5

Category 5: Waste Generated in Operations

Category description

Category 5 includes emissions from third-party disposal and treatment of waste generated in the reporting company's owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater.

Only waste treatment in facilities owned or operated by third parties is included in scope 3. Waste treatment at facilities owned or controlled by the reporting company is accounted for in scope 1 and scope 2. Treatment of waste generated in operations is categorized as an upstream scope 3 category because waste management services are purchased by the reporting company.

This category includes all future emissions that result from waste generated in the reporting year. (See chapter 5.4 of the *Scope 3 Standard* for more information on the time boundary of scope 3 categories.)

Waste treatment activities may include:

- Disposal in a landfill
- Disposal in a landfill with landfill-gas-to-energy (LFGTE) – that is, combustion of landfill gas to generate electricity
- Recovery for recycling
- Incineration
- Composting
- Waste-to-energy (WTE) or energy-from-waste (EfW) – that is, combustion of municipal solid waste (MSW) to generate electricity
- Wastewater treatment.

A reporting company's scope 3 emissions from waste generated in operations derive from the scope 1 and scope 2 emissions of solid waste and wastewater management companies. Companies may optionally include emissions from transportation of waste in vehicles operated by a third party.

Calculating emissions from waste generated in operations

Different types of waste generate different types and quantities of greenhouse gases. Depending on the type of waste, the following greenhouse gases may be generated:

- CO_2 (from degradation of both fossil and biogenic carbon contained in waste)
- CH_4 (principally from decomposition of biogenic materials in landfill or WTE technologies)
- HFCs (from the disposal of refrigeration and air conditioning units).

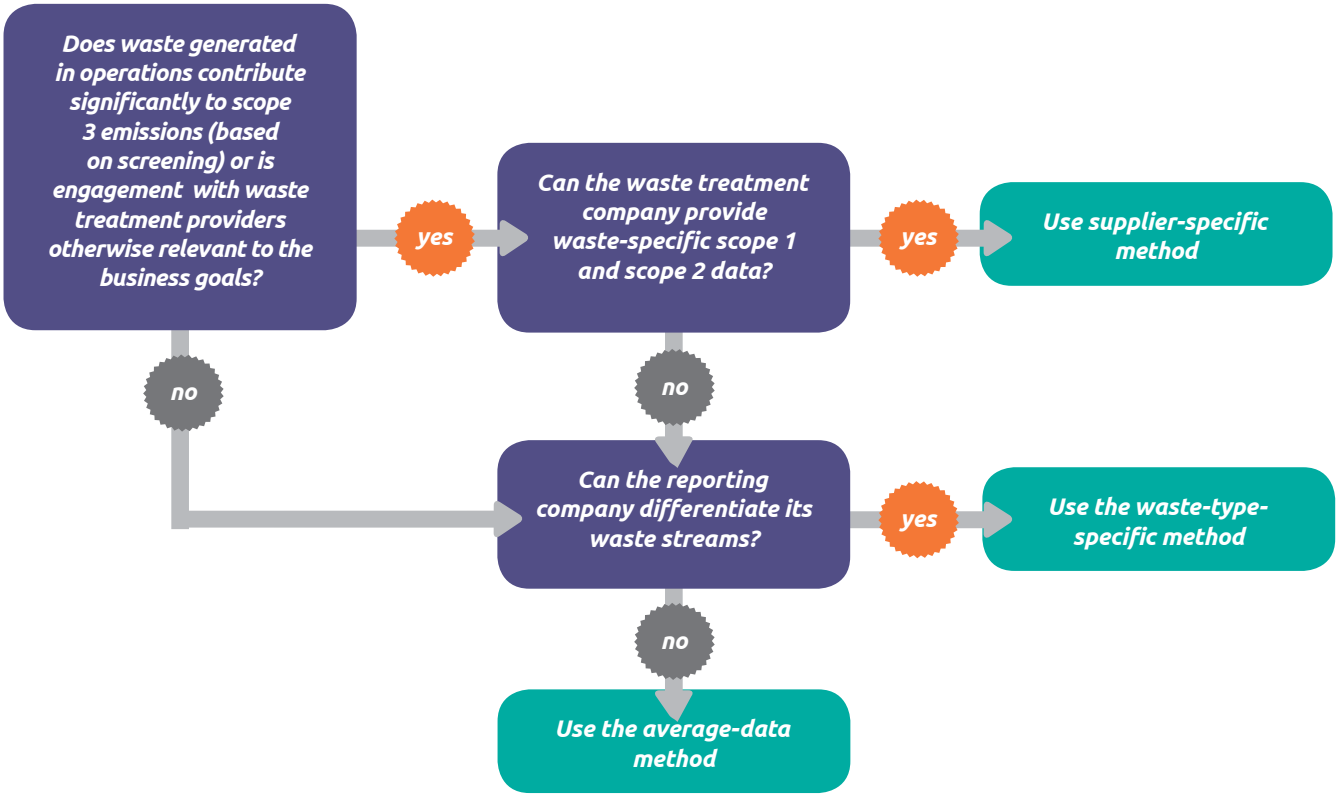
Companies may use any one of the following methods to calculate emissions from waste generated in their operations, but managed by third parties:

