provides similar market incentives and pricing through RIN transactions for alternative fuel products. The proposed regulations influence markets from both sides, as they have mandates to divert organic waste from landfills, which increases product supply, as well as procurement mandates that increase product demand.

3.2. Direct Cost Impact of Organic Waste Recycling Collection and Processing and Edible Food Collection

To estimate the direct cost impacts of collection, processing, transportation, revenues, and avoided cost of disposal, CalRecycle is using existing cost data from the report entitled, “Cost Study on Commercial Recycling” and its associated data model, which HF&H Consultants developed for CalRecycle as part of a cost analysis for AB 341 regarding Mandatory Commercial Recycling¹². This cost study and data model estimated the costs and cost savings resulting from recovering a specified volume of different recyclable commodities (such as paper and other organic materials) from the commercial sector. CalRecycle has extrapolated information and cost data from the cost study and data model to estimate the costs for both commercial and residential organic waste collection based on current and future population, as well as for other organic material types that will be diverted from landfills under the proposed regulations.

For edible food collection costs, CalRecycle is utilizing a portion of the economic analysis from the “Short-Lived Climate Pollutant Reduction Strategy” report that evaluates edible food collection.

3.2.1. HF&H Commercial Cost Model

In 2011, through a contract with HF&H Consulting, CalRecycle developed an economic model of the California waste stream. The Commercial Cost Model developed under this contract incorporated data from the entire waste stream, using data from CalRecycle’s 2008 Waste Characterization Study. In the 2011 application of the Commercial Cost Model, the purpose was to understand the costs, savings, and net costs associated with the expansion of commercial recycling in California in response to the Mandatory Commercial Recycling measure of the AB 32 Scoping Plan. The Mandatory Commercial Recycling measure focuses on increased commercial waste recycling as a method to reduce GHG emissions. It is designed to achieve a reduction in GHG emissions of 5 million metric tons of carbon dioxide (CO₂) equivalents. To achieve the measure’s objective, an additional 2 to 3 million tons of materials annually will need to be recycled from the commercial sector by the year 2020 and beyond. Subsequently, CalRecycle adopted the Mandatory Commercial Recycling regulation on May 7, 2012. This regulation reflects the statutory provisions of AB 341 and provides additional procedural clarifications.

¹² Department of Resources Recycling and Recovery, HF&H Consultants, Cascadia Consulting Group, “Report Topic: Cost Study on Commercial Recycling,” 2011.

<http://www.calrecycle.ca.gov/publications/Documents/Recycling/2011009.pdf>

The regulation included all commercial solid waste that could be reused, recycled, composted, or otherwise diverted. Additionally, putrescible (e.g., food, waste, etc.) and non-putrescible organic waste (e.g., paper, cardboard, wood) were included. As a result, the model incorporates tonnages and detailed cost estimates for organic materials within the database. The costs in the model are categorized into the following system components and presented by target material type:

- The cost of collecting the materials,
- The cost of processing the diverted materials,
- The revenue generated by selling diverted materials in export or domestic markets, and
- The cost of disposing materials in a landfill

The model estimates the statewide costs and savings by estimating the costs within seven regions of the state and adding those regional costs together. The general approach in developing the model was first to estimate the quantity of waste associated with each subsector in each region of the state, and then to overlay on that quantity an estimated composition profile that included all of the identified materials. Thus, the model produced estimates of the tons of each material believed to be disposed in each region for each waste subsector. For the cost study report, HF&H modeled four scenarios to analyze likely programmatic approaches to increase recycling, demonstrating how the model has the flexibility to include or exclude material types as well as to adjust the tonnages of each material type and then evaluate the associated costs. The model includes a scenario (Commercial Cost Study Scenario) that closely aligns with the organic material types associated with these proposed SB 1383 regulations. The Commercial Cost Study Scenario includes recyclables, traditional compostable organic waste, and lumber (lumber is shown as construction/demolition material in the HF&H Cost Study).

3.2.2. Estimating Direct Costs for Proposed Regulation using HF&H Commercial Cost Study

CalRecycle modified inputs to the HF&H Commercial Cost Study Model to include only organic waste in the waste and recycling stream, using the definition of organic waste in the proposed regulations. Material types that may be recyclable but are not included in the organic waste definition of the proposed regulations were deselected from the HF&H model. In addition to these modifications, CalRecycle adjusted tonnages to account for the total tonnage disposal reduction anticipated for the proposed regulations (i.e., the tonnage includes commercial and residential, as well as increases in tonnage due to population increases over the economic study period). Since the model was based on CalRecycle’s 2008 Waste Characterization Study, CalRecycle also compared the waste categories and amounts for CalRecycle’s 2014 Waste Characterization Study and made scalable corrections to reflect the current waste stream composition and amounts.

Costs for the proposed regulations are estimated on a statewide basis in the following categories and as shown in Table 3 below: collection, processing, transportation, disposal, and commodity revenues.

Table 3: Statewide Cost Estimates for Organic Waste Collection and Processing of Increased Tonnage (Million Dollars)

Annual Costs due to Increased Tonnage							
	2019	2020	2021	2022	2023	2024	2025
Collection	58	204	360	516	681	837	837
Processing	21	72	128	183	241	296	296
Disposal Avoided	(21)	(75)	(131)	(188)	(248)	(305)	(305)

Commodity	(26)	(93)	(163)	(234)	(309)	(379)	(379)
Total Costs	32	108	194	277	365	449	449

In the table above, Disposal Avoided and Commodity revenues are shown as negative costs.

3.2.3. Edible Food Collection Costs

For edible food collection costs, CalRecycle is utilizing a portion of the economic analysis from the “Short-Lived Climate Pollutant Reduction Strategy” report that evaluates edible food collection (see excerpt from the report below).

“The food recovery target in this SLCP Strategy can be achieved through source reduction, diverting food to feed the hungry, and utilizing food scraps as animal feed. A 2016 report estimates that achieving a national 20 percent reduction in food waste by 2025 will require an investment of \$18 billion, but results in a societal benefit of \$100 billion and the creation of 15,000 jobs per year.¹³ The report finds that the most cost-effective way to reduce food waste is through food waste prevention and recovery.

Scaling the investments to California (assuming the State comprises 12 percent of the US population in 2025) achieving a 20 percent food recovery target could require investments of \$1.8 billion, or \$200 million a year from 2016 through 2025. These investment requirements are mitigated by an estimated annual business profit potential of \$228 million in food waste savings. These figures do not include benefits that arise from household savings and food donations, which could result in an estimated annual economic value of \$1.2 billion for California. Food recovery will also generate cost savings in avoided tipping fees, estimated at \$25 million in 2020 and increasing to \$50 million in 2025 (assuming a tipping fee of \$45).

Given the variability in methods that can be used to achieve California’s food recovery targets and the uncertainty surrounding costs and scalability, the analysis assumes that food recovery will have no net impact on the California economy. Because potential revenues and avoided tipping fees outweigh costs of achieving a 20 percent food recovery target (as estimated at a national level), this is a conservative approach.

Based on this information, Table 4 below summarizes the estimated costs associated with edible food collection.

Table 4: Annual Food Rescue/Recovery Costs, 2019-2025 (\$ Millions)

Year	Annual Investment	Business Profit Potential (Food Waste Savings)	Household Savings	Avoided Landfill Tipping Fees	Potential Net Economic Benefit
2019	\$200	\$228	\$1,200	\$20	\$1,248
2020	\$200	\$228	\$1,200	\$25	\$1,253
2021	\$200	\$228	\$1,200	\$30	\$1,258
2022	\$200	\$228	\$1,200	\$35	\$1,263
2023	\$200	\$228	\$1,200	\$40	\$1,268

¹³ A Roadmap to Reduce U.S. Food Waste by 20 percent is available for download at: <http://www.refed.com/download>. The 20 percent reduction in food waste includes 27 strategies to reduce food waste including prevention, recovery, and recycling.

2024	\$200	\$228	\$1,200	\$45	\$1,273
2025	\$200	\$228	\$1,200	\$50	\$1,278

3.3. Direct Cost Impact of Requirements related to Education, Enforcement, Contamination Monitoring, Reporting, Capacity Planning, Procurement

CalRecycle surveyed jurisdictions and entities with experience implementing activities to obtain input on some of their processes and estimated costs, specifically for education, enforcement, contamination monitoring, reporting, capacity planning, and procurement. Table 5 mentions survey results when used in calculations. Cost estimates are summarized in Table 5 below and discussed in additional detail in the sections that follow.

Table 5: Summary of Statewide Direct Cost Estimates for Impact of Requirements related to Education, Enforcement, Contamination, Monitoring, Reporting, Capacity Planning, Procurement (Million Dollars)

Entity	Activity	Cost Estimate				
		2022	2023	2024	2025	Beyond
Organic waste haulers	Contamination monitoring	78	78	78	78	78
	Contamination reporting	8	8	8	8	8
Edible food recovery organizations	Edible food recovery reporting	4	4	4	4	4
Solid waste facilities	Reporting	0.7	0.7	0.7	0.7	0.7
	Load checking	54	54	54	54	54
	Contamination monitoring	52	52	52	52	52
	Application of an additional 2 feet of cover	30	30	30	30	30
	Preparation of status impact reports	0.1	0.1	0.1	0.1	0.1
Generators of edible food	Participation in edible food recovery	7	0.7	0.7	0.7	0.7
Local government	Capacity planning	2	2	2	2	2
	Education and outreach for organic waste recycling & edible food recovery	244	33	33	33	33
	Adjustment of franchise agreements	20	0	0	0	0
	Enforcement	91	91	31	31	31

	Procurement of renewable natural gas	14	19	19	19	0
	Procurement of compost	25	25	25	25	25
	Coordination of edible food recovery programs	2	2	2	2	2
	Reporting	4	3	3	3	3
Non-local entities and local education agencies	Participation in edible food recovery	29	7	7	7	7
	Total	665	410	350	350	350

3.3.1. Estimated Impacts for Operators: Organic Waste Haulers and Edible Food Recovery Organizations

Under the proposed regulations, organic waste haulers will need to monitor contamination of organic waste containers at the time of collection, and report contamination data to jurisdictions.

3.3.1.1. Contamination Monitoring

CalRecycle conducted a survey to estimate haulers’ costs for contamination monitoring of organic waste loads at the point of pick up. A hauler already conducting the practice estimated that a bin check took 5 seconds, each customer had 3 bins that needed checking, there were 167,000 customers with bins, bin checks were conducted once a week, and labor costs were \$45 per hour, resulting in a cost of \$1.6 million per year. CalRecycle then used this cost estimate to calculate a per capita cost and extrapolate that statewide, resulting in an annual statewide cost of approximately \$78 million for contamination monitoring by organic waste haulers. The cost of reporting contamination data to jurisdictions was estimated to be 10 percent of contamination monitoring costs, or \$8 million annually.

3.3.1.2. Reporting

Under the proposed regulations, edible food recovery organizations will need to report to jurisdictions data pertaining to edible food recovery. To estimate edible food recovery organization reporting costs, an estimate of the number of edible food recovery organizations that would need to report (approximately 500) was obtained from the California Association of Food Banks, and three food recovery organizations that already track donations were surveyed to obtain cost estimates for annual reporting. The average of the three estimates was \$8,000 per year per organization, which, when applied to the 500 food recovery organizations, equated to an annual estimated statewide cost of about \$4 million.

3.3.2. Estimated Impacts for Solid Waste Facilities

Under the proposed regulations, solid waste facilities will be required to report to CalRecycle tonnages of organic waste processed. Solid waste facilities and stakeholders were surveyed to obtain estimates on the amount of time needed to conduct various tasks including tracking and compiling data, submitting reports, and receiving training. The amount of time needed for each task was then multiplied by the average estimated hourly wage obtained through surveys (\$30.33/hour). Statewide

solid waste facility reporting estimates totaled \$700,000 for the first year and \$600,000 for each subsequent year.

The proposed regulations also would require solid waste facilities to conduct additional activities:

- transfer stations and landfills will be required to conduct load checks and samples of material
- transfer stations and composting/anaerobic digestion facilities will be required to monitor for incoming and outgoing material contamination, and
- landfills will be required to prepare organic disposal status impact reports and, under specified conditions, if no solid waste has been deposited in the landfill within 30 months, apply an additional 2 feet of long-term intermediate cover for a total of 3 feet of cover.

CalRecycle staff surveyed solid waste facilities to obtain information on the time required to conduct each activity, as well as the hourly wages of the landfill staff who would conduct the activity. Based on the number of each type of solid waste facility in CalRecycle's Solid Waste Information System, CalRecycle then aggregated the costs of the activities relevant to each facility. This resulted in an estimated total statewide annual cost of \$137 million.

