WASTE DIVERSION

Waste Prevention and Food Rescue

Ecosystem Service Benefits

- Rescuing food waste, equivalent to 47 million meals, saved the public $150 million in meal costs annually.
- Diverting waste from landfills saved the public $27 million per year in landfill tipping fees.
- Reductions in food waste also increases food security and promotes human health by improving diets, increasing food availability, and avoiding the adverse impacts of agricultural production.
- Less green waste in landfills benefits human health by reducing landfill odors.
- New production of compost, recycled products, and biogas increases commercial revenues associated with those products.

OVERVIEW OF PROJECTS

Project activities

Divert waste from landfills through food rescue, waste prevention, recycling, composting, and anaerobic digestion

Implementing agencies

Department of Resources, Recycling, and Recovery and the Strategic Growth Council

112 projects

funded across 34 counties (2015-2020)

570,000 tons

of waste diverted from landfills per year

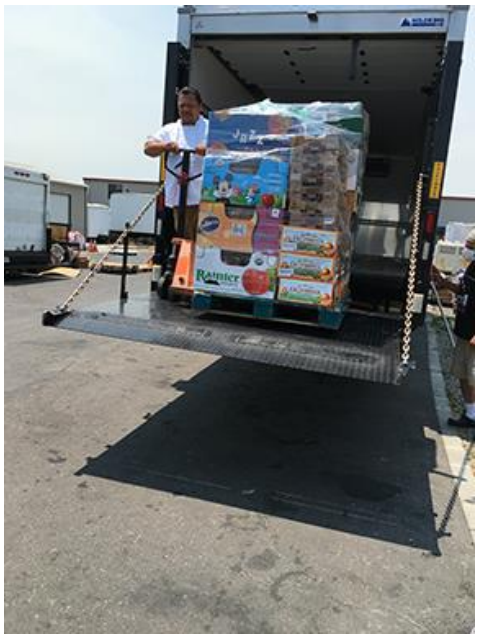
28,000 tons

of food rescued per year

Between 2015 and 2020, CCI invested in 112 projects through the Waste Diversion Program managed by the Department of Resources, Recycling, and Recovery and the Transformative Climate Communities Program managed by the Strategic Growth Council (CARB 2021). The primary activities of these projects are rescuing food and diverting waste from landfills through waste prevention, recycling, composting, and anaerobic digestion. Projects funded by CCI during this six-year period rescued 28,000 tons of food and diverted 570,000 tons of waste, annually (CARB 2021). These projects existed in 34 counties throughout California. The two counties with the greatest amount of rescued food are Alameda and Los Angeles, and the two counties that diverted the most waste are Tulare and San Bernardino.

This analysis documents the societal benefits related to rescuing food and diverting waste from landfills. Appendix page A-12 and page A-13 describe the pathways through which these projects generate environmental changes as well as ecosystem service benefits. Waste diversion avoids landfill costs, reduces landfill odors, and generates commercial revenue for composting, recycling, and anaerobic digestion facilities. Food rescue increases food availability, while saving on meal costs. To demonstrate how people value these services, the analysis includes information on two different quantitative measures: 1) avoided costs of landfilling and 2) avoided meal costs. In addition to these benefits, the analysis also considers the effect of food rescue on food security and human health. Finally, the effect of waste diversion on commercial revenues and landfill odors are summarized.

Avoided meal costs.



CCI invested in 72 food rescue projects, which reclaim high-quality food and deliver it to food banks, food pantries, and other organizations that distribute meals to low-income and underserved populations. The primary benefit of food rescue projects is associated with improvements in the physical and mental health of recipients, which lead to reductions in health care costs and increases in worker productivity. However, while the literature on adverse impacts of food security is extensive, there are few studies that have focused on quantifying the impacts of food banks and food pantries on health outcomes and potential changes in health care costs.

In lieu of this information, this analysis values the benefits of these food rescue projects by estimating the cost savings associated with the total number of meals saved. The 72 food rescue projects reclaimed a total of nearly 28,000 tons of food per year, which is equivalent to approximately 47 million meals.[100] The U.S. Department of Agriculture (USDA's Thrifty Food Plan provides estimates for food costs across all age groups. Using Census data to weight each of these estimates according to the age distribution of California's population—and adjusting all values to account for California's high cost of living—this analysis finds that meals on the Thrifty Food Plan cost $3.10 each. By multiplying this cost estimate with the total number of meals reclaimed each, this analysis finds that the 72 food rescue projects avoided approximately **$150 million** in costs, annually.