- **Supplier-specific method**, which involves collecting waste-specific scope 1 and scope 2 emissions data directly from waste treatment companies (e.g., for incineration, recovery for recycling)
- **Waste-type-specific method,** which involves using emission factors for specific waste types and waste treatment methods
- **Average-data method,** which involves estimating emissions based on total waste going to each disposal method (e.g., landfill) and average emission factors for each disposal method.

To optionally report emissions from the transportation of waste, refer to category 4 (Upstream transportation and distribution) for calculation methodologies.

Figure 5.2 gives a decision tree for selecting a calculation method for emissions from waste generated in operations.

Figure [5.2] Decision tree for selecting a calculation method for emissions from waste generated in operations



Supplier-specific method

In certain cases, third party waste-treatment companies may be able to provide waste-specific scope 1 and scope 2 emissions data directly to customers (e.g., for incineration, recovery for recycling).

Activity data needed

Companies should collect:

- Allocated scope 1 and scope 2 emissions of the waste-treatment company (allocated to the waste collected from the reporting company).

Emission factors needed

If using the supplier-specific method, the reporting company collects emissions data from waste treatment companies, so no emission factors are required (the company would have already used emission factors to calculate the emissions).

Calculation formula [5.1] Supplier-specific method

CO_2e emissions from waste generated in operations =

sum across waste treatment providers:
∑ allocated scope 1 and scope 2 emissions of waste treatment company

Waste-type-specific method

Emissions from waste depend on the type of waste being disposed of, and the waste diversion method. Therefore, companies should try to differentiate waste based on its type (e.g., cardboard, food-waste, wastewater) and the waste treatment method (e.g., incinerated, landfilled, recycled, wastewater).

Activity data needed

Companies should collect:

- Waste produced (e.g., tonne/ cubic meter) and type of waste generated in operations
- For each waste type, specific waste treatment method applied (e.g., landfilled, incinerated, recycled).

Because many waste operators charge for waste disposal by the method used, disposal methods may be identified on utility bills. The information may also be stored on internal IT systems. Companies with leased facilities may have difficulty obtaining primary data. Guidance on improving data collection can be found in chapter 7 of the *Scope 3 Standard*.

Emission factors needed

Companies should collect:

- Waste type-specific and waste treatment-specific emission factors. The emission factors should include end-of-life processes only. Emission factors may include emissions from transportation of waste.

Data collection guidance

Data sources for emission factors include:

- Calculated emission factors using IPCC Guidelines (*2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5)*, available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html
- Life cycle databases
- Industry associations.

Calculation formula [5.2] Waste-type-specific method

CO_2e emissions from waste generated in operations =

sum across waste types:

∑ (waste produced (tonnes or m^3) × waste type and waste treatment specific emission factor (kg CO_2e/tonne or m^3))

Example [5.1] Calculating emissions from waste generated in operations using the waste-type-specific method

Company A manufactures plastic components and produces solid waste as well as a high volume of wastewater in the manufacturing process. The company collects data on the different types of waste produced, and how this waste is treated. Emission factors are then sourced for each of the waste types.

Waste type	*Waste produced*	*Waste treatment*	*Waste type and waste treatment specific emission factor**
Plastic	2,000 t	Landfill	40 kg CO_2e/t
Plastic	5,000 t	Incinerated with energy recovery	2 kg CO_2e/t[a]
Plastic	4,000 t	Recycled	10 kg CO_2e/t[b]
Water disposal	5,000 m^3	Wastewater	0.5 kg CO_2e/m^3

Notes: the activity data and emission factors in this example are for illustrative purposes only.

a. Includes emissions from preparation and transportation not allocated to the energy produced.

b. Includes emissions from material recovery in preparation for recycling not allocated to the recycled material.