3.3.3. Estimated Impacts for Medium and Large Generators of Edible Food

Under the proposed regulations, medium and large generators of edible food will be required to participate in edible food recovery activities. These activities will include handling and collecting edible food, purchasing any needed equipment, and implementing food donation systems. These costs were estimated by surveying different types of generators (supermarkets, hotels, hospitals, large venues, and schools) for their estimates of start-up costs. The number of establishments this would apply to was estimated using the National American Industry Classification System. CalRecycle then assumed that ongoing costs would be 10 percent of start-up costs. Based on this, estimated annual statewide start-up costs are \$7 million in the first year and estimated ongoing costs are \$700,000 thereafter.

3.3.4. Estimated Impacts for Local Governments, Non-Local Entities, and Local Education Agencies

Under the proposed regulations, local governments will need to:

- conduct capacity planning
- conduct education and outreach to inform generators about organic waste recycling and edible food recovery requirements and conduct follow-up education to generators exceeding acceptable contamination rates
- adjust franchise agreements with haulers to include organic waste collection and recycling
- oversee and conduct enforcement on generators, haulers, and other entities subject to their jurisdiction
- procure compost or renewable natural gas
- coordinate new and expanded food recovery programs
- report to CalRecycle

In addition, non-local entities (e.g., special districts, federal facilities, prisons, state agencies) and local education agencies also will need to meet specified requirements.

3.3.4.1. Capacity Planning

Capacity planning cost estimates took into account the time needed for jurisdictions to consult with existing infrastructure, disadvantaged communities, law enforcement agencies, and member cities, and to report to CalRecycle annually. A survey of jurisdictions was conducted to estimate the cost of

completing an annual organic waste recycling and edible food recovery capacity analysis. A per capita cost was calculated for each jurisdiction and then averaged across jurisdictions. The average per capita cost was then multiplied by the total state population to generate an estimate of \$2 million annually.

3.3.4.2. Education and Outreach

Educational outreach includes creation of websites and signage, recycling campaigns for residential generators, staff trainings, graphic design, printing, postage, and the hiring of marketing and/or public relations consultants. Under the proposed regulations, jurisdictions will provide samples and templates of signage and flyers as well as links to posters and guides to property owners. If property owners use these templates, their costs will be zero to minimal. Jurisdictions were surveyed to obtain cost estimates for residential and commercial education on organic waste recycling. An average per capita cost was calculated and multiplied by the state's population. This resulted in a statewide cost of \$234 million for organic waste recycling education for the first year. For subsequent years, CalRecycle assumed costs would decline to 10 percent of the first-year costs (i.e., to \$23 million statewide). Similarly, edible food recovery education and outreach, which includes a smaller pool of generators, is estimated to be \$10 million annually.

3.3.4.3. Adjustment of Franchise Agreements

To estimate the cost of adjusting franchise agreements with organic waste haulers, an initial estimate based on a given number of residents was obtained from a consultant involved in developing these types of agreements. That number was then used to calculate a per capita cost and applied to the statewide population to generate a one-time cost of \$20 million for the year 2022.

3.3.4.4. Enforcement

To estimate jurisdiction enforcement costs under the proposed regulations, CalRecycle used data from existing enforcement agency programs and its own tire enforcement and extended producer responsibility programs. To determine reasonableness, the estimates were then compared to costs reported in surveys of jurisdictions, such as Alameda, that are implementing mandatory enforcement programs for commercial recycling programs.

Jurisdiction enforcement costs were first estimated for the years of 2022 and 2023, which are the first years that jurisdictions will be required to conduct inspections of all regulated commercial businesses. The costs will be the highest in the first two years because jurisdictions will need to do an initial assessment of all of the businesses. Therefore, for the purposes of estimating the highest potential cost, CalRecycle has estimated the costs for one inspection for 50 percent of the businesses in each of the first two years. Jurisdictions can conduct inspections or account reviews or audits to determine compliance, which is much less time consuming. CalRecycle estimates the cost for an on-site inspection would be much higher than a review of the accounts, which can be done in the office. A cost estimate per inspection is based upon CalRecycle's Enforcement Agency methodology (i.e., an existing standardized methodology for assigning enforcement agency costs). CalRecycle determined the number of businesses that would be inspected by using data reported for the number of businesses regulated under AB 341 and AB 1826 (under these statutes, businesses include commercial, state agencies [state, federal, local, schools, colleges, universities], and multi-family complexes). This data was used because the proposed regulations require that these same entities be subject to the inspections; other entities that would be required to recycle under the proposed regulations, such as single-family households, would not be subject to inspections. An estimate of new businesses that will start up when the regulations are in place also was included in the costs, since these will require a first inspection.

Based upon this, CalRecycle estimates that 320,000 businesses would be subject to inspection by jurisdictions. Based on information from other enforcement programs (such as tire enforcement) about the number of hours per inspection, CalRecycle then estimated that it would require approximately 700,000 city/county staff hours to perform enforcement activities on these businesses. This may be an underestimate, because some jurisdictions may choose to conduct a higher number of inspections than the frequency required in the proposed regulations; this is not accounted for in the estimates. The number of staff hours then was multiplied by CalRecycle Enforcement Agency staff's pay rate for Fiscal Year 2017/18 (\$120/hour) to generate a cost estimate of about \$84 million per year. CalRecycle also estimated that travel costs associated with conducting inspections would total about \$6.4 million per year. Summing these two cost estimates resulted in total jurisdiction enforcement costs of \$90 million per year for the first two years. Furthermore, all businesses will be inspected within the first two years of implementation of the regulations, so costs will be highest for calendar years 2022 and 2023. CalRecycle assumed that ongoing costs after this would then be one-third of annual costs (i.e., \$30 million per year) since initial inspection activities would be complete and rates of non-compliance would likely be lower and require less compliance monitoring and enforcement. This assumption regarding rates of non-compliance is based upon the trends in non-compliance that CalRecycle has observed for AB 341 and AB 1826, and so the cost estimate may be too high depending on actual compliance levels. In addition, by 2022 the compliance rate for businesses subject to AB 341 and AB 1826 may have improved, so the rate of re-inspections could end up being lower if compliance rates are higher in 2022.

This statewide cost estimate does not include penalties or penalty activities. Jurisdictions may impose penalties starting in 2024. It is not possible to predict penalty processes since every jurisdiction will have its own process, thus the cost estimate does not reflect costs or revenues from penalties.

In addition to these costs, CalRecycle estimates that there would be an additional annual statewide enforcement cost of \$1 million pertaining to the inspection of solid waste facilities by local enforcement agencies. This cost was calculated using data from the Solid Waste Information System (i.e., the number of solid waste facilities that would require inspections, and the number of solid waste facility inspections that were conducted in 2016), estimates from staff that an inspection would take about an hour, and the CalRecycle Enforcement Agency staff pay rate of \$120/hour.

3.3.4.5. Procurement of Renewable Natural Gas for Fleets

CalRecycle staff estimated the cost of having 20 percent of the fuel consumed by heavy-duty solid waste and recycling vehicles be in-state waste-derived RNG, which represents an upper-bound scenario. The amount of RNG needed to fuel 20 percent of fleets was equivalent to approximately 21 million diesel gallon equivalents (DGEs) of RNG. About 11 million DGEs of the RNG procured by haulers would replace fossil-derived clean natural gas (CNG) being used in existing vehicles, while 1,640 diesel trucks would need to be retrofitted with capabilities to consume RNG in order to use the remaining 10 million DGEs. Currently, the costs of RNG, CNG, and diesel are comparable, so CalRecycle assumed that the procurement of RNG would not result in a change in fuel costs. CalRecycle estimated that upgrading a heavy-duty vehicle from diesel to RNG would cost \$43,000 per truck and, therefore, upgrading 1,640 trucks would cost about \$71 million. CalRecycle then assumed that truck upgrades would take place over 4 years (beginning in 2022 and going through 2025), and after 2025, this activity would not incur any additional costs on haulers.

3.3.4.6. Compost Procurement

In order to estimate the potential need for compost by local governments, one necessary data point is approximately how much land is owned and operated by these entities. That specific statistic is not available; however, the Trust for Public Land has calculated the acres of parkland in the 16 largest cities

in California, which together account for approximately 30 percent of the state's population.¹⁴ From these data, CalRecycle included city parks, county parks, special districts, and state conservancies, but excluded state parks and state recreation areas, as well as federally run parks, reserves, and preserves. Parklands could include city hall grounds and other municipal complexes with landscaping, parklands, ballfields, parking lots, playgrounds, and other areas which might see little or no compost use. Parklands also potentially include naturalistic areas where compost use might occur infrequently or not at all. Schools are not included.

From the acreage and population statistics supplied by the Trust for Public Land, CalRecycle calculated the average parks acreage per capita for the entire state, and adjusted this to account for population growth using projections from the Department of Finance. For purposes of this cost estimate, CalRecycle assumed that 2 percent of all parklands (approximately 10,000 acres) would be treated with compost. The rates of application for compost match the minimum application standards for new landscaping projects in the California Department of Water Resources' Model Water Efficient Landscape Ordinance.

The resulting compost application rates of 850,000 and 858,000 tons of finished compost for 2022 and 2025, respectively, represent slightly more than 26 percent of the total estimated current compost production statewide. Compost was valued at \$30 per ton, resulting in an annual statewide cost for compost procurement of \$25 million. Estimated costs included costs related to delivery and spreading.

3.3.4.7. Coordination of Food Recovery Programs

Jurisdictions already performing coordination for edible food recovery were surveyed to obtain a cost estimate for coordinating expanded food recovery programs. A per capita cost was calculated for each jurisdiction, averaged, and then applied to the statewide population, resulting in an annual statewide cost of about \$2 million.

3.3.4.8. Reporting

Local governments will be required to report a range of information to CalRecycle. However, while this will entail collecting and reporting new information, all jurisdictions in the state already have a process in place for reporting to CalRecycle, so some fixed costs associated with reporting are already in place. CalRecycle surveyed jurisdictions currently implementing organic waste collection programs to obtain estimates of additional start-up reporting costs, as well as on-going reporting costs. A per capita cost was calculated for each jurisdiction, and an average per capita cost was calculated and applied to the total state population. Based on this, CalRecycle estimates that statewide start-up reporting costs will total about \$4 million per year and ongoing reporting costs will total about \$3 million per year.

3.3.4.9. Estimated Impacts for Non-Local Entities and Local Education Agencies

To estimate the cost of having non-local entities and local education agencies participate in edible food recovery collection programs, a list of entities that would fall into this category was created, surveys were conducted to generate cost estimates, and then the costs were applied to the total number of regulated entities.

¹⁴ The Trust for Public Land, "City Park Facts," 2017. <https://www.tpl.org/2017-city-park-facts#sm.0009gnph8y7pfpc11eu14j8t9nqww>

3.3.4.9.1. State and Federal Government

The probable list of state agencies/facilities that would have edible food recovery includes public universities and colleges, hospitals, state correctional facilities, state parks districts, district agricultural associations (fairs), Department of General Services (because of its role in leasing and operating buildings) and Department of Rehabilitation (because of its role in overseeing cafeteria staffing and operation in public buildings). The list of federal agencies included the U.S. General Services Administration, the military, national parks service, and the federal prison system because of the buildings these entities operate in California. Surveys were conducted of University of California campuses, California state universities and California community colleges that have edible food recovery programs. Also, a survey was conducted with fairs, parks districts, hospitals, and a few state office buildings. Based upon the surveys, the costs associated with edible food recovery consist of food donation containers to maintain and transport the food, staff training, and time for staff to collect the edible food and coordinate with a food recovery organization.

Based upon the surveys for universities/colleges, the number of staff hours needed to collect the food and coordinate with a food recovery organization ranged from 10-15 hours/week in the first year. The average of 12.5 hours/week was used and multiplied by 52 weeks for the year. This will be a consistent amount of time and cost for each year thereafter. This may be a high estimate since there may be weeks when food establishments on campuses are closed. The estimated costs for universities/colleges was then applied to the total number of universities/colleges in California (see table 6 below).

Respondents to the State Fair (Cal Expo), parks districts, hospitals, and state office building survey stated that the cost would be minimal and the activity could be integrated into daily duties. The estimates were averaged for a total of \$109 per year, per entity. This average cost was then applied to the total state agencies/facilities/federal facilities (see table 6 below). The cost may be higher or lower for any particular state agency/facility depending on a variety of factors (e.g., if they already have refrigerators, reuse existing food containers, etc.). For example, Cal Expo has an onsite farm that produced 16,000 pounds of edible food donations. Collecting the edible food is integrated into daily maintenance and upkeep duties and coordinating with a food recovery organization requires negligible additional time (e.g., the employee would collect the food either way and it would either be put in disposal container or put in a container for the recovery organization).