[100] Based on an average of 1.2 pounds per meal (Feeding America n.d.).

Improved diet and food availability.
Each of the 72 CCI-funded food rescue projects delivers reclaimed, high-quality food to food banks, food pantries, and other organizations that distribute meals to low-income and underserved populations. These organizations are essential to improving the nutrient intake of California's most vulnerable people. A Texas study found that a local food pantry accounted for more than half of its recipients' daily intake of energy, carbohydrates, vitamin B6, phosphorus, copper, and selenium (Mousa and Freeland-Graves 2017). Though the study found that the food pantry failed to fully meet some of the dietary needs of its recipients, it concludes that food pantries are an important resource for improving the nutrient intake of low-income populations.

By delivering some 28,000 tons of food to these organizations each year, CCI-funded food rescue projects could significantly improve the physical and mental health of recipients, leading to reductions in health care costs and increases in productivity. For example, it is well documented that malnourishment in children under the age of five can severely and irreversibly undermine cognitive development (Prado and Dewey 2014; Krebs et al. 2017; Black et al. 2017). Addressing malnourishment by increasing food availability could both lower children's healthcare needs and substantially improve their life-long earnings potential. Though the literature has not been developed enough to quantify these benefits, the amount of food rescued by CCI's projects indicates these benefits could be substantial. In addition, seven of the food rescue projects operate in school settings and are expected to provide educational opportunities for school-aged children.

Avoided costs of landfilling.
All 112 projects diverted waste from landfills for other beneficial uses, such as composting, recycling, and/or the redistribution of food to feed people. In addition to reducing greenhouse gas emissions, the primary ecosystem benefits of waste diversion include extending the lifespan of existing local landfills, reducing odors to properties located adjacent to landfills, and attenuating existing inefficiencies in consumption behaviors (e.g., food rescue) and/or product supply chains (e.g., recycling).

To estimate the economic value associated with these and other benefits, this analysis relies on tipping fees as a proxy for the overall benefit of avoided landfilling. Though tipping fees are not a precise measure of the value of reducing a ton of waste to people's well-being, they capture enough of the costs associated with waste to serve as a lower bound estimate of the value of waste diversion. Indeed, tipping fees account for the up-front costs of purchasing land to site and construct a landfill, annual operations and maintenance costs to receive and process waste, and additional facility measures designed to minimize and monitor for potential adverse impacts of landfills on public health and the environment. Combined, the 112 CCI projects diverted 570,000 tons of green waste from landfills on an annual basis. According to Department of Resources, Recycling, and Recovery analysis, the average tipping fee for green waste is $47.35 (CalRecycle 2015). By multiplying the average tipping fee for green

waste with the total number of tons of waste diverted, this analysis finds that the 112 waste diversion projects avoided approximately **$27 million** in annual landfilling costs.

Commercial revenues associated with eco-friendly waste processing.
Commercial entities, such as composting, recycling, and anaerobic digestion facilities, received increased commercial revenues because of the 112 waste diversion projects. Since data on the facilities affected by the waste diversion projects are not available, this analysis cannot quantify the revenue gains of these facilities. However, it is safe to assume that redirecting some portion of the 570,000 tons of waste from landfills to these facilities on an annual basis significantly benefited these revenue streams. In addition, the increased business likely allowed these facilities to create local green jobs, thereby stimulating regional economic activity.

Human health and well-being benefits of reduction in odors.
Projects that divert green waste have the added benefit of reducing odors generated by landfills. As waste undergoes the complex physiochemical processes of decomposition, landfills emit odor pollution that adversely affects the quality of life of nearby households (Palmiotto et al. 2014). The public has demonstrated a strong preference to avoid these externalities. For example, it is well documented that the presence of landfills negatively affects property values (Reichert et al. 2020; Nelson et al. 1992). By diverting 570,000 tons of waste from landfills on an annual basis, the 112 CCI-funded waste diversion projects may reduce the volume of pungent gas emitted by Californian landfills. To the extent that this reduction substantively reduces landfill-related odors, households within close proximity to these landfills may gain health and welfare benefits from the cleaner air.

