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From Waste to Wins: How Orange County's Smart Landfills Are Slashing Methane

From compost piles to methane-sensing robotic dogs, Orange County is reimagining landfill management to reduce pollution and benefit communities.

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By Ellie Garland, Tom Frankiewicz, Madison Hall

Orange County Waste & Recycling Smart Landfill Program



David Tieu, deputy director of OC Waste & Recycling (OCWR), has spent years getting up close and personal with what people throw away. He's seen it all – banana peels, broken lawn chairs, last year's holiday fruitcake. But to him, this isn't just garbage – it's an opportunity. "What we're doing is taking the stuff that no one wants. When we started this journey in 2017, the question was...can we take contaminated waste and actually produce a product out of it?"



Deputy Director David Tieu at one of OCWR's compost facilities.

Orange County is California's third-most populous region – home to Disneyland, famous surf beaches, and three active landfills. The American Lung Association gives Orange County and the Southern California Metropolitan area a failing grade for air quality, citing high ozone days and elevated particle pollution levels. For Tieu, rethinking waste can help address this challenge. New initiatives at OCWR's landfills can drive down methane emissions, improve air quality, and deliver real community benefits.

Cutting methane in California

As organic waste such as food scraps and yard clippings decomposes in landfills, it generates methane – a greenhouse gas with over 80 times the heat-trapping power of carbon dioxide in the short term. In California, landfills are the second-largest source of human-caused methane emissions, representing 22 percent of the state's 2022 methane inventory. Airborne studies conducted by the California Air Resources Board – in partnership with Carbon Mapper and NASA's Jet Propulsion Laboratory – have identified large methane plumes over dozens of California landfills.

California Methane Emissions (2022)