3.3.4.9.2. Schools/School Districts:

California Department of Education website resources were used to obtain the number of K-12 public schools in California, the result being 10,633 public schools. A survey was conducted of schools to estimate the cost to recover edible food. For example, Oakland Unified school district was surveyed, resulting in a cost estimate of \$2,300 for the first year for start-up costs. CalRecycle then assumed that all schools would need to purchase mini-chest freezers, a supply of cold packs, and a refrigerator. This assumption likely results in an overestimate of costs, since some schools already have this equipment on site. CalRecycle assumed that ongoing statewide costs would be 10 percent of start-up costs (i.e., approximately \$2.4 million per year) (see Table 9 below).

The total number of state and federal entities/facilities was multiplied by the corresponding cost estimate, resulting in a total statewide startup costs of about \$29 million and ongoing costs of about \$7 million.

Table 6: Summary of Statewide Direct Cost Estimates for Impact of Requirements for Edible Food Recovery for Non-Local Entities and Local Education Entities

State and Federal Government Entities/Facilities	Number of Entities/Facilities	Start Up Costs	Start Up Total	Ongoing Annual Total
Public Schools K-12	10,633	\$2,300	\$24,456,000	\$2,446,000
CA Colleges/Universities (UC, CSU, Community)	160	\$26,000	\$4,160,000	\$4,160,000
Other CA State Entities/Facilities (Fairs, Veterans Homes, Hospitals, Corrections, Park Districts)	130	\$109	\$14,200	\$1,420
Federal Facilities in CA	64	\$109	\$6,976	\$697
Total			\$28,637,000	\$6,608,000

Fiscal impacts to CalRecycle and CARB are discussed in Section 7.

3.4. Direct Costs on Individuals

Based on the Direct Impact Model and summary of total statewide costs, CalRecycle estimates the direct costs to individuals to be about \$17 per household per year after full implementation. Any indirect or induced costs or savings on individuals, such as increases in consumer prices or businesses passing increased direct costs onto consumers, are discussed further in the Economic Impacts section below (Section 4).

3.5. Direct Costs on Typical Businesses

CalRecycle estimates that approximately 380,000 regulated businesses (including commercial businesses, state and federal agencies, schools, colleges, and universities) will be subject to potential costs as a result of the proposed regulations. Based on the Direct Impact Model and summary of total statewide costs, CalRecycle estimates that the average direct cost to a typical business will be about \$662 annually. It is reasonable to assume that over time these direct costs will be passed through to consumers via increases in consumer prices of goods and services. This is discussed in the Economic Impacts section below (Section 4).

3.6. Direct Costs on Small Businesses

Of the approximately 380,000 businesses that would be regulated under the proposed regulations, the majority of these are considered small businesses. CalRecycle estimates the cost on small businesses to be about \$662 annually. The costs for an individual business will vary significantly, as the cost will depend on the amount of organic waste that is currently disposed, and the ability of the business to reduce the amount of organic disposal.

4. Economic Impacts

4.1. Methodology for Determining Economic Impacts

To estimate indirect and induced economic impacts, CalRecycle consulted with Regional Economic Models, Inc. (REMI), and used its analytical tool— a single-region, 160-sector model that has been modified to include California-specific data (for population, demographics, and employment) as specified by the Department of Finance (DOF). The REMI Policy Insight Plus model (Version 2.1.1) employed for this analysis was “Software Build 4597” (May 8, 2017). The REMI model was chosen because it is a robust analytical tool that allows a California-specific comparison of current market conditions (baseline) to projected market conditions under the proposed regulations in order to

calculate their economic impact. The REMI analytic tool models a regional economy and analyzes year-by-year impacts, which can be aggregated to total multi-year impacts. Specifically, it estimates economic impacts of the proposed regulations on businesses, the costs and benefits to individuals, and impacts to the state economy as a whole.

This economic analysis of the proposed regulations encompasses the time from January 1, 2019 through the 12 months after the estimated date the proposed regulations will be fully implemented (2026), as estimated by CalRecycle. The baseline is assumed to be existing conditions (i.e., no regulations in place) as forecasted by DOF through 2026, the study period that covers full implementation of the regulations, and beyond to 2030.

4.2. Inputs of the Assessment

The policy variables used in the analysis were Consumer Price, Industry Sales, and State and Local Government Spending. The Consumer Price variables were used to change the price for goods in many consumption categories; the Industry Sales variables were used to increase output for the Construction, Waste Management and Remediation Services, and Truck Transportation sectors; and the State and Local Government Spending variable was used to change the level of State Government Spending.

The projected costs of the proposed regulations were estimated through 2030. They were split among consumers, private industry, and the government according to their proportional demand for the Waste Management and Remediation Services sector. Each of these groups of costs pass through the economy in their own unique ways, which combine to produce the total cost.

Total demand for the Waste Management and Remediation Services sector is estimated to comprise 84 percent from private industry, 16 percent from consumers, and a much smaller residual amount (approximately 0.1 percent) from government. These percentages were generated by calculating the proportion of Intermediate Demand (private industry), Local Consumption Demand (consumers), and Government Demand for the Waste Management and Remediation Services sector in 2020.

The increase in costs to consumers is captured by increases in Consumer Price across many consumption categories. The magnitude of the price change for each consumption category is proportional to the demand it generates for the Waste Management and Remediation Services sector. For example, the Water Supply and Sanitation consumption category generates the largest demand for that sector—approximately 19 cents for every dollar spent

The increase in costs to private industry is assumed to pass through completely to consumers, so it is also entered into the model via an increase in Consumer Price. These increases in Consumer Price have several impacts, including decreases in real disposable income, migration, and consumption.

The increase in costs to government is captured by a decrease in State Government Spending. This reflects the fact that the increased costs leave the state government with less money to spend on other expenditure categories. This decrease in State Government Spending has several impacts, including decreases in output and employment and changes in compensation.

The impacts of the proposed regulations are simulated in REMI using the variables listed in Table 7 below. They reflect the changes in costs above as well as the changes in purchases, revenues, and taxes resulting from the increased diverted tonnage that was previously destined for landfills but that instead will now be hauled to organic waste processing and recycling facilities.

Table 7: Variables Used in the REMI Macroeconomic Model

Var #	REMI Macro Category	NAICS Category
	Consumer Price from Producer and Consumer Categories	
1	Consumer Price	New motor vehicles
2	Consumer Price	Furniture and furnishings
3	Consumer Price	Household appliances
4	Consumer Price	Glassware, tableware, and household utensils
5	Consumer Price	Tools and equipment for house and garden
6	Consumer Price	Video, audio, photographic, and information processing equipment and media
7	Consumer Price	Sporting equipment, supplies, guns, and ammunition
8	Consumer Price	Sports and recreational vehicles
9	Consumer Price	Musical instruments
10	Consumer Price	Therapeutic appliances and equipment
11	Consumer Price	Books, educational and recreational
12	Consumer Price	Luggage and similar personal items
13	Consumer Price	Telephone and facsimile equipment
14	Consumer Price	Alcoholic beverages purchased for off-premises consumption
15	Consumer Price	Food produced and consumed on farms
16	Consumer Price	Men's and boys' clothing
17	Consumer Price	Children's and infants' clothing
18	Consumer Price	Other clothing materials and footwear
19	Consumer Price	Motor vehicle fuels, lubricants, and fluids
20	Consumer Price	Fuel oil and other fuels
21	Consumer Price	Pharmaceutical and other medical products
22	Consumer Price	Recreational items
23	Consumer Price	Household supplies
24	Consumer Price	Personal care products
25	Consumer Price	Tobacco
26	Consumer Price	Magazines, newspapers, and stationery
27	Consumer Price	Water supply and sanitation
28	Consumer Price	Membership clubs, sports centers, parks, theaters, and museums
29	Consumer Price	Other recreational services
30	Consumer Price	Purchased meals and beverages
31	Consumer Price	Food furnished to employees (including military)
32	Consumer Price	Postal and delivery services
33	Consumer Price	Professional and other services
	Government - Decrease in Government Spending	
34	State and Local Government Spending	State Government
	Benefits	
35	Industry Sales (Exogenous Production)	562 - Waste management and remediation services
	Value Added Removed (Assuming no profits)	
36	Value Added with no effect on Sales or Employment	562 - Waste management and remediation services
	Amount subtracted from consumer price table	
37	Consumer Price Table Reduction	

These variables reflect the changes in costs and revenues resulting from the increased diverted tonnage that previously was destined for landfills but that instead will now be hauled to organic waste processing and recycling facilities. The model specifications required to appropriately reflect the expected industry and household responses are complex.

4.3. Assumptions and Limitations of the Model

The REMI model’s estimated economic impacts of the proposed regulations are sensitive to assumptions made by CalRecycle. The following are the key assumptions that CalRecycle made for the purposes of modeling the proposed regulations in REMI:

- 1) The primary impacted industry is the Waste Management and Remediation category (NAICS 562 in REMI).
- 2) The financing assumptions for infrastructure capital for building facilities and the associated major facility equipment uses a 10-year amortization and 7 percent interest rate as modeled by the CARB Short-Lived Climate Pollutants report. For collection and transportation equipment, a 5-year amortization with 8 percent interest rate is used to model the shorter lifespan of that rolling stock equipment.
- 3) Equipment purchases by state and local government are not modeled in REMI. The REMI model does not adjust tax collection in response to changes in spending. Thus, increased spending by government does not accurately reflect the benefits to the economy when modeled in REMI.

4.4. Results of the Assessment

4.4.1. California Employment Impacts

The REMI model estimates that Total Employment added reaches approximately 17,000 jobs during peak construction, but then reduces to an additional 11,700 jobs by 2030 (see Table 8 below). If these changes are viewed as percent changes over BAU, the changes are essentially 0.04 to 0.07 percent and therefore are minor in the overall economy. The model is unable to discern the additional employment that is generated by the industry of compost processing because there is not a specific NAICS code for this industry. If the expected number of new jobs arising from the composting and digestion facilities is included as direct impacts, the REMI model would overestimate the total impact of the additional jobs and the related income from that employment.

The number of jobs in the category of Waste Management and Remediation Services is shown to increase over all years of the analysis period. This is an expected outcome of the proposed regulations. The employment in this category is expected to increase an average of 8.5 percent from the period of 2019-2030. The increased jobs in Waste Management and Remediation Services averages accounts for roughly one-third of the total jobs added as a result of this regulation. The details are shown in Table 8 below:

Table 8: Impact on Total Employment in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Waste Mgmt & Remed. Svcs.	% change	5.74%	6.11%	7.25%	8.55%	9.66%	10.70%	10.60%	9.92%	9.30%	8.71%	8.21%	7.88%
Waste Mgmt & Remed. Svcs.	1000s	2.961	3.169	3.782	4.489	5.11	5.703	5.69	5.36	5.053	4.763	4.516	4.361
Total Employment	% change	0.04%	0.04%	0.05%	0.06%	0.06%	0.07%	0.07%	0.06%	0.06%	0.05%	0.05%	0.05%
Total Employment	1000s	8.359	9.406	11.677	13.672	15.422	16.991	16.452	15.315	14.306	13.365	12.489	11.676

The estimates of the jobs created are in the range that has been projected in other studies on jobs related to recycling. In July 2013, CalRecycle published a report that examined the potential for job creation through expanded recycling. The report was titled *AB 341’s 75 Percent Goal and Potential New Recycling Jobs in California by 2020*. This report cited two other studies that presented estimates of the jobs created through recycling of compost and miscellaneous organic waste. The 2010 report published by Tellus Institute, *More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.*, estimated that one job was created for each 2,000 tons of compostable materials managed. CalRecycle estimates that 8.6 million tons of additional compostable/digestible organic waste will be recycled in 2025 and each

year thereafter, resulting in 4,300 new jobs in Waste Management and Remediation Services. This estimate alligns very closely with the number of jobs estimated for this sector by the REMI model, which projects around 4,500 jobs by the end of the construction phase.

An alternative study prepared in 2009 by DSM Environmental Services, Inc., *Recycling Economic Information Study Update: Delaware, Maine, Massachusetts, New York, and Pennsylvania*, estimated the jobs ratio at 1.18 per one thousand tons processed.