Avoided adverse impacts of agricultural production.
Finally, food rescue projects have the potential to reduce demand for new food, which in turn may reduce the environmental consequences of agricultural production. As the USDA states, “when food is wasted, so too is the land, water, labor, energy, and other inputs that are used in producing, processing, transporting, preparing, storing, and disposing of the discarded food” (USDA n.d.). The more food gets discarded, the more agricultural producers need to compensate to keep everybody fed. Large-scale agricultural production causes environmental harm, such as undermining water-quality due to manure and chemical run off. By reducing food waste and redistributing excess food to those in need, food rescue projects have the potential to increase the efficiency of existing agricultural production processes and in turn avoid the adverse environmental impacts associated with agricultural production of delivered meals.

Table 14: Summary of Monetized Ecosystem Service Benefits for the Waste Prevention and Food Rescue Projects by County (2021 dollars)

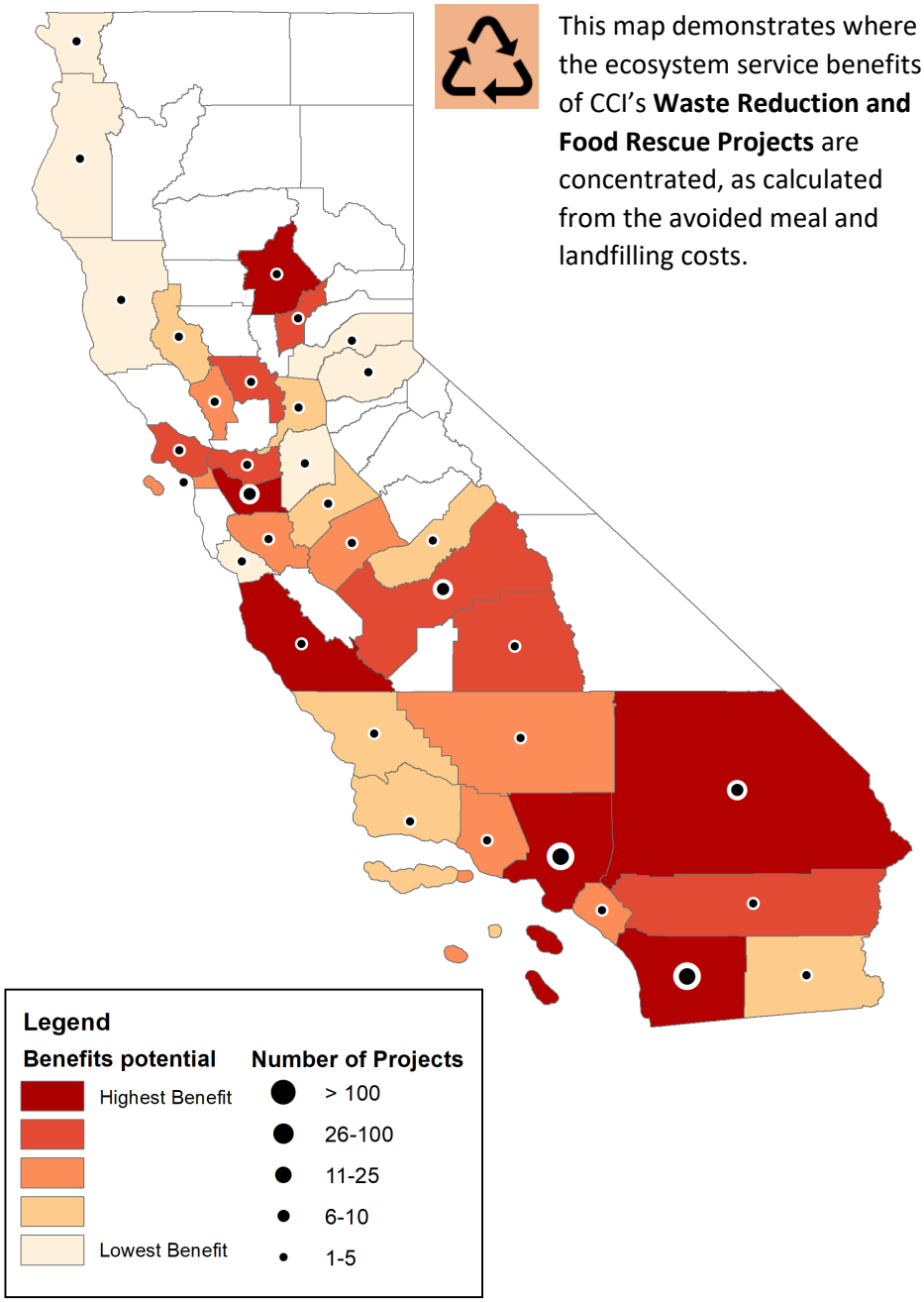
County	Tons of Food Rescued (Annual)[a]	Tons of Waste Diverted from Landfills (Annual)[a]	Avoided Meal Costs (Annual)[b]	Avoided Costs of Landfilling (Annual)[b]
Alameda	12,000	49,000	$61,000,000 - $64,000,000	$2,300,000
Butte	1,200	17,000	$6,100,000 - $6,400,000	$820,000
Contra Costa	930	930	$4,800,000 - $5,100,000	$44,000
Del Norte	27	72	$140,000 - $140,000	$3,400
El Dorado	77	77	$400,000 - $420,000	$3,600
Fresno	470	45,000	$2,400,000 - $2,500,000	$2,100,000
Humboldt	28	28	$150,000 - $150,000	$1,300
Imperial	250	250	$1,300,000 - $1,400,000	$12,000
Kern	250	250	$1,300,000 - $1,400,000	$12,000
Lake	150	4,800	$780,000 - $820,000	$230,000
Los Angeles	5,800	57,000	$30,000,000 - $31,000,000	$2,700,000
Madera	--	26,000	--	$1,200,000
Marin	530	530	$2,800,000 - $2,900,000	$25,000