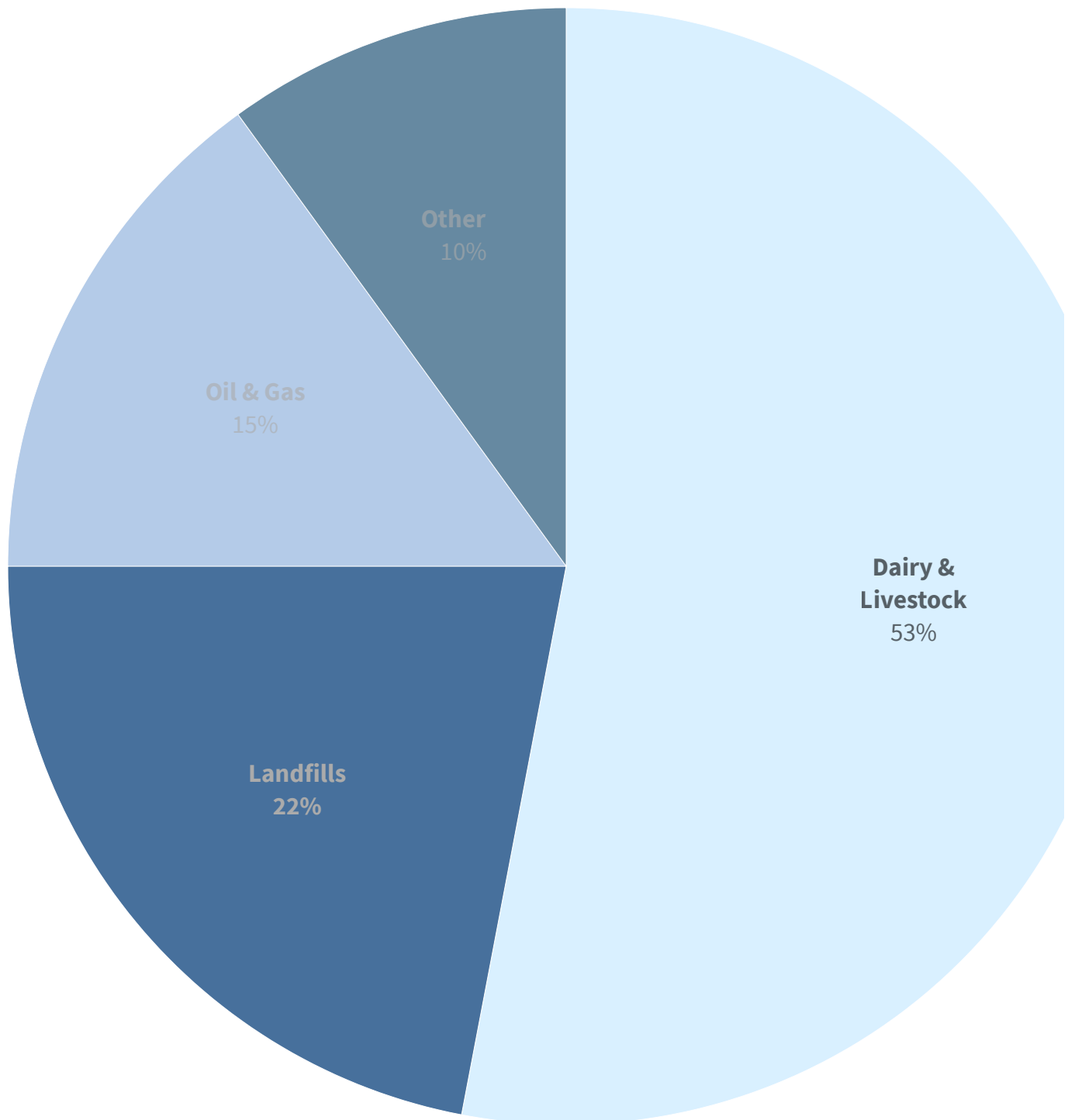
36.33 million MTCO₂e

Dairy & Livestock

Landfills

Oil & Gas

Other



California AB 32 GHG Inventory 2000-2022 (2024 Edition)

Fast action to cut methane is essential to slow warming over the near term. And for hundreds of thousands of Californians living within one mile of these sites,

addressing landfill emissions is more than just a climate issue: it's also about minimizing odors, securing clean air and water, and protecting public health. California has developed a comprehensive strategy to address waste sector emissions. The state's [Scoping Plan](#), which targets a 40 percent reduction in methane emissions by 2030, underscores the need to divert organic waste from landfills to prevent future methane generation, while also controlling methane emissions at the source through improved landfill design and operations.

[SB 1383](#), California's landmark law aiming to cut landfill-bound organic waste by [75 percent by 2025](#), has already diverted [295 million pounds](#) of food waste from landfills, created over [440 jobs](#) in food recovery, and provided millions of meals to those in need. SB 1383 is sparking a statewide shift toward a circular economy, where waste is minimized, surplus food is donated, and the remaining organics are reused to create nutrient-rich products like compost. Nearly [80 percent](#) of California communities are now rolling out organic waste collection programs. The state is also working on critical improvements to its [Landfill Methane Regulation](#), to ensure operators are making use of the latest technologies and best practices to cut methane emissions quickly from waste-in-place.

OCWR is already leading on this two-part solution – turning organic waste into compost while making technology upgrades to boost methane capture at the landfill. “We’ve been landfilling for 70 years; it’s our bread and butter,” says Tieu. “(But) this transition is relatively recent, and it’s new to our industry.”

Compost for the community

Starting in 2020, OCWR developed composting facilities at its landfills to process organic waste separately and prevent future methane generation. “The baseline of what we’re doing is to divert organics. I’ll say that’s the ‘low hanging fruit,’ just simply because we were already receiving it for many, many years,” explains Tom Koutroulis, OCWR Director. “Now, our focus is building out the infrastructure to handle the 1,000-2,000 tons coming in daily from residents.”



OCWR diverts organic material from the landfill and turns it into nutrient-rich compost.

To manage this growing volume, OCWR is using windrow composting – a method where organic material is piled and periodically turned – and is developing Covered Aerated Static Piles (CASP) technology. CASP, which Tieu likens to a “set it and forget it” crock pot, involves covering compost piles and using a forced air system to optimize and accelerate the breakdown process, doubling the facility’s capacity.