4.4.2. Impacts on California Business and Investments in California

The net impacts of the proposed regulation on California Business Output (Private non-Farm) are both small and positive. In terms of percent change, the overall economic impact of the proposed regulations is minimal, ranging from 0.04 to 0.08 percent change. In comparison to Total Employment, the absolute levels show changes very similar to the increases in the Total Employment as enumerated above. The values are shown in Table 12 below:

Table 9: Impact on California Businesses and Investment

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Business Output (P N-F)	% change	0.04%	0.04%	0.05%	0.06%	0.07%	0.08%	0.07%	0.07%	0.06%	0.06%	0.05%	0.05%
Business Output (P N-F)	\$Billions	1.513	1.682	2.094	2.492	2.849	3.185	3.13	2.947	2.788	2.642	2.509	2.392

4.4.3. Impacts on Individuals in California

Individuals will face an increase in the price of goods based on increased business costs related to organic waste recycling. This is evidenced in the increase in Total Wages and Salaries. The Total Wages and Salaries increase very modestly, a smaller increase than the increase in Total Employment. The Proprietors’ Income shows a very small decrease as a result of the costs imposed upon these establishments due to the proposed regulations. These are shown in Table 13 below:

Table 10: Impact on Individuals in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Wages and Salaries	% change	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
Total Wages and Salaries	\$Billions	0.276	0.192	0.203	0.204	0.199	0.200	0.178	0.144	0.114	0.083	0.054	0.033
Proprietors' Income	% change	0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%
Proprietors' Income	\$Billions	0.026	0.011	0.010	0.003	(0.005)	(0.011)	(0.021)	(0.028)	(0.033)	(0.038)	(0.043)	(0.048)

4.4.3.1. Health Impacts from Recycling Facilities

Many state programs are attempting to stimulate the reduction of organic waste disposal and associated development of additional organic waste recycling facilities. For example, some Climate Change Investment funding is used to finance new organic waste recycling facilities and edible food recovery programs. As this infrastructure grows, CalRecycle recognizes that many of the issues associated with landfilling organic waste—e.g., potential criteria pollutant emissions, water quality impacts, and odors—could be issues at anaerobic digestion or compost facilities. These can be effectively limited with available technologies and best management strategies, for example, by utilizing zero emission vehicles or renewable natural gas in low-NO_x engines associated with these operations. In addition, almost all new composting facilities will use an aerated static pile process, some will incorporate biofilters, and all will have to meet California State Water Resources Control Board regulatory standards that are already in place such as working pads, lined ponds, and stormwater berms. Nevertheless, positive and negative impacts can be expected from the recycling facilities that are needed to meet the statute’s goals.

4.4.3.1.1. Air Quality Impacts from New Facilities

To assess health impacts associated with PM2.5 and NOx emissions from these facilities, CalRecycle worked with the CARB to:

1. Determine PM2.5/NOx emissions per ton of material, based upon existing facilities;
2. Estimate number of facilities for 2025 and where they will be located in each air basin;
3. Estimate the change in health outcomes associated with changes in NOx and PM 2.5 emissions resulting from the increase in recycling facilities;
4. Use this health outcome information in REMI to estimates costs for ER/Hospital.

The criteria pollutant inventory for the anticipated new facilities in each air basin throughout the state showed a net pollutant emission reduction compared to BAU of landfilling the organic materials. While composting showed a significant increase in PM2.5 due to increased ammonia emissions from composting (a precursor for particulate matter formation), the PM2.5 emissions for composting did not exceed those for the same tonnage in a landfill environment. This is attributed primarily to landfill combustion pollutants (both PM2.5 and NOx) associated with the flares and landfill gas recovery systems that are present at landfills. These combustion pollutants are not present with the alternative organic waste management technologies of composting, in-vessel digestion, and chip and grind. Table 11 below shows the results of the criteria pollutant inventory for the anticipated new facilities due to the proposed regulations.

Table 11: Summary of Criteria Pollutant Inventory for New Facilities
(All emissions data are in tons per year)

Air Basin	Total New Facility Emissions of NO _x (Anaerobic Digestion + Compost + Chip and Grind)	Total New Facility Emissions of PM _{2.5} (Anaerobic Digestion + Compost + Chip and Grind)	BAU Landfill NO _x	BAU Landfill PM _{2.5}	Net SB1383 Emissions of NO _x (Total New Facility - BAU Landfill)	Net SB1383 Emissions of PM _{2.5} (Total New Facility - BAU Landfill)
South Coast	62	3261	7458	5597	-7396	-2337
San Francisco Bay	20	1035	2521	1892	-2501	-858
San Joaquin Valley	15	762	1986	1490	-1971	-728
San Diego County	14	748	1699	1275	-1685	-527
Sacramento Valley	9	462	1110	833	-1101	-371
South Central Coast	8	394	961	721	-952	-327
Mojave Desert	6	246	589	442	-583	-196
North Central Coast	4	189	500	375	-496	-186
Salton Sea	1	53	120	90	-119	-37
Lake County	1	13	33	25	-32	-12
Mountain Counties	1	11	26	20	-25	-8
Great Basin Valleys	1	9	20	15	-19	-6

Northeast Plateau	1	4	11	8	-10	-4
North Coast	0	0	0	0	0	0
Lake Tahoe	0	0	0	0	0	0
Statewide Totals:	145	7186	17034	12784	-16889	-5599

The results of this air quality aspect of the health impacts analysis take into consideration the air quality improvements over baseline conditions as documented in the State Implementation Plans for non-attainment air basins. The results of the analysis indicate that the proposed regulations are expected to provide direct health benefits to individuals through the reduction of PM_{2.5} emissions. Reduction of PM_{2.5} emissions have been directly correlated with a reduction in the risk of premature deaths and hospital visits, especially for sensitive groups such as children, elderly, and people with chronic heart or lung disease.

To estimate the health benefits from emission reductions from the proposed regulations, staff used CARB’s incidents-per-ton (IPT) methodology¹⁵. This methodology is used to quantify the health benefits of directly emitted (primary) and secondary PM reductions due to regulatory controls. It is similar in concept to the methodology developed by the US EPA for similar estimations.¹⁶ The basis of the IPT methodology is the approximately linear relationship that exists between changes in emissions and estimated changes in health outcomes. In this methodology, the number of premature deaths is estimated by multiplying emissions by a scaling factor, the IPT factor. The IPT factor is derived by calculating the number of incidents (premature deaths, hospitalizations, emergency room visits) associated with exposure to PM from a specific source, using concentration-response functions, described below, and dividing by the emissions of that PM source. IPT factors are calculated separately for each air basin by dividing the number of incidents in each air basin by primary PM emissions from that air basin:

$$IPT = \frac{\text{number of incidents (deaths, hospitalizations, etc.) in air basin}}{\text{annual emissions in air basin (tons/year)}}$$

Calculation of the change in premature death and other impacts associated with changes in PM exposure requires concentration-response functions (CRF), population data, baseline incidence rates, and the change in concentration of PM.¹⁷ Calculations are performed separately for each 2010 census tract and age bracket and then aggregated to totals by air basin. Population is aggregated into 5-year age brackets from ages 30 to 80, and an 85+ age bracket. Following recent U.S. Environmental Protection Agency practice, CRFs from Krewski et al. (2009)¹⁸ are used for premature death, CRFs from

¹⁵ CARB 2010a. Appendix J of Staff Report, Initial Statement of Reasons for Proposed Rulemaking, “Proposed Amendments to the Truck and Bus Regulation, the Drayage Truck Regulation and the Tractor-Trailer Greenhouse Gas Regulation” (2010)

¹⁶ Fann et al. 2009. The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution. *Air Qual. Atmos. Health.* 2009 Sept.; 2(3): 169-176.

¹⁷ CARB 2010b Estimate of Premature Deaths Associated with Fine Particle Pollution (PM_{2.5}) in California Using a U.S. Environmental Protection Agency Methodology.

https://www.arb.ca.gov/research/health/pm-mort/pm-report_2010.pdf

¹⁸ Krewski et al. 2009. Extended Follow-Up and Spatial Analysis of the American Cancer Society Study Linking Particulate Air Pollution and Mortality. Health Effects Institute Research Report 140.

<https://ephtracking.cdc.gov/docs/RR140-Krewski.pdf>

Bell et al. (2008)¹⁹ are used for hospital admissions, and CRFs from Ito et al. (2007)²⁰ are used for emergency room visits. For premature death, each CRF is assumed to be approximately linear down to a PM2.5 concentration of 5.8 µg/m3, the lowest concentration analyzed in Krewski et al. (2009)¹⁸, and health benefits from reductions in PM below that level are not quantified. Age-specific baseline incidence rates were taken from the Center for Disease Control’s Wonder database. Population was estimated by taking 2010 census data for total population by age bracket and projecting to 2025 using total county population projections from the California Department of Finance. This accounts for overall population growth in a county but does not reflect shifts in the spatial distribution of the population, such as new housing developments built on previously undeveloped land.

A number of sources may contribute to the uncertainty associated with the mortality estimates. The uncertainty ranges given in this report only take into account the uncertainty of the relative risk, which determines how changes in air quality translate into changes in mortality rates. Other factors, such as the uncertainty arising from spatial interpolation, and presence of effect modifiers such as socioeconomic variables and smoking rates that are not included in the health model, also contribute to the variability in mortality estimates. Therefore, the uncertainty ranges in mortality estimates shown in this report understate the true uncertainty.

Table 12 below shows the estimated reduction in mortality, hospitalizations, and emergency room visits associated with the proposed regulations, along with their valuation. A discount rate of 0 was assumed.

Table 12: Cumulative Statewide Avoided Incidence from 2019 to 2025

	Health Outcomes	Valuation (2015 \$USD)
Mortality	530 (420 - 650)	\$4.8 B (3.8 B – 6.0 B)
Hospitalizations (all)	79 (10 - 180)	\$2.2 M (380 K – 7.4 M)
ER visits	220 (140 - 310)	\$65 K (40 K – 87 K)

Values in parentheses represent the 95% confidence interval.

4.4.3.1.2. Water Impacts from New Facilities

Regarding water quality, no model is available to estimate potential impacts. However, anaerobic digestion facilities entail contained in-vessel processes built on working pads, and composting facilities already need to be in compliance with the State Water Resources Control Board’s General Order that provides for groundwater and surface water protections. The General Order sets the minimum standard for groundwater and surface water protections and includes working pads with specified hydraulic conductivity, lined collection ponds, stormwater berms, and monitoring and reporting. Thus, CalRecycle does not anticipate additional infrastructure costs for regulatory compliance beyond what is already required and expects there will not be additional health impact costs due to water quality because of the environmental protections already in place.

¹⁹ Bell et al. 2008. Seasonal and Regional Short-term Effects of Fine Particles on Hospital Admissions in 202 US Counties, 1999–2005. *Am J Epidemiol.* 2008 Dec 1; 168(11): 1301–1310. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2732959/>

²⁰ Ito et al. 2007. Characterization of PM2.5, gaseous pollutants, and meteorological interactions in the context of time-series health effects models. *J Expo. Sci. Environ. Epidemiol.* Vol. 17 Suppl .2: S45-60. <http://www.nature.com/jes/journal/v17/n2s/full/7500627a.html>

Regarding water usage due to expansion of existing organic waste management facilities and construction of new facilities, additional water demand is expected to be minimal. The organic materials being diverted from landfills, especially food waste and green waste, have inherent moisture levels that minimize the need for additional water during processing. Organic materials are blended to balance moisture content for very wet materials by using bulking agents, e.g., carbonaceous organic waste is used in composting with both food waste and green waste for moisture control and carbon to nitrogen ratios. Digestion processing, at either stand-alone digesters or waste water treatment plants, is in contained vessels that rely on moist feedstock to promote anaerobic digestion.

4.4.3.2. Impacts in Disadvantaged Communities

CalRecycle understands the siting of new facilities might affect disadvantaged and low-income communities. These impacts can be negative (e.g., increased traffic, odors, and other emissions, etc.) and positive (e.g., jobs and job training, lesser emissions if recycled materials are from a nearby landfill, etc.). Accordingly, funding from the Climate Change Investment fund that CalRecycle uses to support the development of composting and anaerobic digestion must adhere to the funding guidelines established by CARB pursuant to SB 535 and AB 1550. As part of the grant application for such funding, for example, CalRecycle requires project applicants to engage with potentially affected communities to understand and better address local issues and concerns. In addition, the proposed regulations include provisions for consultation with disadvantaged communities when new or expansions of solid waste facilities are under consideration. Furthermore, the California Environmental Quality Act process will address mitigation of any significant environmental impacts associated with expansion of existing facilities or construction of new facilities through the permitting process.

Although CalRecycle has estimated the general distribution of new facilities based on the scenarios developed by CARB for the SLCP Strategy Plan, CalRecycle cannot predict at this time how many new facilities will be located in or near disadvantaged and/or low-income communities. CalRecycle therefore included the impacts associated with such facilities within the overall estimates of the impacts of these facilities as described above.

4.4.3.3. Impact of Reducing Methane Landfill Emissions

SLCPs are more potent greenhouse gases than carbon dioxide and have significant negative impacts on human health and the climate. Diverting organic waste from landfills to compost facilities and anaerobic digestion facilities, along with implementing food recovery programs, will significantly reduce methane emissions from landfills, many of which are located in or near disadvantaged communities.

Reducing these emissions will have beneficial impacts on climate and public health and will result in avoided social costs. Social costs estimate the health and environmental damage that is avoided by reducing GHGs, as opposed to representing the cost of achieving the GHG reductions.

