

# OP 12: Waste Generation and Recovery

## Rationale

This credit recognizes institutions that minimize the waste materials they produce through source reduction, and divert materials from disposal to a landfill or incinerator through recovery operations.

## Applicability

This credit is applicable to all institutions, however indicator 12.4 is only applicable to institutions that have conducted one or more major construction, renovation, and/or demolition projects within the previous three years.

## Points available

A total of either 5 or 4 points are available for this credit, as outlined in Table I.

Table I. Points available for waste generation and recovery

Has the institution conducted one or more major construction, renovation, and/or demolition projects within the previous three years?	Points available for indicator 12.1	Points available for indicator 12.2	Points available for indicator 12.3	Points available for indicator 12.4	Total points available
Yes	1	1	2	1	5
No	1	1	2	0	4

## Criteria

### 12.1 Non-hazardous waste generated per person

An institution earns 1 point when its annual amount of **non-hazardous waste** generated per **full-time equivalent** of students and employees is less than or equal to a benchmark for its peer group. Incremental points are available and earned as outlined in Tables II-VII.

Table II. Performance range by peer group, non-hazardous waste per person

Peer group	A. Minimum threshold		B. Benchmark		C. Range
Associate's colleges, short-cycle institutions, and pre-tertiary schools	95 kilograms (kg) per person	-	16 kg per person	=	79
Baccalaureate colleges and boarding schools	556 kg per person	-	49 kg per person	=	507
Master's colleges and universities	275 kg per person	-	26 kg per person	=	249
Doctoral universities and research institutions	322 kg per person	-	24 kg per person	=	298

Table III. Non-hazardous waste diverted from disposal through recovery operations (metric tons)

Non-hazardous waste recycled		Non-hazardous waste composted		Non-hazardous waste prepared for reuse		Total non-hazardous waste diverted from disposal
	+		+		=	

Table IV. Annual non-hazardous waste generated (metric tons)

Total non-hazardous waste diverted from disposal (Table III)		Non-hazardous waste disposed of to a landfill or incinerator		Annual non-hazardous waste generated
	+		=	

Table V. Full time equivalent students and employees

Full-time equivalent student enrollment		Full-time equivalent of employees		Full-time equivalent students and employees

	+		=	
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Table VI. Annual non-hazardous waste generated per person (kg)

Annual non-hazardous waste generated (Table IV)		Conversion factor		Full-time equivalent students and employees (Table V)		Annual non-hazardous waste generated per person
	×	1,000	÷		=	

Table VII. Points earned for indicator 12.1

Minimum threshold (Table II, column A)		Annual non-hazardous waste generated per person (Table VI)		Range (Table II, column C)		Points available		Points earned
	-		÷		×	1	=	

### Measurement

Report the most recent annual data available from within the previous three years. An institution may track **waste** over a full one-year time period (calendar or fiscal year), report average annual waste over a two or three year period, or estimate annual waste based on a **representative sample**.

Include all municipal solid waste (i.e., trash or rubbish) and non-hazardous recyclable and compostable materials generated by the institution. Construction, demolition, hazardous, universal, special (e.g., coal ash), medical, and non-regulated chemical waste should be excluded to the extent feasible.

If possible, waste figures measured in volume should be converted to weight using factors determined locally based on multiple weight samples taken of materials collected on-site. Otherwise, an institution may use generic volume-to-weight conversion factors provided by the United Nations Environment Programme (UNEP), the US Environmental Protection Agency, CalRecycle, or the equivalent.

An institution may account for reuse at the point an item is diverted from disposal (e.g., to a surplus/repair facility) or at the point an item is reallocated, donated, or resold to a new user, as long as the methodology is used consistently.

Provide information about the methodology used to complete this indicator, the scope of the analysis (e.g., materials included/excluded), and any data limitations or other factors (e.g., contamination rates and/or sorting inefficiencies) that may have influenced the results in the public Notes field provided in the Reporting Tool.

## Documentation

Report the following information in the online Reporting Tool, with waste figures provided in metric tons (tonnes) and percentage figures provided within a range of 0 to 100. To convert US (short) tons, multiply by 0.907185.

- Performance year for non-hazardous waste (required). The year the performance period ended.
- Peer group (required)
  - Associate's colleges, short-cycle institutions, and pre-tertiary schools
  - Baccalaureate colleges and boarding schools
  - Master's colleges and universities
  - Doctoral universities and research institutions
- Non-hazardous waste **recycled** (required). Metric tons.
- Non-hazardous waste composted (required). Metric tons. Include on-site anaerobic digestion that produces materials fit for use on soils and farmlands.
- Non-hazardous waste **prepared for reuse** (required). Metric tons. Include items redirected for repair, surplus, donation, or resale.
- Non-hazardous waste disposed of to a landfill or incinerator (required). Metric tons. This may include facilities that have energy recovery systems.
- Estimated percentage of non-hazardous waste disposed of to a landfill or incinerator that is disposed of to a **waste-to-energy (WTE) facility** (optional)
- Full-time equivalent student enrollment (required)
- Full-time equivalent of employees (required)

The Reporting Tool will automatically calculate the following four figures:

- Total non-hazardous waste diverted from disposal. Metric tons.
- Annual non-hazardous waste generated. Metric tons.
- Full-time equivalent students and employees
- Annual non-hazardous waste generated per person. Kilograms.

