

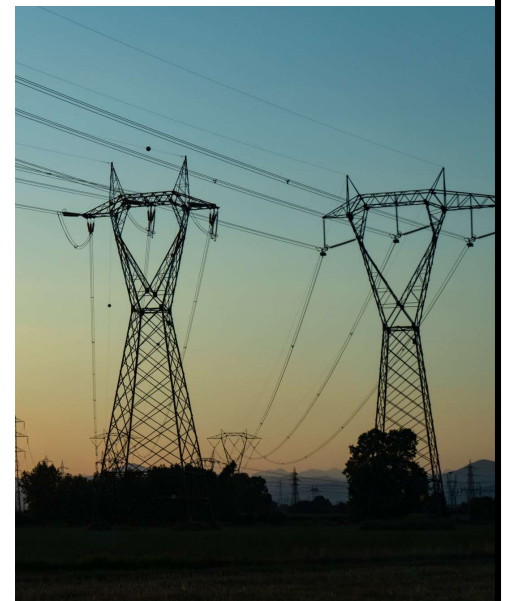


Energy and Waste

Energy and waste carbon offsets refer to activities that compensate for the emission of greenhouse gases (GHGs) by improving energy efficiency and reducing waste. These projects help reduce reliance on fossil fuels and decrease GHG emissions. Energy efficiency activities include retrofitting buildings, upgrading industrial equipment, and optimizing energy management systems. Waste reduction activities focus on diverting waste from landfills through recycling, composting, and reprocessing.

Carbon Offsets

These activities can be eligible for carbon credits, which represent the amount of carbon dioxide equivalent (CO₂e) that the energy efficiency or waste reduction project offsets. Carbon dioxide is the most significant GHG, so all other GHGs are compared to CO₂. Typically, one carbon credit is issued for each metric ton of CO₂e offset or removed. These carbon credits can then be bought and sold through a carbon market, allowing organizations and individuals to offset their emissions by supporting energy efficiency and waste reduction initiatives.



Carbon Markets

Carbon markets can be categorized as either voluntary or regulatory (compliance) markets. Compliance markets are regulated by governments, while voluntary carbon markets consist of individuals, companies, and governments dedicated to reducing their carbon footprint. These organizations work to lower their GHG emissions and purchase carbon credits in carbon markets to offset any residual emissions. Carbon credits are issued and traded through a carbon registry. Often, private companies and individuals collaborate with landowners to develop, enroll, and validate carbon offset projects.

Carbon Registries

Carbon registries operate as a marketplace for carbon credits. Before a carbon credit can be registered for sale, an independent third party must verify that an approved protocol was followed to measure the amount of CO₂e. Upon successful verification, carbon credits are issued and tracked with a unique serial number to prevent double counting. Registries must address the following requirements:

Additionality – carbon credits must only be issued for projects that otherwise would not have occurred in the absence of the issued credit.

Leakage – carbon offset projects must not shift CO₂ emissions elsewhere as a consequence of the project.

Permanence – carbon offsetting projects must not be reversed before the allotted time after the issuance of the carbon credit.

Exclusive – carbon credits must be issued for at least one metric ton of CO₂e and to only one entity for each credit.

Verified – carbon credits must be quantified based on scientific evidence, verified through a third-party, and enrolled in a credible carbon registry.



Forevergreen Project 2

Location: Quebec, Canada

Project Type: Energy & Waste

Annual Reduction: 2,285,200tCO₂e

Project Standard: Verified Carbon Standard (VM0018)

Carbon Calculations

The CO₂e of any GHG is calculated by multiplying the amount of the GHG by its global warming potential (GWP). The U.S. Environmental Protection Agency defines the GWP as “how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide.”

Gas Compound	20 Year GWP	100 Year GWP
Carbon Dioxide (CO ₂)	1	1
Methane (CH ₄)	84	25
Nitrous Oxide (N ₂ O)	264	298
HFC-134a	3710	1430
CFC-11	6900	7390
Carbon tetrafluoride (CF ₄)	4880	17200

$CO_2e = GHG \times GWP = 4 \text{ tons } CH_4 \times 25 = 100 \text{ tons of } CO_2e$

*Methane (CH₄) has a GWP of 25, meaning 4 tons of CH₄ released into the atmosphere will trap as much heat as 100 tons of CO₂.

Energy and Waste Credits

Overview of Energy and Waste Carbon Credits

Energy and waste carbon credits are generated through projects that focus on improving energy efficiency and reducing waste, thereby minimizing greenhouse gas (GHG) emissions. These projects are recognized for their ability to lower the consumption of fossil fuels and reduce methane emissions from waste, contributing significantly to global climate change mitigation efforts. The credits are typically sold on carbon markets, allowing companies or individuals to purchase them to offset their carbon emissions.

Types of Energy and Waste Projects

Large-Scale Energy Efficiency Projects:

- **Industrial Retrofits:** These projects involve significant upgrades to industrial processes or facilities, such as installing high-efficiency equipment or optimizing energy use systems. A prime example would be retrofitting large manufacturing plants to use less energy.
- **Carbon Credit Generation:** Large-scale energy efficiency projects can generate substantial amounts of carbon credits due to the significant reductions in energy consumption and associated GHG emissions. These projects are often critical components of corporate sustainability strategies, particularly in energy-intensive industries.

Small-Scale Waste Diversion Projects:

- **Recycling and Composting Initiatives:** These projects aim to divert waste from landfills through recycling, composting, or reprocessing waste materials. They are typically implemented in communities or small businesses.
- **Carbon Credit Generation:** While the carbon credits generated by small-scale waste diversion projects are smaller in volume compared to large-scale projects, these credits are often more attractive in voluntary carbon markets due to their direct community impact and lower environmental footprint.

Energy and Waste Carbon Credit Calculation and Methodology

The calculation of carbon credits from energy and waste projects involves several key steps:

- **Baseline Scenario:** Establishing a baseline scenario is the first step. This involves estimating the amount of energy consumption or waste generation that would have occurred without the project.
- **Monitoring and Verification:** Continuous monitoring of the project's energy savings or waste diversion and the associated GHG emissions reduction is required. Independent third-party verifiers must validate the emissions reductions.
- **Emission Factors:** Emission factors for the displaced energy use or avoided waste emissions must be applied to determine the volume of carbon credits generated. For example, projects that reduce energy use in regions with carbon-intensive electricity grids or that divert organic waste from landfills (thereby avoiding methane emissions) can generate more carbon credits.