Since the mid-2000s, numerous federal agencies have estimated the social costs of greenhouse gases, including methane, as part of their regulatory actions. In 2009, the Council of Economic Advisors and the Office of Management and Budget convened the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) to develop a methodology for estimating these social costs. The IWG recommended the use of values using discount rates to account for future values of 2.5, 3, or 5 percent. It then provided estimates of the social costs of methane for the years 2015-2030, using 2007 dollars adjusted into 2015 dollars and multiplied across the range of estimated methane reductions in 2030. Table 16 below shows the IWG's estimates per metric ton of methane:

Table 13: Social Costs of Methane, 2015-2030 (in 2007\$ per Metric Ton)²¹

Year	5 Percent Discount Rate	3 Percent Discount Rate	2.5 Percent Discount Rate
2015	\$450	\$1000	\$1400
2020	\$540	\$1200	\$1600
2025	\$650	\$1400	\$1800
2030	\$760	\$1600	\$2000

https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf

CalRecycle used this approach to estimate the social costs of reducing methane emissions pursuant to the proposed SB 1383 regulations, as follows. The Air Resources Board’s SLCP Reduction Strategy estimated that meeting the SB 1383 organic disposal reduction targets would reduce landfill emissions by 4 MMTCO_{2e} in 2030, and that one year of waste disposal reduction would be expected to avoid 14 MMTCO_{2e} of emissions over the 100-year lifetime of waste decomposition. Taking these values for MMTCO_{2e} and converting (based on global warming potential) to MMT of methane, CalRecycle estimates that meeting the SB 1383 targets would reduce landfill emissions by 56,000 MT of methane in 2030 and that each year of waste disposal reduction would prevent 194,000 MT of methane emissions over the lifetime of waste decomposition, relative to the baseline. CalRecycle multiplied these metric tons of methane reductions with the corresponding year’s social cost values from the above IWG table. Note that this approach to the social cost of methane may overstate the avoided adverse impacts in California because it uses worldwide or global climate damages rather than impacts specific to California.

Based on this, CalRecycle estimates the social cost, using the three discount rates, to range from \$40 million to \$100 million in 2030. For one year of waste over the lifetime of waste decomposition, CalRecycle estimates that the social cost of methane ranges from \$270 million to \$390 million using the 2.5 percent discount rates, \$200 million to \$300 million using the 3 percent discount rates, and \$90 million to \$150 million using the 5.0 percent discount rates. This may actually underestimate avoided social costs, since it does not include the impacts associated with non-methane reductions.

4.4.3.4. Impact of Transportation

The proposed regulations will affect many different entities that will be making decisions about organic waste collection, recycling, and edible food recovery programs, and many of these decisions could result in changes in collection routes. However, it is not possible to predict the types of vehicles and exact changes in Vehicle Miles Traveled (VMT). Instead, for purposes of this analysis, CalRecycle assumes VMT under the proposed regulations will be equal to “business as usual” without the regulation. The rationale for this assumption is based on several considerations:

- Most collected organic materials travel to facilities (whether to landfills for disposal or to composting and digestion facilities for recycling) located in the same air basin because the material is wet, heavy, and bulky and therefore costly to transport great distances. Since almost

²¹ Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, “Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide,” 2016.

https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf

all the tons of organic waste generated in the state are already being collected and transported, CalRecycle assumes potential shifts in transportation will not increase VMT. This assumption is based in part on CalRecycle’s projection of potential infrastructure development in each air basin (see Section 3.1). Under this assumption, the number and frequency of heavy vehicle or truck trips to existing landfills, through neighboring communities, could even potentially be reduced as organic materials are directed to anaerobic digestion facilities and regional compost facilities. However, it also is possible this projection may not be correct and VMT may increase for some locations and thus affect (both positively and negatively) disadvantaged and low-income communities.

- Because of the 20 percent edible food recovery target in SB 1383, CalRecycle expects to see an increase in very localized food recovery. This will result in less organic material being collected and transported longer distances, which could significantly lessen VMT.
- As noted in section 4.4.3.6 below, the SLCP and other statutes and regulations require or encourage conversion of vehicles from diesel to RNG or EV, resulting in fewer criteria pollutants.

Another issue is whether the frequency of collection will increase given different requirements for different materials. CalRecycle does not expect a measurable increase in collection frequency because trash collection will likely decrease while organic waste/food waste collection increases.

In addition, there will be some change in VMT associated with the transport of secondary products from recycling facilities to end-use destination, such as compost going to landscaping and agricultural markets. Although CalRecycle has general information about the distribution of compost and mulch on a regional basis from previous studies, it does not have specific information on transport mileage of such products and how that compares with transport mileage if the feedstock for those materials had instead been transported to landfills for disposal. CalRecycle acknowledges that this type of transport could increase VMT and associated impacts or conversely it could decrease VMTs, but it cannot estimate those impacts at this time. More detailed information on the facility origin and end-use destination of products such as compost and mulch will be available when CalRecycle’s new Recycling and Disposal Reporting System regulations (pursuant to AB 901, Chapter 746, Statutes of 2015) are finalized. CalRecycle expects reporting under these new regulations to begin in early 2019.

4.4.3.5. Impact of Providing Edible Food to Hungry Californians

In addition to avoiding landfill methane emissions, the recovery of edible food from landfills provides a new opportunity to positively affect the health of California citizens. Increasing edible food recovery—especially from large-scale food producers, processors, and users—and safely redirecting food to those in need could increase access to healthy fruits and vegetables and benefit millions of Californians who suffer from food insecurity. The USDA defines food insecurity as a household-level economic and social condition of limited or uncertain access to adequate food²². The overall food insecurity rate in California is 12.5 percent, meaning that approximately one out of every eight Californians does not know where their next meal will come from²³. The rate for children is much higher resulting in approximately one in five children going to bed hungry each night. This places California at the nineteenth highest rate of child food insecurity in the nation.

²² USDA ERS, “Definitions of Food Security”, accessed October 27, 2017. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security/>

²³ California Association of Food Banks, “Hunger Fact Sheet”, accessed October 27, 2017. <https://www.cafoodbanks.org/hunger-factsheet>

4.4.3.6. Impact of Requiring Use of Renewable Fuel in Fleets

Capturing biogas and using it for production of energy and fuels, as when fuel is combusted in an engine, could affect the environment and public health. However, to the extent that biogas is produced and injected into the natural gas pipeline network, or used in low-NO_x engines to displace diesel combustion, air quality impacts can be reduced regionally and statewide. These emission reductions translate directly into health benefits, especially in disadvantaged communities near dairies and along transportation corridors, and in areas of non-attainment for ambient air quality standards. In addition, if electricity is generated onsite using biogas derived from organic waste, then using microturbines or fuel cells can minimize new emissions of NO_x and PM and thereby lessen potential local health impacts.

CalRecycle expects the proposed regulations will result in approximately 20 percent of the fuel consumed by heavy-duty solid waste and recycling vehicles in the state to be in-state waste-derived RNG, which is equivalent to roughly 21 million diesel gallon equivalents (DGEs). See Section 3.3.4.5 for more details.

Air Resources Board programs, such as the LCFS and Heavy Duty Truck Diesel regulations, will primarily drive the conversion of transportation fleets so they are able to use renewable fuels. The proposed regulation's requirements regarding procurement of renewable fuels will also help drive this conversion, but to a much smaller degree than the air board regulations.

4.4.4. Impacts on State Gross Domestic Product

The State Gross Domestic Product (GDP) is projected to increase by a very small percentage, with the increase peaking at 0.06 percent during the construction phase, and dropping to 0.04 percent by 2030. This increase reflects the increased construction and related economic activity during each year. The results are shown in Table 14 below:

Table 14: Estimated Impact on Gross Domestic Product

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
GDP	% change	0.03%	0.04%	0.04%	0.05%	0.06%	0.06%	0.06%	0.05%	0.05%	0.05%	0.04%	0.04%
GDP	\$Billions	0.852	0.948	1.184	1.409	1.610	1.801	1.767	1.663	1.570	1.484	1.404	1.333

4.5. Creation or Elimination of Businesses

CalRecycle anticipates that new businesses will be created as a result of the regulation. Potential new businesses may include new recycling manufacturing including anaerobic digestion, corrugated paper recycling manufacturers, equipment manufacturers, and so on. Furthermore, edible food recovery organizations will likely expand and some will probably transition from being volunteer organizations to businesses, as recovered edible food becomes a valuable commodity.

4.6. Incentives for Innovation

CalRecycle expects the regulations will drive innovation in collection, processing technology, edible food mapping technology, and so on. CalRecycle also anticipates innovations in sorting and processing systems. During the workshops CalRecycle has conducted to date for this regulatory process, stakeholders have provided information indicating new and innovative technologies are already coming into commercial use. These include alternatives to wax coated paper, technology that removes putrescible organic waste from the recycling stream, and improved systems for matching edible food donors with recovery organizations. New companies measure and collect data on food waste and provide this information back to the generators, other companies provide imaging and monitoring for contamination and container capacity, and others de-package edible food waste for recovery.

4.7. Competitive Advantage or Disadvantage

The proposed regulations would not create any competitive disadvantage to the recycling and edible food recovery industry located in California, as competitors would have to comply with the same requirements.

4.8. Inclusion of Monetized Health Benefits

Two variables were used in the REMI model analysis to address the monetized health benefits: Consumer Spending on Hospitals and Consumption Reallocation. CalRecycle anticipates the regulation will result in slightly higher consumer spending power, as consumers are expected to spend less on healthcare related costs due to improved healthy communities (e.g., reductions in methane that improve air quality and increased edible food that alleviates hunger).

4.9. Summary and Interpretation of the Results of the Economic Impact Assessment

The overall impact to the state economy as a result of the proposed regulation is net positive. State GDP is projected to initially increase an estimated 0.03 percent, peak at an increase of 0.06 percent, and settle at an increase of 0.04 percent. State employment is projected to increase initially at over 8,000 jobs, growing by nearly 17,000 jobs at peak construction phase in 2024, and settle at a permanent increase of over 11,000 new jobs.

The Total Wages and Salaries increase is projected to be more modest, increasing initially by about 0.02 percent, and declining to around 0.00 percent by 2030. The State Business Output is projected to track slightly above the forecast for the increase of state GDP, peaking at an increase of 0.08 percent, before settling at a long-range increase of 0.05 percent.

5. Sensitivity Analysis

CalRecycle conducted a sensitivity analysis on the baseline assumption, using an optimistic assumption for BAU. Instead of the baseline assumption of achieving 30 percent organic waste recycling by 2019, the sensitivity analysis uses an assumption of achieving 50 percent organic waste recycling by 2019. CalRecycle believes it is possible and likely that 50 percent can be achieved. The Legislature did not set the date for the implementation of the regulations to coincide with the 2020 goal. CalRecycle understands the later effective date for the regulations was set because it was expected that SB 1383's 2020 goal would be met due to early actions and other existing regulations and statutes. Some of these existing statutes and regulations include the 75 percent solid waste recycling goal set in AB 341 (note this is different than the 75 percent organic waste disposal reduction goal in SB 1383), and the Mandatory Commercial Recycling and Mandatory Commercial Organic Recycling laws (AB 341 and AB 1826 respectively). In addition to SB 1383 providing a clear early target for 2020, CalRecycle has conducted informal regulatory workshops on the proposed regulations since the beginning of 2017, which has provided stakeholders with early signals on the forthcoming regulatory requirements. In addition, there are some jurisdictions already implementing enhanced organic waste recycling programs with enforcement, with other jurisdictions following suit. The Bay Area and Southern California comprise most of the total statewide waste stream and jurisdictions in these areas are either already implementing programs or have plans in place, including some with zero waste goals.

Many cities and counties have or will have adopted their own 75 percent recycling goal or zero waste plans with timelines to coincide with 2020. This will also contribute to achieving the 75 percent solid waste recycling rate (AB 341) and the 50 percent organic waste goal (SB 1383).

Furthermore, many jurisdictions, nonprofits and businesses are already implementing extensive edible

food recovery programs. Some jurisdictions have already implemented edible food recovery programs that ensure the food is delivered to those most in need combined with organic waste recycling of the food that is not edible. Some of these jurisdictions include all of the Bay Area (such as San Francisco, Oakland, San Jose), Fresno, Orange County, City of Los Angeles, City of San Diego and County of San Diego.

5.1. Direct Costs for Assumption of 50 Percent Organic Waste Recycling in 2019

The sensitivity analysis with an assumption of 50 percent organic waste recycling by 2019 results in an overall lower cost impact for the proposed regulations. Most of the lower costs are a result of less infrastructure expansion being needed. The direct cost impact of edible food collection, as documented in Section 3.1, will not change for the sensitivity analysis. Similarly, the direct cost impact of requirements related to education, enforcement, contamination monitoring, reporting, capacity planning, and procurement, as documented in Section 3.3, will not change for the sensitivity analysis.