## 12.2 Non-hazardous waste generated per square meter

An institution earns 1 point when its annual amount of **non-hazardous waste** generated per **gross square meter of floor area** is less than or equal to a benchmark for its peer group. Incremental points are available and earned as outlined in Tables VIII-X.

Table VIII. Performance range by peer group, non-hazardous waste per square meter

Peer group	A. Minimum threshold		B. Benchmark		C. Range
Associate's colleges, short-cycle institutions, and pre-tertiary schools	7.9 kilograms (kg) per square meter	-	1.6 kg per square meter	=	6.3
Baccalaureate colleges and boarding schools	12.1 kg per square meter	-	2.1 kg per square meter	=	10
Master's colleges and universities	14.1 kg per square meter	-	1.5 kg per square meter	=	12.6
Doctoral universities and research institutions	11.0 kg per square meter	-	1.4 kg per square meter	=	9.6

Table IX. Annual non-hazardous waste generated per unit of floor area (kg)

Annual non-hazardous waste generated (Table IV)		Conversion factor		Gross floor area of building space		Annual non-hazardous waste generated per square meter
	×	1,000	÷		=	

Table X. Points earned for indicator 12.2

Minimum threshold (Table VIII, column A)		Annual non-hazardous waste generated per square meter (Table IX)		Range (Table VIII, column C)		Points available		Points earned
	-		÷		×	1	=	

## Measurement

Report gross floor area from the same time period as that from which the waste data are drawn, e.g., an average from throughout the performance period or a snapshot at a single representative point.

## Documentation

Report the following information in the online Reporting Tool, with gross floor area provided in square meters. To convert square feet, multiply by 0.09290304.

- **Gross floor area of building space** (required). Square meters. Parking structures excluded.

The Reporting Tool will automatically calculate the following figure:

- Annual non-hazardous waste generated per unit of floor area. Kilograms per square meter.

## 12.3 Percentage of non-hazardous waste diverted from disposal

An institution earns 2 points by diverting 90 percent or more of non-hazardous waste from **disposal** through **recovery** operations. Incremental points are available and earned as outlined in Table XI.

Table XI. Points earned for indicator 12.3

Total non-hazardous waste diverted from disposal (Table III )		Annual non-hazardous waste generated (Table IV )		Factor		Points earned
	÷		×	2.22	=	Up to 2

## Measurement

The figures required for this indicator are automatically drawn from indicator 12.1.

## Documentation

The Reporting Tool will automatically calculate the following figure:

- Percentage of non-hazardous waste diverted from disposal

## 12.4 Percentage of construction and demolition waste diverted from disposal

An institution earns 1 point by diverting 90 percent or more of construction and demolition (C&D) waste from disposal through recovery operations. Incremental points are available and earned as outlined in Tables XII-XIV.

Table XII. C&D waste diverted from disposal through recovery operations (metric tons)

C&D waste recycled		C&D waste prepared for reuse		Total C&D waste diverted from disposal
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	+		=	
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Table XIII. Annual C&D waste generated (metric tons)

Total C&D waste diverted from disposal (Table XII)		C&D waste disposed of to a landfill or incinerator		Annual C&D waste generated
	+		=	

Table XIV. Points earned for indicator 12.4

Total C&D waste diverted from disposal (Table XII)		Annual C&D waste generated (Table XIII)		Factor		Points earned
	÷		×	1.11	=	Up to 1

## Measurement

Report the most recent annual C&D waste data available from within the previous three years. An institution may track C&D waste over a full one-year time period (calendar or fiscal year), report average annual C&D waste over a two or three year period, or estimate annual C&D waste based on a representative sample.

Include all debris generated during the construction, renovation, and demolition of buildings, roads, and bridges, e.g., concrete, wood, metals, glass, and salvaged building components. Soil and organic debris from excavating or clearing sites are excluded.

If possible, waste figures measured in volume should be converted to weight using factors determined locally based on multiple weight samples taken of materials collected on-site. Otherwise, an institution may use generic volume-to-weight conversion factors provided by the United Nations Environment Programme (UNEP), the US Environmental Protection Agency, CalRecycle, or the equivalent.

Provide information about the methodology used to complete this indicator, the scope of the analysis (e.g., materials included/excluded), and any data limitations or other factors (e.g., contamination rates and/or sorting inefficiencies) that may have influenced the results in the public Notes field provided in the Reporting Tool.

## Documentation

Report the following information in the online Reporting Tool, with waste figures provided in metric tons (tonnes). To convert US (short) tons, multiply by 0.907185.