∑ (waste produced (tonnes)
× waste type and waste treatment specific emission factor (kg CO_2e/tonne or m^3))
= (2,000 × 40) + (5,000 × 2) + (4,000 × 10) + (5,000 × 0.5) = 132,500 kg CO_2e

Average-data method

Companies using the average-data method should collect data based on the total waste diversion rates from the reporting organization. This is often preferable where the type of waste produced is unknown. However, this method has a higher degree of uncertainty than the waste-type-specific method.

Activity data needed

Companies should collect:

- Total mass of waste generated in operations
- Proportion of this waste being treated by different methods (e.g., percent landfilled, incinerated, recycled).

Because many waste operators charge for waste by disposal method, this data may be collected from utility bills. The information may also be stored on internal IT systems.

Emission factors needed

Companies should collect:

- Average waste treatment specific emission factors based on all waste disposal types. The emission factors should include end-of-life processes only.

Data collection guidance

Data sources for emission factors include:

- Life cycle databases
- National inventories.

Calculation formula [5.3] Average-data method

CO_2e emissions from waste generated in operations =

sum across waste treatment methods:

∑ (total mass of waste (tonnes) × proportion of total waste being treated by waste treatment method × emission factor of waste treatment method (kg CO_2e/tonne))

Example [5.2] Calculating emissions from waste generated in operations using the average-data method

Company A is a telesales center. The company does not have sufficient information to allow the waste-type specific data method. Company A, therefore, collects data on the total waste collected, the proportion of waste treated by various methods, and average emission factors for waste diversion methods:

Total waste produced (tonnes)	*Waste treatment*	*Proportion (percent)*	*Average emission factor of waste treatment method (kg CO_2e/tonne)*
40	Landfill	25	300
	Incinerated with energy recovery	5	0[a]
	Recycled	30	0[b]
	Recycled	20	10[c]
	Composted	20	30

Notes: the activity data and emission factors in this example are for illustrative purposes only.

a. Emissions from preparation and transportation have been allocated to the energy produced.

b. Emissions from material recovery in preparation for recycling have been allocated to the recycled material.

c. Emissions from material recovery in preparation for recycling have not been allocated to the recycled material.

$$\sum \text{(total mass of waste (tonnes)} \times \text{proportion of total waste being treated by waste treatment method} \times \text{emission factor of waste treatment method (kg } CO_2\text{e/tonne))}$$
$$= (40 \times 0.25 \times 300) + (40 \times 0.05 \times 0) + (40 \times 0.3 \times 0) + (40 \times 0.2 \times 10) + (40 \times 0.2 \times 30)$$
$$= 3{,}320 \text{ kg } CO_2\text{e}$$

Accounting for emissions from recycling

Emission reductions associated with recycling are due to two factors:

- The difference in emissions between extracting and processing virgin material versus preparing recycled material for reuse
- A reduction in emissions that would otherwise have occurred if the waste had been sent to a landfill or other waste treatment method.

Companies may encounter recycling in three circumstances, each of which is relevant to a different scope 3 category (see table 5.1 and figure 5.1).

Table [5.1] Accounting for emissions from recycling across different scope 3 categories

Circumstance	*Relevant scope 3 category*
A Company purchases material with recycled content	Category 1 (Purchased goods and services), or Category 2 (Capital goods)
B Company generates waste from its operations that is sent for recycling	Category 5 (Waste generated in operations)
C Company sells products with recyclable content	Category 12 (End-of-life treatment of sold products)

Under circumstance A (table 5.1), if a company purchases a product or material that contains recycled content, the upstream emissions of the recycling processes are built into the cradle-to-gate emission factor for that product and would, therefore, be reflected in category 1 (Purchased goods and services). If a company purchases a recycled material that has lower upstream emissions than the equivalent virgin material then this would register as lower emissions in category 1. Under circumstance B, a company may recycle some of its "operational waste". These emissions are reported under category 5 (Waste generated in operations). Under circumstance C, products with recyclable content eventually become waste, which could be recycled. Emissions generated in this process are reported as category 12 (End-of-life treatment of sold products). (See figure 5.1.)

Because one company may both purchase recycled materials and sell recyclable products, methodologies have been established to keep the emissions from being double counted. To allocate the emissions from the recycling process between the disposer of the waste and the user of the recycled material, the recommended allocation method is the "recycled content method." This method allocates the emissions to the company that uses the recycled material (reported as category 1).