Tables 15 to 17 below document the estimated timeline and direct cost impact for collection/processing the organic materials and for building the new organic waste recycling infrastructure with an assumption of 50 percent organic waste recycling rate by 2019.

Table 15: Estimated New Facilities to be Built Each Year, 2019-2025 (Based on 50% by 2019)

Year	Existing Compost Facilities	New Build - Compost Facilities	Existing AD Facilities	New Build - AD Facilities
2019	68	5	41	2
2020	73	6	43	2
2021	79	5	45	2
2022	84	6	47	1
2023	90	5	48	2
2024	95	6	50	1
2025	101		51	
Total New Facilities		33		10

*Table 16: Cumulative Costs and Revenues for Proposed Regulations Over 12-Year Accounting Period (Million Dollars)
(Based on 50% in 2019)*

Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
Compost	33	\$451	\$1,721	\$3,234

12-Year Net Present Value (2019-2030)		\$1,062		
Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
AD	10	\$499	\$4,094	\$9,251
12-Year Net Present Value (2019-2030)		\$4,658		

*O&M and Revenue for all facilities

Table 17: Statewide Cost Estimates for Organic Waste Collection/Processing of Increased Tonnage (Million Dollars) Under 50% Sensitivity Analysis

Annual Costs due to Increased Tonnage							
	2019	2020	2021	2022	2023	2024	2025
Collection	68	146	214	282	350	419	419
Processing	24	52	76	100	124	148	148
Disposal Avoided	(25)	(53)	(78)	(103)	(128)	(153)	(153)
Commodity	(31)	(66)	(97)	(128)	(159)	(190)	(190)
Total Costs	36	79	115	151	187	224	224

Note that in this table, disposal and commodity revenues are shown as negative costs.

5.2. Economic Impacts for Sensitivity Analysis

5.2.1. Inputs of the Assessment

The inputs for the REMI Model are the same variables that were used for the Economic Impact assessment using 30 percent recycling in 2019 for the baseline assumptions (see Section 4.2 for a list of the REMI input variables). However, the values for the variables for the sensitivity analysis changed due to the sensitivity assumption of 50 percent organic waste recycling by 2019. This assumption results in an overall lower direct cost for expansion of the organic waste management infrastructure. However, all other costs associated with the proposed regulations remain the same.

5.2.2. Result of the Assessment

5.2.2.1. California Employment Impacts

The sensitivity analysis(50 percent recycling by 2019) assumes, the Total Employment increases in comparison to BAU, to a peak of 12,500 Total Employment in 2025, and a gradual reduction to 8,400 Total Employment in 2030. Compared to the Baseline scenario of 30 percent recycling by 2019, these employment increases are lower due to the lower construction demand associated with the sensitivity assumptions of already achieving 50 percent recycling by 2019. The values are shown in Table 18 below.

Table 18: Impact on Total Employment in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Waste Mgmt & Remid. Svcs.	% change	5.63%	5.81%	6.55%	7.38%	7.91%	8.45%	8.42%	7.79%	7.22%	6.69%	6.34%	6.01%
Waste Mgmt & Remid. Svcs	1000s	2.905	3.013	3.420	3.874	4.183	4.506	4.516	4.208	3.924	3.658	3.484	3.326
Total Employment		0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.04%	0.04%	0.04%	0.03%
Total Employment	1000s	7.801	7.578	8.932	10.342	11.474	12.582	12.552	11.629	10.769	9.938	9.143	8.430

5.2.2.2. Impacts on California Business and Investments in California

The impact of the proposed regulation on California Business Output (Private non-Farm) is small but the overall economic impact is positive. However, compared to the Baseline Scenario, the Business Output numbers are roughly 22 percent lower. The values are shown in Table 19 below:

Table 19: Impact on California Businesses and Investments

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Business Output (P N-F)	% change	0.04%	0.04%	0.04%	0.05%	0.05%	0.06%	0.06%	0.05%	0.05%	0.04%	0.04%	0.04%
Business Output (P N-F)	\$Billions	1.417	1.386	1.642	1.927	2.156	2.389	2.413	2.257	2.115	1.978	1.855	1.744

5.2.2.3. Impacts on Individuals in California

Individuals will face an increase in the price of goods based on increased business costs related to organic waste recycling. This is evidenced in the increase in Total Wages and Salaries. The Total Wages and Salaries increase very modestly, a smaller increase than the increase in Total Employment. The Proprietors' Income shows a very small decrease as a result of the costs imposed upon these establishments due to the Regulation.

However, compared to the Baseline Scenario (30 percent recycling by 2019), the increases are distributed very differently, due to the lower levels of construction. In the initial years, the Total Wages and Salaries are positive but about 40 percent lower than the Baseline Scenario. In the final years, the Total Wages and Salaries increase remains positive, though smaller. The Proprietors' Income follows the same trends as the Baseline Scenario but at a greatly reduced level, due to the decreased need for new construction of facilities since the Sensitivity Analysis assumes 50 percent recycling in 2019.

These changes are shown in Table 20 below.

Table 20: Impact on Individuals in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Wages and Salaries	% change	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%
Total Wages and Salaries	\$Billions	0.159	0.062	0.102	0.144	0.173	0.205	0.215	0.183	0.155	0.125	0.100	0.077
Proprietors' Income	% change	0.00%	-0.01%	-0.01%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%
Proprietors' Income	\$Billions	0.003	(0.018)	(0.014)	(0.011)	(0.008)	(0.006)	(0.007)	(0.013)	(0.018)	(0.023)	(0.029)	(0.034)

5.2.2.4. Impacts on California GDP

The California GDP is projected to increase by a very small percentage, with the increase peaking at 0.05 percent during the construction phase, and dropping to 0.03 percent by 2030. This increase reflects the increased construction and related economic activity during each year. Compared to the Baseline Scenario analysis, this increase in GDP under the Sensitivity Analysis is approximately 20 percent smaller in the early years of implementation, and reduces to approximately 24 percent smaller in the latter years of the regulation. The amounts for the Sensitivity Analysis are shown in Table 21 below:

Table 21: California GDP

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
GDP	% change	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.04%	0.04%	0.03%	0.03%	0.03%
GDP	\$Billions	0.792	0.771	0.92	1.084	1.217	1.353	1.367	1.28	1.198	1.118	1.044	0.977

6. Alternatives

CalRecycle has addressed two alternatives, one with fewer benefits and less costs than the proposed regulations and one with greater benefits and greater costs than the proposed regulations. Alternative 1 poses less stringent regulatory requirements on jurisdictions by eliminating mandatory local jurisdiction enforcement. This would result in lower overall cost because of lower enforcement costs, and lower infrastructure expansion costs since the regulation would not be as effective in achieving the needed reduction in organic waste disposal. However, it also results in fewer benefits since more organic waste would be disposed in landfills, less methane would be reduced, and the statutory mandate of 75 percent reduction in organic disposal by 2025 would not be achieved. Alternative 2 poses greater benefits and greater costs than the proposed regulations by achieving an 80 percent reduction in organic disposal by 2025, exceeding the statutory requirement of 75 percent. This alternative would result in greater costs primarily because of additional infrastructure expansion needed to process the additional organic materials that would not be disposed in landfills. With a greater reduction in organic waste disposal in landfills, Alternative 2 results in greater methane emission reductions that translate to greater benefits.

Analyses for Alternative 1 and Alternative 2 are presented below.

6.1. Alternative 1: Less Stringent Regulatory Requirements on Jurisdictions by Eliminating Local Jurisdiction Enforcement

Alternative 1 would include most of the proposed draft regulatory requirements, except that it would not require jurisdictions to implement and conduct enforcement programs. Instead, CalRecycle assumes the compliance of all regulated entities with the provisions of the proposed regulations would be ensured through current permitting, licensing, and waste hauler franchise agreements and through enforcement mechanisms employed by CalRecycle. Under this alternative, only CalRecycle would conduct enforcement oversight of regulated entities, and this would primarily be limited to random audits and inspections of jurisdictions and other regulated entities. (Note: The draft proposed regulations do provide for CalRecycle conducting this type of enforcement, but it is in addition to local enforcement.)

6.1.1. Cost

Alternative 1 would result in decreased costs to jurisdictions relative to the proposed regulations. Jurisdictions would not be required to conduct inspections of the estimated 360,000 regulated businesses (including commercial, state agencies [state, federal, local, schools, colleges, universities]) statewide. CalRecycle estimates these inspections would require approximately 700,000 city/county staff hours to perform inspections and enforcement activities on those businesses in the first two years after the regulation is implemented and beyond. These costs are estimated to be approximately \$90,000,000 in each of the first two years and approximately \$30,000,000 for each year thereafter. These costs are discussed in section 3.3.4.4 and noted in Table 22 below.

Table 22: Reduced Enforcement Costs to Jurisdictions Under Alternative 1 (Million Dollars)

	2022	2023	Beyond

Total Jurisdiction Enforcement Costs (These cost reductions are for all 540 Jurisdictions)	-\$90	-\$90	-\$30
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In addition to lower enforcement costs for local jurisdictions, there would be lower infrastructure expansion costs as well since the regulations would not be as effective in achieving a reduction in organic waste disposal in landfills without local enforcement. As a result of not requiring mandatory enforcement by jurisdictions, collection efficiency would suffer in two ways. First, without any enforcement program, fewer entities will subscribe to collection services. Second, the quality of collected organic waste would likely decrease as there would be no penalties for contamination. As a result, CalRecycle estimates the state would only achieve a 35 percent reduction in organic waste disposal by 2025. This means fewer organic materials would be collected and processed and fewer recycling facilities would be built. Therefore, infrastructure expansion costs would be lower as shown in Tables 23 to 25 below.

Table 23: Estimated New Facilities to be Built Each Year, 2019-2025 (No Enforcement)

Year	Existing Compost Facilities	New Build - Compost Facilities	Existing AD Facilities	New Build - AD Facilities
2019	41	2	25	2
2020	43	1	27	1
2021	44	2	28	2
2022	46	1	30	1
2023	47	2	31	2
2024	49	1	33	1
2025	50		34	
Total New Facilities		9		9

Table 24: Cumulative Costs and Revenues for Proposed Regulations Over 12-Year Accounting Period (Million Dollars) (No Enforcement)

Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
Compost	9	\$126	\$905	\$1,701
12-Year Net Present Value (2019-2030)		\$669		
Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
AD	9	\$443	\$2,656	\$6,001

12-Year Net Present Value (2019-2030)	\$2,903
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*O&M and Revenue for all facilities

Table 25: Statewide Cost Estimates for Organic Waste Collection/Processing of Increased Tonnage (Million Dollars)

Annual Costs due to Increased Tonnage							
	2019	2020	2021	2022	2023	2024	2025
Collection	39	58	97	117	156	175	175
Processing	14	21	34	41	55	62	62
Disposal Avoided	(14)	(21)	(35)	(43)	(57)	(64)	(64)
Commodity	(18)	(26)	(44)	(53)	(71)	(79)	(79)
Total Costs	21	32	52	62	83	94	94

Note that in the table above, Disposal Avoided and Commodity revenues are shown as negative costs.

6.1.2. Benefits

Alternative 1 results in the elimination of requirements that each jurisdiction adopt an inspection and enforcement plan for all regulated entities within its authority. As a result, jurisdictions would not have to hire staff for enforcement or be able to redirect staff to other priorities. Under this alternative, CalRecycle assumes the reduction in organic waste disposal in landfills will be less than the 75 percent statutory requirement illustrated by the Baseline scenario. Therefore, while PM, methane, and GHG emissions would still be reduced, the reductions would be less than for the Baseline Scenario. Similarly, while there would still be reductions in premature mortalities, avoided hospitalizations, and avoided emergency room visits, they would be less than the estimates for the Baseline Scenario.

6.1.3. Inputs of the Assessment

The input variables for the REMI Model are the same variables that were used for the Economic Impact assessment using 30 percent recycling in 2019 for the baseline assumptions (see Section 4.2 for a list of the REMI input variables). However, the values for the variables in the Alternative 1 analysis changed due to the assumption of reduced enforcement, and the resulting reduced collection and processing amounts. The expenditures for local government would be reduced by the amount estimated for enforcement costs under the Baseline Scenario.²⁴ This assumption results in an overall lower direct cost for expansion of the organic waste management infrastructure, and related collection and transportation costs.

6.1.4. Result of the Assessment

6.1.4.1. California Employment Impacts

With the assumptions of the Alternative 1 analysis, the lack of enforcement results in only achieving roughly 20 percent of the tonnage increase that is projected to occur under the Baseline Scenario. The reduced tonnage results in a reduced infrastructure build in collection and processing expenditures. This also results in a commensurate reduction in the projected jobs expected under this alternative scenario. The increased jobs start at about 25 percent of the Baseline Scenario jobs increase, and

²⁴ Within the REMI model, the reductions in expenditures by local government were modeled through an increase in available local government revenue (revenue not spent on enforcement), offset by reduced consumer spending for services.

increases slightly to nearly 8,000, before settling to an increase of 5,000 jobs. The final number of jobs created represents roughly 55 percent of the jobs projected under the Baseline Scenario. The gradual decline in jobs is a result of the delayed phase-in of construction, and the associated delayed impacts of the secondary jobs impacts, and is shown in Table 26 below.