To date, OCWR’s composting program has diverted over 64,000 tons of organic waste – and kept 12,400 metric tons of greenhouse gases out of the atmosphere, equal to removing 2,700 cars from the road for a year.

“We’re doing this as an essential public service. We don’t charge for the compost product. It’s free. At this day and age, when inflation is high, it’s a great thing we can do for our community,” says Tieu.



Compost and mulch are available for residential and community use.

Beyond reducing emissions, composting gives organic waste a second life, transforming it into a resource that sequesters carbon, enriches soil, boosts crop yields, and cuts reliance on chemical fertilizers. It's a simple process with profound impacts, linking waste reduction to stronger agricultural systems and healthier communities.

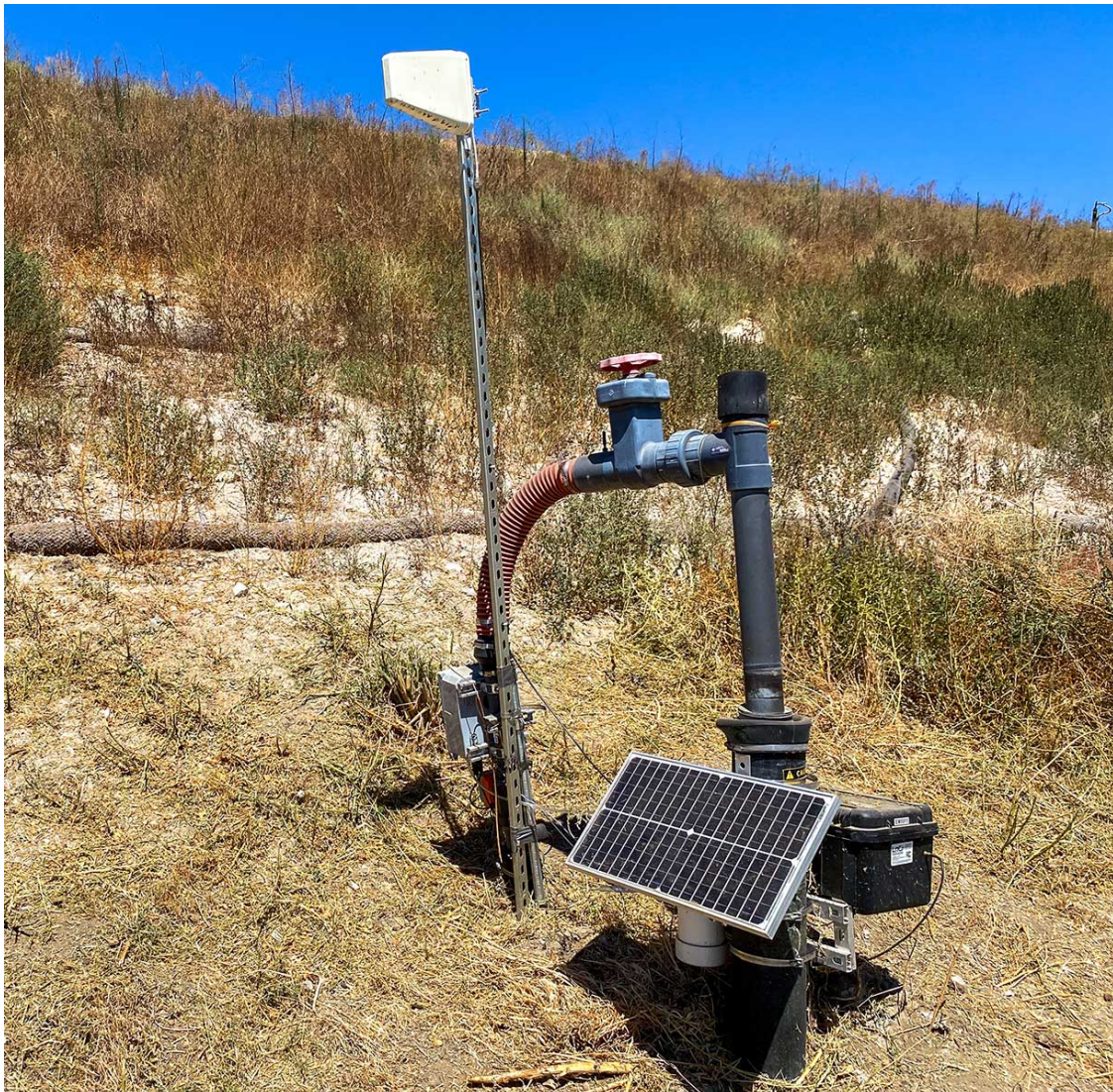
Successes to date:

64,313 tons of waste diverted

- 12,400 tons of CO₂e eliminated

The Smart Landfill Program

OCWR's Smart Landfill Program (SLP) enhances and automates critical information and equipment to increase landfill gas collection. By incorporating real-time data assessment, drone technology, and infrared imaging, the program monitors and manages the landfill system with precision, improving efficiency and cutting methane and co-pollutants. The SLP can proactively identify leaks and fine-tune methane capture from its landfills, reducing greenhouse gas emissions by up to 15 percent. Deputy director of compliance support, Julian Sabri, describes this technology as “the eyes, ears, and control tool” of landfill operations, emphasizing how it allows OCWR to stay on top of its emissions.



Head equipped with real-time monitoring and controls.

One standout feature of the SLP is automated well tuning, which makes continuous valve adjustments to boost collection efficiency as temperature, pressure, and weather conditions fluctuate. These systems also provide operators with real-time information on potential issues related to the gas collection system, such as flooded wellheads or cover integrity problems, enabling timely repairs to maintain optimal performance.

"You might not think there's a lot of technology that goes on at a landfill. Matter of fact, there is," Sabri explains. With centralized control and monitoring, OCWR is creating a model for other landfills to follow.

Dogs and drones: boosting methane detection and capture

As part of SLP, OCWR is further enhancing landfill operations by piloting cutting-edge tools to detect, quantify, and mitigate methane emissions and integrating all automation components. Robotic dogs equipped with methane sensors patrol landfill sites, in addition to the drones that map emissions from above. Compared to traditional monitoring, where a technician walks the site for miles, these methods are safer, more efficient, and more economical.

OCWR uses this data to identify leaks and implement targeted solutions, from expanding gas collection systems to improving cover materials. This approach goes beyond compliance, positioning OCWR as a leader in proactive methane management. "We don't just hope to *meet* the standard, but to *be* the standard," celebrates Koutroulis.



We don't just hope to meet the standard, but to be the standard.

TOM KOUTROULIS, OCWR DIRECTOR

Additionally, OCWR is utilizing its expansive properties for energy projects, with plans in progress to process excess landfill gas that would otherwise be flared into biomethane for local energy use. OCWR is also researching options such as solar installations on closed landfills that align with California's SB 100 goal of a 100 percent clean energy grid by 2045. "We have a lot of property, and in southern

California, we have a lot of sun. So, we believe this is another great opportunity to take advantage of the infrastructure we currently have to address renewable energy needs," notes Koutroulis.





Methane-detecting drones and robotic dogs efficiently identify leaks for mitigation.

Model for methane mitigation

By diverting organic waste and implementing smart landfilling technologies, OCWR is demonstrating how to comprehensively cut methane emissions while delivering local benefits. These strategies work in tandem: composting improves soil health, creates jobs, and builds resilience, while controlling landfill methane emissions leads to cleaner air, reduced odors, and healthier neighborhoods.

Tackling waste sector emissions is one of the most affordable and impactful ways to advance state and local climate goals. As Orange County continues to make strides, its methane mitigation strategy can serve as a model for other communities across the country and around the world.

For more information on how landfill operators and municipalities can reduce methane emissions see RMI's playbook [Deploying Advanced Monitoring Technologies at US Landfills](#).

Top image: Tom Frankiewicz, RMI's waste sector subject matter expert, and Tom Koutroulis, director of waste & recycling for Orange County, at the Frank R. Bowerman Landfill

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