Expanding composting capacity to reduce methane emissions from organic waste in Indonesia

Share

Location:

Bali, Indonesia

Region:

Asia

Timeframe

2022–2027

Executive Summary: Delterra, an environmental non-profit organization based in the United States (U.S.), partnered with regional environmental agencies and local waste management facilities in Bali, Indonesia, to increase source separation of waste measures that divert organic waste and recyclable materials from landfills, and in turn, reduce methane emissions. The goal of the project is to achieve recycling rates of 11 percent by 2025 and is projected to reduce emissions by 3,000 metric tons of carbon dioxide equivalent (tCO_2e) by 2026.

Introduction and Background

In Bali, Indonesia, waste management is administered by village-level facilities, locally known as Tempat Pengolahan Sampah 3R (TPS3Rs), which are often under-resourced and inefficient. Typically serving communities between 5,000 and 30,000 people, these facilities sort recyclable materials and compostable organic waste in an effort to reduce the amount of waste sent to landfills. The facilities face many challenges including limited processing capacity, high volumes of organic waste, and poor market demand for compost due to soil fertility, government subsidies for chemical fertilizers, and concerns about quality. Many of these facilities are not utilized to their full capacity or are left abandoned. As a result, communities choose to burn waste or dump mixed waste into unmanaged landfills, which negatively impacts the environment and public health by increasing emissions of methane and other air pollutants.

To address these challenges and reduce methane emissions from organic waste, Delterra partnered with Bali's Forestry and Environmental Agency (DKLH) and the Badung Regency Department of Environment and Sanitation (DLHK Badung) in 2022 to pilot an integration project that links five village TPS3Rs with a larger, regency-level facility known as a Tempat Pengolahan Sampah Terpadu (TPST). This ongoing initiative aims to improve organic waste management and reduce methane emissions by increasing waste diversion, improving compost quality, and enhancing facility operations.

Delterra began a collaboration through the Global Methane Initiative (GMI) with the U.S. Environmental Protection Agency to improve the estimation of emissions from waste management in Bali. Using the Solid Waste Emissions Estimation Tool (SWEET) to estimate methane emission reductions, Delterra collaborated with the Government of Indonesia and local environmental groups in Bali, leveraging its expertise in scalable waste management solutions to design a more effective waste management system for Bali that would increase source separation rates, improve organic waste processing, and create a replicable model for sustainable waste systems.

Project Partners:
Delterra**,** Environment and Sanitation Agency of Badung Regency, Badung Regency and village governments, Global Methane Initiative, Global Methane Hub, Griya Luhu, AGET

Project Objectives and Actions Taken

Delterra followed a rigorous multi-step approach to project delivery:

1. **Conduct stakeholder mapping and engagement.** Delterra created enabling conditions for partnerships and agreements with key stakeholders, including the Bali Provincial Government, DKLH Bali, Environment and Sanitation Agency of DLHK Badung, several village governments, and material recovery facilities (MRFs) at both the village and regency levels.

   Delterra's partnership engagement resulted in:

   - The renewal and development of memorandums of understanding (MOUs) and cooperation agreements with DLHK Badung and DKLH Bali in 2022.
   - Regular stakeholder engagement sessions to co-design the waste management project.
   - The development of pre-screening criteria for selecting village governments based on readiness and alignment with project objectives.
   - The establishment of a partnership with the Global Methane Hub in 2023 to fund targeted strategies for methane reduction and increase source separation rates in Indonesia.

2. **Establish baselines.** At the start of the project, Delterra collected primary data to establish an accurate estimate of each village's baseline emissions to set reasonable targets. Key metrics that were tracked included:

   - Waste characterization and flow analysis to understand the types and volumes of waste transported to facilities.
   - Detailed data on waste collection volumes, recycling rates, and landfill diversion rates.
   - Customer coverage by waste collection services, segmented by customer type and waste generation levels.

3. **Analyze and design interventions.** After collecting precise data, Delterra analyzed the data to design interventions, including behavioral

changes that drive source separation, behavioral changes of households and other waste generators, operational improvements at the MRFs and collection routes, and offtake and material sales.

4. **Build capacity of local partners.** Delterra began implementing the project in February 2024 and worked with on-the-ground stakeholders to implement the key areas of interventions (behavioral change and education, waste operations, and compost market demand).
5. **Ensure project sustainability.** As of 2025, Delterra continues to collaborate with local partners and stakeholders to phase out and hand over projects to them and to ensure monitoring and evaluation processes are in place to facilitate project longevity.

This integrated approach combines stakeholder collaboration, data-driven planning, community engagement, and operational improvements. It also promotes effective scaling of organic waste recycling and creates a replicable model for sustainable waste management.

Sector(s):

Municipal Solid Waste

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Projected Future Results

The goal of the project is to significantly increase organic waste recycling in the northern Badung Regency and recycling rates of 11 percent by 2025 and 25 percent by 2027. According to the SWEET analysis, increasing recycling rates to 11 percent by 2025 will lead to emissions reduction of 3,000 metric tons of carbon dioxide equivalent (tCO_2e) by 2026. Further increasing recycling rates to 25 percent by 2027 would reduce emissions by 6,800 tCO_2e by 2028.

Beyond projected emissions reductions, this initiative has already boosted local employment and strengthened collaboration among village-level TPS3Rs and regional facilities. Since beginning the pilot study in 2022 to the beginning stages of project implementation in late 2024, Delterra has trained more than 4,000 households from 13 villages and over 350 waste workers in separation, composting, and data collection, which has laid the groundwork for broader program adoption. The project led to a dramatic increase in participation in waste separation. For example, the Mengwi village improved waste separation rates from 22 to 54 percent in 2024 due to strong enforcement of existing regulation, leadership engagement, and tailored collection systems. Increased separation rates will support both composting and recycling improvements.

Lessons Learned

1. **Regulation and enforcement achieves high participation rates:** Significant improvements in source separation rates are achievable by using strong top-down regulation and enforcement, as well as building infrastructure and collection systems designed to reinforce sorting behavior.

2. **Cost efficiencies are gained by scaling up waste processing facilities:** Expanding the scale and capacity of waste processing facilities is essential for transforming Bali's waste system cost-effectively. Larger facilities offer economies of scale by reducing the costs of processing individual waste items while enhancing skill development, capability building, and increasing sales of recycled products.

3. **Compost market challenges can be addressed through the exploration of new sale opportunities:** While there is demand for compost in Bali, current price and volume dynamics often fail to justify the cost of diverting organic waste. Efforts are ongoing to explore large-scale offtake (sales) opportunities, such as the use of compost for landfill daily cover, as a soil amendment for village parks and green spaces, and partnerships with private fertilizer companies.

Relevant Links

- https://delterra.org/our-programs/indonesia/

- Global Methane Initiative - https://www.globalmethane.org/resources/details.aspx?resourceid=5176

Tags

- Waste Management
- Organic Waste
- Source Separation
- Methane
- Indonesia