Table 26: Impact on Total Employment in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Waste Mgmt & Remed. Svcs.	% change	4.24%	4.24%	5.28%	5.19%	5.02%	4.92%	4.61%	4.27%	3.96%	3.65%	3.45%	3.22%
Waste Mgmt & Remed. Svcs	1000s	2.191	2.202	2.757	2.724	2.656	2.624	2.473	2.306	2.150	1.996	1.895	1.781
Total Employment		0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%
Total Employment	1000s	6.374	6.121	7.919	7.928	7.871	7.554	7.011	6.470	5.959	5.482	5.045	4.669

6.1.4.2. Impacts on California Business and Investments in California

The impact of the proposed regulations on California Business Output (Private non-Farm) is small but the overall economic impact is positive. However, in comparison to the Baseline Scenario, the absolute levels show a reduction very similar to the reduction in the Total Employment as enumerated above. The values are shown in Table 27 below:

Table 27: Impact on California Businesses and Investments

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Business Output (P N-F)	% change	0.03%	0.03%	0.04%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%
Business Output (P N-F)	\$Billions	1.147	1.106	1.441	1.39	1.391	1.394	1.309	1.221	1.138	1.06	0.993	0.933

6.1.4.3. Impacts on Individuals in California

Under the assumptions of Alternative 1, as in the prior analyses, individuals will face an increase in the price of goods based on increased business costs related to organic waste recycling. This is evidenced in the increase in Total Wages and Salaries. The Total Wages and Salaries increase very modestly at about 0.01 percent, a smaller increase than the increase in Total Employment. The Proprietors' Income shows a very small decrease as a result of the costs imposed upon these establishments due to the regulation.

However, in comparison to the Baseline Scenario, the increase in Total Wages and Salaries ranges from zero percent to 20 percent less through 2027. Proprietors' Income also is slightly reduced, in comparison to the baseline.

These changes are shown in Table 28 below.

Table 28: Impact on Individuals in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Wages and Salaries	% change	0.02%	0.01%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
Total Wages and Salaries	\$Billions	0.214	0.158	0.206	0.206	0.188	0.159	0.140	0.121	0.103	0.085	0.072	0.059
Proprietors' Income	% change	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%
Proprietors' Income	\$Billions	0.022	0.009	0.012	0.003	(0.001)	(0.003)	(0.008)	(0.011)	(0.014)	(0.017)	(0.020)	(0.021)

6.1.4.4. Impacts on California GDP

The California GDP under Alternative 1 is projected to increase by a very small amount, with the increase peaking at 0.03 percent during the construction phase, and dropping to 0.02 percent by 2030. This increase reflects the increased construction and related economic activity during each year. Compared to the baseline analysis, this increase in GDP under Alternative 1 is approximately one-third

smaller in the early years of implementation, and reduces to approximately half of the Baseline Scenario increase in the latter years of the regulation. The amounts for the Alternative 1 analysis are shown in Table 29 below:

Table 29: California GDP

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
GDP	% change	0.03%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%	0.02%
GDP	\$Billions	0.647	0.625	0.819	0.845	0.846	0.815	0.765	0.713	0.664	0.617	0.577	0.541

6.1.5. Cost-Effectiveness

CalRecycle anticipates Alternative 1 would be less cost-effective for businesses. The per-ton cost for processing and collecting organic waste would increase because the omission of enforcement would result in fewer businesses participating in organic waste recycling programs (which is what would decrease the cost per business). Cost-effectiveness (measured in cost per recovered ton) is influenced primarily by the amount of material targeted for recovery. As more tons are recovered, the cost per recovered ton is reduced. Conversely, if fewer businesses subscribe to organic waste recycling collection, fewer organic tons are recovered and the cost per recovered ton increases. Another factor is that collection densities influence cost-effectiveness. As a result, if the number of businesses subscribing is not maximized (where there are fewer businesses and those businesses are distributed over a larger area) the cost for collection and transportation will be greater on a per-ton basis.

6.1.6. Reason for Rejecting Alternative 1

Alternative 1 will likely not result in meeting the SB 1383 goal of 75 percent reduction in organic waste disposal. If local jurisdictions do not take enforcement actions on regulated entities, i.e., businesses, these entities may not fully participate with local organic waste recycling programs. Historical precedent supports this conclusion., AB 341 and AB 1826 do not require that jurisdictions undertake enforcement. In those jurisdictions that are voluntarily enforcing these related programs, participation rates are substantially higher than those in jurisdictions that have neglected to take enforcement for non-compliance. . Based on the results from these jurisdictions, jurisdiction-level enforcement would be much more effective in ensuring the organic recycling goals and methane reductions are met, rather than relying solely on CalRecycle’s limited enforcement role.

6.2. Alternative 2: Higher Target that Achieves an 80% Reduction in the Level of Statewide Disposal of Organic Waste from the 2014 Level by 2025

Alternative 2 would include all of the proposed draft regulatory requirements, except that it would exclude provisions that allow for exemptions and waivers from the organic waste collection requirements (i.e., for de minimis generation, physical space constraints, emergencies, low population areas, and rural jurisdictions). CalRecycle estimates these combined provisions currently allow approximately 5 percent of organic waste that is disposed to be waived from collection requirements (potentially resulting in the continued disposal of this material). The regulations are designed to reduce disposal of organic waste by 75 percent from the 2014 baseline. Including these additional entities would increase the scope of the regulations and result in a projected increased organic waste disposal reduction of 80 percent instead of 75 percent. This alternative may also be feasible due to voluntary

actions of jurisdictions already diverting organic wastes, and those that have adopted “Zero Waste”²⁵ goals that will drive them to higher recycling rates for all materials, including organic waste.

6.2.1. Cost

Alternative 2 results in greater costs primarily because of additional organic materials collected and processed and additional infrastructure expansion needed to process the additional organic materials diverted from landfills to achieve 80 percent reduction in organic waste disposal by 2025. The costs associated with more organic materials collection and processing and more recycling facilities are shown in Tables 30-32 below.

Table 30: Estimated New Facilities to be Built Each Year, 2019-2025 (80% in 2025)

Year	Existing Compost Facilities	New Build - Compost Facilities	Existing AD Facilities	New Build - AD Facilities
2019	41	11	25	5
2020	52	12	30	5
2021	64	11	35	5
2022	75	12	40	5
2023	87	11	45	5
2024	98	10	50	3
2025	108		53	
Total New Facilities		67		28

Table 31: Cumulative Costs and Revenues for Proposed Regulations Over 12-Year Accounting Period (Million Dollars) (80% in 2025)

Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
Compost	67	\$925	\$1,637	\$3,076
12-Year Net Present Value (2019-2030)		\$514		
Facility Type	Number of Facilities	Capital Cost (new facilities)	O&M*	Revenue*
AD	28	\$1,381	\$3,744	\$8,460
12-Year Net Present Value (2019-2030)		\$3,335		

*O&M and Revenue for all facilities

²⁵ <http://www.calrecycle.ca.gov/zerowaste/>

Table 32: Statewide Cost Estimates for Organic Waste Collection/Processing of Increased Tonnage (Million Dollars)

Annual Costs due to Increased Tonnage							
	2019	2020	2021	2022	2023	2024	2025
Collection	156	321	477	642	798	925	925
Processing	55	114	169	228	283	327	327
Disposal Avoided	(57)	(117)	(174)	(234)	(291)	(337)	(337)
Commodity	(71)	(146)	(216)	(291)	(362)	(419)	(419)
Total Costs	83	172	256	345	428	496	496

Note that in the table above, Disposal Avoided and Commodity revenues are shown as negative costs.

6.2.2. Benefits

Alternative 2 has greater costs in order to reach the higher organic waste recycling goal but would also result in greater benefits. Under this alternative, CalRecycle assumes the reduction in the amount of organic waste disposed in landfills will be more than the Baseline Scenario. Therefore, PM, methane, and GHG emissions will be reduced even further than for the Baseline Scenario. Similarly, there will be further reductions in premature mortalities, avoided hospitalizations, and avoided ER visits compared to the Baseline Scenario.

6.2.3. Inputs of the Assessment

Under Alternative 2, the inputs for the REMI Model are the same variables that were used for the Economic Impact assessment using 30 percent recycling in 2019 for the baseline assumptions. See Section 4.2 for a list of the REMI input variables. However, the values for the variables for the Alternative 2 analysis changed due to the assumption of increased recycling of organic waste, and the resulting increased collection and processing amounts. All expenditure categories were increased in proportion to the projected increase in diverted tonnage of organic waste.

In economic analysis, as the total reduction in disposal of organic waste increases from 75 percent to 80 percent, the law of diminishing returns would lead us to believe that the related collection and transportation costs would need to increase more than proportionately. This same principle would apply to the costs related to outreach and education as well as enforcement costs. As CalRecycle was unable to determine an appropriate increase in these proportionate costs, all costs were escalated strictly with the increase in tonnage. Therefore, the cost estimates determined in this process would be an underestimate of true costs. The discussion of the estimates, and the costs shown in the tables in this section, should be viewed with this caveat.

6.2.4. Result of the Assessment

6.2.4.1. California Employment Impacts

With the assumptions of the Alternative 2 analysis, the increase in disposal reduction to 80 percent of the organic waste results in a slight increase in infrastructure build, relative to the Baseline Scenario. This increased tonnage is reflected also in increased expenditures for collection and processing. This also results in a commensurate increase in the projected jobs expected under Alternative 2. The increase in Total Employment starts at an average of 0.04 percent over the first 3 years, increases to over 0.07 percent during peak construction, and ends at an increase of 0.05 percent by 2030. The peak

year for job increases is over 18,000, with an increase of 12,800 by 2030. When compared to the Baseline Scenario, the larger increase during the initial years is related to the increased construction during these years, and the associated delayed impacts of the secondary jobs impacts. The results are shown in Table 33 below.

Table 33: Impact on Total Employment in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Waste Mgmt & Remed. Svcs.	% change	5.08%	6.57%	8.74%	9.93%	10.95%	11.65%	11.25%	10.62%	10.11%	9.48%	9.02%	8.58%
Waste Mgmt & Remed. Svcs.	1000s	2.62	3.408	4.56	5.214	5.793	6.213	6.037	5.736	5.493	5.181	4.958	4.748
Total Employment		0.03%	0.04%	0.06%	0.06%	0.07%	0.07%	0.07%	0.07%	0.06%	0.06%	0.05%	0.05%
Total Employment	1000s	8.059	10.119	13.710	15.552	17.193	18.235	17.466	16.551	15.651	14.600	13.635	12.760

6.2.4.2. Impacts on California Business and Investments in California

The impact of the proposed regulation on California Business Output (Private non-Farm) is small but the overall economic impact is positive. However, in comparison to the Baseline Scenario, the absolute levels show a slight increase very similar to the increase in the Total Employment as enumerated above. The values are shown in Table 34 below:

Table 34: Impact on California Businesses and Investments

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Business Output (P N-F)	% change	0.04%	0.05%	0.06%	0.07%	0.08%	0.08%	0.08%	0.07%	0.07%	0.06%	0.06%	0.05%
Business Output (P N-F)	\$Billions	1.436	1.812	2.475	2.846	3.186	3.425	3.321	3.180	3.05	2.885	2.743	2.614

6.2.4.3. Impacts on Individuals in California

Individuals will face an increase in the price of goods based on increased business costs related to organic waste recycling. This is evidenced in the increase in Total Wages and Salaries. The Total Wages and Salaries increase very modestly at about 0.01 percent, a smaller increase than the increase in Total Employment. The Proprietors' Income shows a very small decrease as a result of the costs imposed upon these establishments due to the regulation.

However, in comparison to the Baseline Scenario, the increase in Total Wages and Salaries ranges from zero percent to 20 percent less through 2027. Proprietors' Income also is slightly reduced, in comparison to the baseline, with a reduction of around 10 percent compared to the same period in the baseline.

These changes are shown in Table 35 below.