Mendocino	--	5,400	--	$260,000
Merced	370	370	$1,900,000 - $2,000,000	$17,000
Monterey	1,400	9,500	$7,000,000 - $7,400,000	$450,000
Napa	240	7,900	$1,200,000 - $1,300,000	$370,000
Orange	370	390	$1,900,000 - $2,000,000	$18,000
Placer	42	110	$220,000 - $230,000	$5,300
Riverside	370	36,000	$1,900,000 - $2,000,000	$1,700,000
Sacramento	180	180	$950,000 - $1,000,000	$8,700
San Bernardino	730	100,000	$3,800,000 - $4,000,000	$4,700,000
San Diego	1,400	13,000	$7,400,000 - $7,800,000	$630,000
San Francisco	350	470	$1,800,000 - $1,900,000	$22,000
San Joaquin	--	10,000	--	$500,000
San Luis Obispo	160	5,000	$820,000 - $860,000	$240,000
Santa Barbara	14	18,000	$72,000 - $76,000	$870,000
Santa Clara	270	270	$1,400,000 - $1,400,000	$13,000

County	Tons of Food Rescued (Annual)[a]	Tons of Waste Diverted from Landfills (Annual)[a]	Avoided Meal Costs (Annual)[b]	Avoided Costs of Landfilling (Annual)[b]
Santa Cruz	42	42	$220,000 - $230,000	$2,000
Stanislaus	--	22,000	--	$1,000,000
Tulare	--	88,000	--	$4,200,000
Ventura	260	260	$1,400,000 - $1,400,000	$12,000
Yolo	770	3,800	$4,000,000 - $4,200,000	$180,000
Yuba	--	52,000	--	$2,500,000
Statewide Total	**28,000**	**570,000**	**$150,000,000**	**$27,000,000**

Sources and notes:

1. Data observed in CARB (2021). The average annual calculations consider projects implemented from 2015 to 2020.
2. Author calculations described in this report. The monetary values presented in this table are not necessarily additive to a single, total benefits value as they reflect alternative valuation methods and measures (e.g., market values, social welfare values) and may double-count the same benefit stream.

Figure 16: Spatial Distribution of Ecosystem Service Benefits Potential for the Waste Diversion and Food Rescue Projects



Note: The benefit potential conveyed in the avoided meal costs and avoided landfilling costs presented in Table 14.

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