

## **Attachment 1: Description of Emission Reduction Measure Form**

Please fill out one form for each emission reduction measure. See instructions in Attachment 2.

**Title: Recycling and Composting Protocol**

**Type of Measure (check all that apply):**

- |   |   |
|---|---|
| <input type="checkbox"/> Direct Regulation                          | <input type="checkbox"/> Market-Based Compliance          |
| <input type="checkbox"/> Monetary Incentive                         | <input type="checkbox"/> Non-Monetary Incentive           |
| <input type="checkbox"/> Voluntary                                  | <input type="checkbox"/> Alternative Compliance Mechanism |
| <input checked="" type="checkbox"/> Other Describe: <b>Protocol</b> |   |

**Responsible Agency: CARB/CCAR/CIWMB/ICLEA**

**Sector:**

- |   |   |
|---|---|
| <input type="checkbox"/> Transportation   | <input type="checkbox"/> Electricity Generation   |
| <input type="checkbox"/> Other Industrial | <input type="checkbox"/> Refineries   |
| <input type="checkbox"/> Agriculture      | <input type="checkbox"/> Cement   |
| <input type="checkbox"/> Sequestration    | <input checked="" type="checkbox"/> Other Describe: <b>Solid waste recycling and composting</b> |

**2020 Baseline Emissions Assumed (MMT CO<sub>2</sub>E): 3 MMT CO<sub>2</sub>E reduction in the CAT Report**

**Percent Reduction in 2020: Varies based upon possible 2008 legislation**

**Cost-Effectiveness (\$/metric ton CO<sub>2</sub>E) in 2020: To be determined**

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**Description:**

Niether the California Climate Action Registry (The Registry) nor the ARB has an established protocol for calculating GHG emissions reductions due to recycling, composting, and combustion of wood waste for energy generation. GHG emissions reductions are achieved by recycling, composting, and combusting solid waste. Recycling reduces the demand for raw or virgin materials while re-manufacturing with recycled materials generally reduces overall energy use. Recycling also results in increased carbon sequestration by forests since fewer trees need to be harvested for wood and paper products. Well-managed composting results in increased soil carbon storage, and end use of compost results in reduced demand for water, fertilizer and other soil inputs. Combustion of wood waste for energy generation offsets fossil fuel use.

The Registry has developed a General Reporting Protocol and additional industry-specific protocols which give guidance on how to inventory GHG emissions for participation in The Registry: what to measure, how to measure, the back-up data required, and certification requirements. When organizations become participants, they agree to register their GHG emissions for all operations in California. Both gross emissions and efficiency metrics will be recorded. The Registry requires the inclusion of all direct GHG emissions, along with indirect GHG emissions from electricity use. The Registry also allows for optional reporting for other activities to help describe GHG reduction activities, such as recycling, waste prevention, and composting that have demonstrated GHG reduction benefits, as illustrated in Federal EPA studies and protocols.

The Registry is in the process of developing protocols for the Landfill Sector for methane emissions, which are 21 times stronger than CO<sub>2</sub>. The Registry has recognized that recycling and composting reporting and protocols should be separate from the Landfill Sector, and has recently discussed the formation of a Working Group to develop the recycling and composting protocols.

The Cities for Climate Protection™ (CCP) Campaign assists cities to adopt policies and implement quantifiable measures to reduce local greenhouse gas emissions, improve air quality, and enhance urban livability and sustainability. More than 800 local governments participate in the CCP, which is supported by ICLEI—Local Governments for Sustainability, where many of the California cities are members. Large counties from across the country joined the Sierra Club in announcing the creation of the Cool Counties Climate Stabilization Declaration, a major new initiative to combat global warming. The counties pledge to reduce global warming emissions 80 percent by 2050, an achievable average annual reduction of 2 percent. The Cool Counties Climate Stabilization Declaration also urges the federal government to adopt legislation requiring an 80 percent emissions reduction by 2050.

However, the Clean Cities and the Cool Counties are stuck on older models that credit landfill carbon sequestration and are not accounting for GHG emissions reductions from recycling. In some city reports, the assumption is that the solid waste and recycling industry is just carbon neutral since the amount of landfill sequestration could equal fleet emissions.

The industry, local government, and the environmental community are clamoring for a recycling and composting reporting protocol to fully recognize the GHG reductions associated with recycling and composting.

**Emission Reduction Calculations and Assumptions:** Best practice methodology uses EPA's WASTE Reduction Model (WARM) , which was developed to help solid waste managers evaluate management options with respect to their GHG emissions impact. WARM calculates the emissions impacts of several management options

(landfill, recycling, composting, and combustion with waste-to-energy (WTE) recovery) for 34 separate categories of waste material. The WARM emission factors are based on an EPA study entitled "Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks", originally published in 2002 and now in its 3rd edition (September 2006). The WARM model can serve as the basis for the recycling protocol, where the WARM model can be updated for organics utilizing the new lifecycle study that the California Integrated Waste Management Board is preparing for organics (contract awarded to RTI International in May 2007, "Lifecycle Assessment of Organic Diversion Alternatives and Economic Analysis of Greenhouse Gas Reduction Options").

WARM calculates and totals GHG emissions of baseline and alternative waste management practices—source reduction, recycling, combustion, composting, and landfilling. GHG savings are calculated by comparing the emissions from an alternative scenario with the emissions associated with the baseline scenario. In this way, the reduction in GHG emissions from increasing the recycling rates of various commodities can be determined. Because of the stringent reporting requirements related to solid waste management, the recycling rates can be easily verified.

The WARM model calculates emissions in metric tons of carbon equivalent (MTCE), metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>E), and energy units (million BTU) across a wide range of material types commonly found in municipal solid waste (MSW). The model uses a life-cycle analysis approach, and is being used by many states to quantify GHG reductions from different solid waste management strategies. The model considers emissions associated with acquisition of raw materials, emissions during the manufacturing process, and transportation emissions.

The EPA WARM model includes assumptions that are generalized, but that can be modified to accommodate different conditions in protocols based on performance standards. For instance, the assumed mix of energy sources can be adjusted to match those within the State of California, or even on a regional basis, to provide more accurate estimates of emissions reductions. Transportation distances can be revised to more accurately reflect regional conditions and used as a standardized model for the region.

It is noted that, like all models, WARM has inherent uncertainties, embedded simplifications, and boundary conditions that limit its accuracy and applicability to all situations. In fact, the California Integrated Waste Management Board is currently funding a large study to improve the life-cycle assessment on organic diversion alternatives that result in greenhouse gas emission reductions. In lieu of an alternative, and until more research is completed, WARM remains the best general model available in order to develop the protocol.

The Recycling Reporting Working Group working with CCAR is just in the formation stage and plans to review the science of the WARM model on a material-by-material basis, and relate the WARM model material types to typical recyclable commodities.

**Cost-Effectiveness Calculation and Assumptions:** To be determined

**Implementation Barriers and Ways to Overcome Them:** WARM model for composting of organics does not account for full life cycle benefits. A 2-year study funded at \$500,000 by the CIWMB is underway to better assign GHG reductions for organic diversion alternatives, such as composting.

**Potential Impact on Criteria and Toxic Pollutants:** To be determined

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