Table 35: Impact on Individuals in California

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Wages and Salaries	% change	0.02%	0.01%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
Total Wages and Salaries	\$Billions	0.290	0.225	0.292	0.269	0.265	0.254	0.208	0.169	0.131	0.082	0.045	0.008
Proprietors' Income	% change	0.01%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%
Proprietors' Income	\$Billions	0.024	0.009	0.010	-	(0.007)	(0.014)	(0.024)	(0.029)	(0.036)	(0.042)	(0.047)	(0.052)

6.2.4.4. Impacts on California GDP

Under the assumptions of Alternative 2, California GDP is projected to increase by a very small percentage, with the increase peaking at 0.07 percent during the construction phase, and dropping to 0.04 percent by 2030. This increase reflects the increased construction and related economic activity during each year. Compared to the Baseline Scenario analysis, this increase in GDP under the 80 percent disposal reduction cap is approximately 7 percent greater in the early years of implementation,

and increases to nearly 9 percent greater than that of the Baseline Scenario increase in the latter years of the regulation. The amounts for the Alternative 2 are shown in Table 36 below:

Table 36: California GDP

Category	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
GDP	% change	0.03%	0.04%	0.05%	0.06%	0.06%	0.07%	0.06%	0.06%	0.05%	0.05%	0.05%	0.04%
GDP	\$Billions	0.808	1.017	1.395	1.605	1.799	1.936	1.875	1.795	1.717	1.62	1.534	1.456

6.2.5. Cost-Effectiveness

Alternative 2 would be more costly for all entities, and would be less cost-effective for businesses, jurisdictions, and the state. The cost for processing and collecting organic waste would increase because there would be increased facility and infrastructure builds, equipment purchases, collection costs, contamination monitoring, and local enforcement and inspections. The organic materials that would prospectively be included in the additional 5 percent of the increased goal would likely be of lower quality, have increased contaminants, result in lower quality end-products that would generate lower revenues per ton collected/processed, and result in increased transportation costs in rural areas. Cost-effectiveness (measured in cost per recovered ton) is influenced primarily by the amount of material targeted for recovery. As more tons are recovered, the cost per recovered ton is reduced, but if the organic wastes being collected are of lower quality, therefore requiring increased contamination screening and increased processing costs, overall costs to all entities may increase.

6.2.6. Reason for Rejecting Alternative 2

This alternative will result in meeting the SB 1383 goal of 75 percent reduction in organic waste disposal but will increase costs, reduce cost-effectiveness, and may be unenforceable at the state level. Eliminating the waivers would increase costs. For example, providing collection services in remote areas of the state will increase costs significantly primarily by requiring collection vehicles to travel further distances between collection points, resulting in increased fuel costs for collection and increased distances to transport materials to processing facilities. Eliminating waivers will create unnecessary hardships on some jurisdictions and generators. Furthermore, as of early 2018 as many as 60 California jurisdictions have adopted “Zero Waste” plans that exceed the 50 percent jurisdictional waste diversion goal established by AB 939, or have created similar waste reductions plans that align with the statewide 75 percent recycling goal established by AB 341. The voluntary measures on behalf of these jurisdictions may also help exceed the 75 percent organic waste recycling statewide mandate established by SB 1383. Since these plans do not specifically target organic materials and are non-mandated local goals, CalRecycle would have little enforcement authority and could not reliably count on this additional recycling to meet a more stringent 80 percent organic waste recycling goal proposed in Alternative 2. Additionally, the increased organic recycling goal would be more costly, with a reduced cost-effectiveness due to the composition of the remaining 25 percent of organic material in the waste stream after the initial 75 percent, which consists of material types that are harder to process, contain more contaminants, and would create less marketable end products. Therefore, while higher organic waste recycling of 80 percent may have some advantages, the negative implications noted to moving the goal higher than SB 1383 established is not feasible to pursue.

7. Fiscal Impacts

7.1. Local Government

CalRecycle estimates overall costs to local governments in Section 3.3.4. The fiscal impacts on local governments will be spread across residential and commercial solid waste ratepayers for organic waste recycling. The total annual costs to local governments are summarized in the Table 37. The costs in Table 37 are statewide averages. The actual cost impact to each city and county will vary depending on a number of factors:

- Lower costs will result if the city or county has already implemented mandatory food waste residential and/or commercial collection, and other programmatic activities, such as edible food recovery programs, education, and contamination monitoring.
- Larger cities and counties will have higher costs, e.g., they will have a larger number of inspections to conduct. Rural cities and counties may have lower costs as they will have fewer inspections and they may have phased-in implementation due to lacking infrastructure.

Table 37: Estimated Annual Costs for Local Governments (Million Dollars)

	2022	2023	2024	2025	Beyond
Capacity planning	2	2	2	2	2
Coordination of expanded food recovery program	2	2	2	2	2
Reporting to CalRecycle	4	3	3	3	3
Adjustment of franchise agreements	20	0	0	0	0
Education & outreach	244	33	33	33	33
Enforcement	91	91	31	31	31
Procurement	38	44	44	44	25
Total	400	175	115	115	96

CalRecycle is not able to determine quantitatively how much savings cities and counties will realize from recycling organic waste. As generators, cities and counties may realize cost savings by reducing the trash service for their government operations. This will depend on the type of arrangement that they have with their service provider. Cost savings will also depend on if the city or county produces any green waste, food waste, or other organic waste, such as paper. For example, cities that contract out for services and have only a few employees may not generate organic waste.

Cities and counties will be required to implement an enforcement program that includes the ability to assess penalties commencing in 2024. It is not possible to estimate quantitatively the amount of revenue that will be generated from the penalties that are assessed on generators. This may not be a large amount of revenue for cities and counties if they have a strong effort on education and compliance, which will reduce their need to assess penalties. For example, cities that have implemented

penalties have focused on education and warnings to gain compliance first and then only resorting to fines if necessary. Additionally, cities and counties will be able to assess fees for service to cover costs of activities such as inspections. Cities and counties may also recover costs for increased processing of contaminated organic waste materials by charging the affected generator an additional amount.

The size of each city or county subject to these proposed regulations varies widely, so it is reasonable to expect the benefits they might accrue from implementation of the regulations will also vary.

Qualitatively, CalRecycle expects cities and counties to benefit in numerous ways, including but not limited to:

- New job creation associated with organic materials collection and recycling.
- Increased tax revenues generated from businesses located in the city or county resulting from the sales of products including recycled content paper, cardboard, compost and renewable gas.
- Increased tax revenues from sales of equipment.
- Fewer lost workdays and increased productivity due to health benefits from reducing methane (e.g., reduced incidence of asthma), which may also help local government to improve recruitment and retention of workers.

7.2. State Government

Two separate costs may pertain to the state government level: costs to CalRecycle and the Air Resources Board to implement and enforce the proposed regulation, and costs to state agencies that are organic waste generators or edible food generators that must be in compliance. In addition, state government may experience cost savings from health benefits of the proposed amendments.

7.2.1. CalRecycle

CalRecycle will need additional staff to fully implement the provisions of SB 1383, including regulatory training, education and outreach, conducting enforcement, reviewing various documents, enhancing reporting databases, conducting waste characterization studies, and other functions.

CalRecycle will implement an enforcement program that includes the ability to assess penalties commencing in 2022. It is not possible to estimate quantitatively the amount of revenue that will be generated from the penalties that are assessed on cities and counties or other entities. This may not be a large amount of revenue for CalRecycle, since the intent is to have a strong effort on compliance first and utilize penalties only as a last resort.

To determine cost, CalRecycle staff analyzed existing staff resources necessary to implement comparable programs required by SB 1383. For example, estimates for enforcement costs reflect comparable inspection and audit costs associated with CalRecycle's current enforcement and oversight costs for solid waste facilities and local enforcement agencies. Anticipated costs for accusations and administrative hearings are based on experience with the tire enforcement program and other programs with similar penalty and hearing structures. CalRecycle applied standard overhead costs for administrative duties (e.g., Information Technology, Payroll, Human Resources, etc.) associated with new staff needed for program implementation.

Full implementation of SB 1383 will require 60 new staff with an annual cost of \$7,393,000. This reflects the gross number of staff and the annual cost necessary to fully implement the provisions of SB 1383

and thus this number represents the true cost of implementation of the regulation. However, redirection of existing resources would significantly reduce the net staff needed and the net cost necessary to implement SB 1383. As the regulations move through the formal process, CalRecycle will be able to verify areas where resources can eventually be redirected. Upon completion of the rulemaking process, CalRecycle will submit a Budget Change Proposal specifying program and resources that can be redirected as well as identifying any additional resources needed. The figures in this analysis represent an initial cost ceiling.

7.2.2. California Air Resources Board

CARB will not require additional resources to conduct the proposed review of new technologies, or to recommend to CalRecycle whether the activity is disposal or recycling.

7.2.3. State Agencies as Generators

CalRecycle estimates the costs to state agencies as generators in Section 3.3.4.9.

1. CalRecycle consulted with the following state agencies regarding the edible food recovery requirements: DGS, CSUs, Community colleges, and UCs. These types of state government entities would most likely have larger edible food recovery programs.
2. Changes in rates for waste and recycling services:
 - a. State agencies are already required to implement mandatory recycling and organic waste recycling programs, as well as procurement programs. The new requirement for state agencies is to recover edible food. Rates for waste and recycling services are not expected to change for edible food recovery collection for state government since edible food is collected typically by a non-profit organization.
 - b. Table 38 provides a summary of the costs to state agencies.

Table 38: Summary of Statewide Direct Cost Estimates for Impact of Requirements for Edible Food Recovery for State Entities

State and Federal Government Entities/Facilities	Number of Entities/Facilities	Start Up Costs	Start Up Total	Ongoing Annual Total
CA Colleges/Universities (UC, CSU, Community)	160	\$26,000	\$4,160,000	\$4,160,000
Other CA State Entities/Facilities (Fairs, Veterans Homes, Hospitals, Corrections, Park Districts)	130	\$109	\$14,200	\$1,420
Total			\$4,174,200	\$4,161,420

3. Estimates of savings, revenues, benefits to state agencies
 - a. Some state government agencies may be able to realize some savings as a result of the edible food recovery program, as they may be able to reduce trash collection. Because it is not possible to estimate how much agencies will recover, it is not possible to provide a quantitative estimate. However, CalRecycle will provide assistance to the state agencies that are conducting edible food recovery to help them identify cost savings in right-saving trash services. CalRecycle will also share best management

practices, including providing training for state government staff. State agencies are not likely to generate revenues as a result of edible food collection programs.

Benefits to state government will include improved air quality resulting in avoided incidence in mortalities, hospitalizations, and emergency room visits due to health benefits from reducing methane. This leads to fewer lost workdays and increased productivity for state government employees. The primary reason for health benefits due to reducing methane at landfills is associated with the infrastructure expansion of alternative organic waste management facilities. Section 4.4.3.1 begins a discussion of statewide health impacts from the new anaerobic digestion, composting, and chip and grind facilities. Table 15 shows the cumulative statewide health impacts based on mortality, hospitalizations and emergency room visits. The cumulative health impacts for state agencies is a subset of this information based on the number of state employees relative to the statewide population. Roughly, 5.8 percent of the statewide population are employees of state agencies²⁶. Table 45 below shows the estimated cumulative health impacts for state agencies based on mortalities, hospitalizations, and emergency room visits. While the regional distribution of state agency employees will likely be different from the statewide population distribution by air basin and proximity to organic waste management facilities, these estimates provide reasonable order of magnitude results for the state agency subset.

Table 39: Estimated Cumulative Avoided Incidence from 2019 to 2025 for State Agencies

	Health Outcomes	Valuation (2015 \$USD)
Mortality	31	\$280 M
Hospitalizations (all)	5	\$130 K
ER visits	13	\$4 K

²⁶ Number of State employees: 228,982 (https://www.sco.ca.gov/ppsd_empinfo_demo.html). Statewide population: 39,524,000 (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/documents/E-1_2017PressRelease.pdf)

8. Acronyms

AB	Assembly Bill
AD	Anaerobic digestion
BAU	Business as usual
CARB	California Air Resources Board
CDC	Centers for Disease Control
CNG	Compressed Natural Gas
CO ₂ E	Carbon dioxide equivalents
CRF	Concentration-response functions
DGE	Diesel gallon equivalents
DOF	Department of Finance
ER	Emergency
FY	Fiscal year
GHG	Greenhouse gases
GSP	Gross State Product
HH	Household
IPT	Incidents per ton
IWG	Interagency Working Group on the Social Cost of Greenhouse Gases
LCFS	Low Carbon Fuel Standard
LEA	Local enforcement agency
MRF	Material recovery facility
MT	Metric tons
MMT	Million metric tons
MWELLO	Model Water Efficient Landscape Ordinance
NAICS	Northern American Industry Classification System
NO _x	Nitrogen oxides
O&M	Operating and maintenance
PM	Particulate matter
PY	Personnel year
REMI	Regional Economic Models, Inc.
RIN	Renewable Identification Number
RNG	Renewable natural gas
SABRC	State Agency Buy Recycled Campaign
SB	Senate bill
SIR	Status impact report
SLCP	Short-lived climate pollutant
SSO	Source separated organic waste
TPL	The Trust for Public Land
USDA	United States Department of Agriculture
VMT	Vehicle miles traveled