- Has the institution conducted one or more major construction, renovation, and/or demolition projects within the previous three years? (required)

*If No, this indicator is not applicable and is excluded from scoring. If Yes, the following field is also required:*

- Does the institution have sufficient data on construction and demolition waste to pursue this indicator?

*If Yes to both of the preceding questions, the following four fields are also required:*

- Performance year for construction and demolition waste. The year the performance period ended.
- Construction and demolition waste recycled. Metric tons.
- Construction and demolition waste prepared for reuse. Metric tons. Include items redirected for repair, surplus, donation, or resale.
- Construction and demolition waste disposed of to a landfill or incinerator. Metric tons.

The Reporting Tool will automatically calculate the following three figures:

- Total construction and demolition waste diverted from disposal. Metric tons.
- Annual construction and demolition waste generated. Metric tons.
- Percentage of construction and demolition waste diverted from disposal

## Glossary

**Disposal** – The end-of-life management of discarded products, materials, and resources in a sink or through a chemical or thermal transformation that makes these products, materials, and resources unavailable for further use (e.g., incineration and landfilling). Disposal includes any operation which is not **recovery**, even where the operation has as a secondary consequence the recovery of energy. Adapted from the definitions used by the Global Reporting Initiative (GRI) and the European Union (EU) Waste Framework Directive.

**Full-time equivalent (FTE)** – A unit used to measure employed persons or students in a way that makes them comparable although they may work or study a different number of hours per week. An institution should report its best estimates for FTE figures, annualized as feasible and calculated according to relevant national, regional or international standards. IPEDS, for example, calculates the number of FTE staff by summing the total number of full-time staff and adding one-third of the total number of part-time staff. [Adapted from the definition used by Eurostat.]

**Gross floor area of building space** – The total amount of building space that is included within the institutional boundary. Any standard definition of building space may be used (e.g., ASHRAE, ANSI/BOMA, IECC) as long as it is used consistently. Unless otherwise specified, unoccupied buildings and parking structures are excluded. Buildings within the overall STARS boundary that the institution leases entirely (i.e., the institution is the only tenant) should be included. Buildings that are not owned by the institution and in which the institution is one of multiple tenants may be excluded. If the institution chooses to include such buildings, it must include all multi-tenant buildings that are included in the institution's overall STARS boundary and in which the institution is a tenant; an



institution cannot choose to include some leased spaces and omit others. If an institution chooses to include leased spaces, the institution should count only the square footage of building space it occupies and not the entire building.

**Hazardous waste** – Waste that is considered to be hazardous by state/provincial or national legislation or that possesses any of the characteristics contained in Annex III of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Examples include certain chemicals, batteries, pesticides, mercury-containing equipment, lamps, and light bulbs. [Adapted from the definition used by the United Nations Environment Programme (UNEP).]

**Major renovation** – A project that includes major HVAC improvements, significant building envelope modifications, and/or major interior rehabilitation, for example that require occupants to vacate the space, as specified in a green building standard or rating system or the institution's own policies or standards.

**Non-hazardous waste** – Any substance or object which the institution discards, intends to discard, or is required to discard that is not classified as **hazardous waste**. This includes municipal solid waste (i.e., trash or rubbish) and non-hazardous recyclable and compostable materials.

**Preparation for reuse** – Checking, cleaning, or repairing operations by which products or components of products that have become waste are prepared to be put to use for the same purpose for which they were conceived. This may include redirecting items for surplus, donation, or resale. [Adapted from the definitions used by the Global Reporting Initiative (GRI) and the European Union (EU) Waste Framework Directive.]

**Recovery** – Any operation wherein products, components of products, or materials that have become waste are prepared to fulfill a purpose in place of new products, components, or materials that would otherwise have been used for that purpose. Preparation for reuse and recycling are examples of recovery operations. In the context of waste reporting, recovery operations do not include energy recovery. [Adapted from the definition used by the United Nations Environment Programme (UNEP).]

**Recycling** – The reprocessing of products or components of products that have become waste, to make new materials. [Adapted from the definition used by the United Nations Environment Programme (UNEP).]

**Representative sample** – A subset of a statistical population that accurately reflects the members of the entire population. A representative sample should be an unbiased indication of what the entire population is like. For example, in a student population of 1,000 students in which 25 percent of the students are enrolled in a business school, 50 percent are enrolled in humanities programs, and 25 percent are enrolled in science programs, a representative sample might include 200 students: 50 business students, 100 humanities students, and 50 science students. Likewise, a representative sample of purchases should accurately reflect the institution's total purchases, accounting for seasonal and other variations in product availability and purchasing.

**Waste** – Any substance or object which the institution "discards, intends to discard, or is required to discard". This includes materials that are disposed of and materials that are diverted from disposal through recovery operations. [Adapted from the definition used by the United Nations Environment Programme (UNEP).]

**Waste-to-energy (WTE) facilities** – Facilities that convert non-recyclable residual waste materials into usable heat, electricity, or fuel, e.g., through combustion, gasification, pyrolysis, anaerobic digestion, or landfill gas recovery.