If there is doubt about which processes are allocated to the recycled material (circumstance A), it may be helpful to look at which processes are included in the cradle-to-gate emission factor for the material when it is used as an input. Any processes not included in that factor, but applicable to the company's supply chain, should be included in category 5 or category 12 because they have not been allocated to the recycled material.

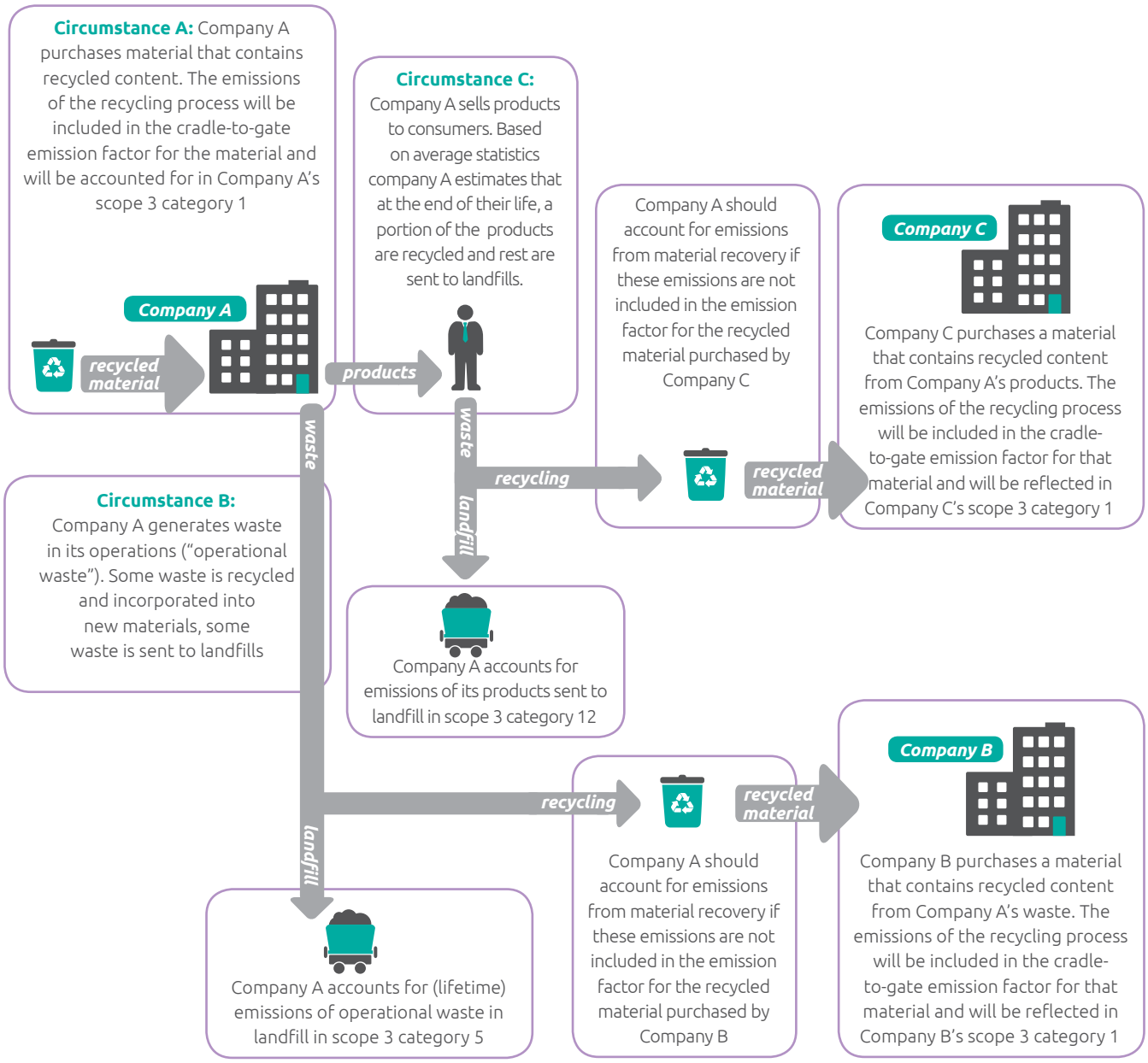
The recycled content method is recommended for scope 3 inventories because it is easy to use and generally consistent with secondary emission factors available for recycled material inputs. However, companies may use other methods if they are more applicable to specific materials in their supply chain. For example, the "closed loop approximation method" may be applicable when a recycled material output has the same inherent properties as virgin material input into the same supply chain. This method, also defined in more detail in section 9.3.6 of the Product Standard, accounts for the impact that end-of-life recycling has on the net virgin acquisition of a material. If there is uncertainty about which recycling method is appropriate for a given material or if the supply chain is complex, the recycled content method is the recommended choice to avoid double counting or miscounting of emissions.

Reporting negative or avoided emissions from recycling

Claims of negative or avoided emissions associated with recycling are claims beyond a reduction in processing emissions (as described in circumstance A above) and beyond a reduction in waste treatment emissions in categories 5 or 12

(as described in circumstances B and C above). Negative or avoided emissions claims refer to a comparison of the emissions from processing the recycled material relative to the emissions from producing the equivalent virgin material. Any claims of avoided emissions associated with recycling should not be included in, or deducted from, the scope 3 inventory, but may instead be reported separately from scope 1, scope 2, and scope 3 emissions. Companies that report avoided emissions should also provide data to support the claim that emissions were avoided (e.g., that recycled materials are collected, recycled, and used) and report the methodology, data sources, system boundary, time period, and other assumptions used to calculate avoided emissions. For more information on avoided emissions, see section 9.5 of the *Scope 3 Standard* (see also "Reporting additional metrics for recycling and waste-to-energy," below).

Figure [5.1] Using the recycled content method to account for emissions from recycling



Accounting for emissions from incineration with energy recovery (waste-to-energy)

Attributing emissions from waste-to-energy is similar to the approach taken for recycling. Companies may both generate waste that is incinerated with energy recovery (waste-to-energy) and consume energy that is generated by waste-to-energy processes. If a company purchases energy from the same facility that it sends its waste to, then accounting for emissions from the waste-to-energy combustion process both upstream and downstream would double count the emissions. To avoid double counting, a company should account for upstream emissions from purchased energy generated from waste in scope 2. (In most cases, the emissions associated with combustion of waste to produce energy will be included in the grid average emission factor). Companies should account for emissions from preparing and transporting waste that will be combusted in a waste-to-energy facility in category 5, but should not account for emissions from the waste-to-energy combustion process itself. These emissions should be included in scope 2 by the consumers of energy generated from waste.

If waste from operations is incinerated and used for energy on-site and under operational or financial control, the emissions associated with the incineration are included as scope 1 (and scope 2 would decrease as a result of a reduction in purchased energy). Companies should not report negative or avoided emissions associated with waste-to-energy in the inventory.

This guidance does not apply to accounting for emissions from waste that is incinerated without energy recovery. All emissions from combusting waste without energy recovery are reported by the company generating the waste under scope 3, category 5 (Waste generated in operations).

Reporting additional information for recycling and waste-to-energy

Under the accounting methodology described above, emissions from recycling and waste-to-energy both appear to have a similar effect on the reporting company's scope 3 category 5 emissions (i.e., emissions from both will be reported as close to zero) based on the scope 3 boundary definition. It is, therefore, suggested that companies separately report additional information to help identify the full GHG impacts within and outside their inventory boundary and make informed decisions about the best options for waste treatment (e.g. recycling compared to waste-to-energy).

If electricity is generated from waste-to-energy, companies may report separately the emissions per unit of net electrical generation from the combustion stage of waste-to-energy relative to the local grid average electricity emission factor (tonnes CO_2e per kWh). For example incinerating plastic waste is likely to be more carbon-intensive per kWh of electricity generated than the grid average. Reporting this metric would help companies understand whether sending their waste to a waste-to-energy facility is leading to more- or less-carbon-intensive electricity for the region.

Similarly in the case of recycling, it is suggested that companies report separately the recycling emissions relative to the emissions from producing the equivalent virgin material. This number will often be a negative emissions figure (as recycled material inputs generally have lower upstream emissions than virgin materials). If reported, this figure must be reported separately to the scope 3 inventory.

Accounting for emissions from wastewater

Emissions from wastewater are highly variable depending on how much processing is needed to treat the water (determined by biological oxygen demand [BOD] and/or chemical oxygen demand [COD]). The following industries often have higher emissions from wastewater (where wastewater is not treated onsite): starch refining; alcohol refining; pulp and paper; vegetables, fruits, and juices; and food processing. Companies in these industries should calculate emissions from wastewater using methods provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste*, available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html.