

# Scopes & Types

## Voluntary Registry Offsets Database, v9

This document describes all of the scopes (major project categories) and detailed types of projects on the major voluntary offset registries as categorized in the Berkeley Carbon Trading Project's [Voluntary Registry Offsets Database](#).

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## Agriculture

Projects reduce emissions from row crops, pastureland, and dairies by increasing soil carbon as well as capturing or reducing methane emissions. New agricultural protocols are in development which we add as new projects are implemented.

### ***Biochar***

The production of biochar and application on soils or other uses.

Projects use VCS's VM0044 Methodology for Biochar Utilization in Soil and Non-Soil Applications.

### ***Bundled Compost Production and Soil Application***

This project type encompasses both compost production, an activity categorized under Waste Management, and compost application to soils, an activity normally categorized as 'Compost Addition to Rangelands' or 'Sustainable Agriculture.'

### ***Compost Addition to Rangelands***

Applying compost to rangelands, directly increasing soil organic carbon and indirectly increasing soil organic carbon through enhanced plant growth.

Projects may use the ACR Compost additions to grazed lands protocol.

### ***Feed Additives***

Reducing enteric fermentation emissions (methane emissions from cattle) through feed additives.

Projects may use VCS's VM0041 Methodology for the reduction of enteric methane emissions from ruminants through the use of 100% natural feed supplement and a methodology under development by Gold Standard called Reducing methane emissions from enteric fermentation in dairy cows through application of feed supplements.

### ***Improved Irrigation Management***

Installing irrigation equipment powered by renewable sources that would have otherwise been powered by fossil fuel sources.

Projects may use CDM's AMS-I.B. Mechanical energy for use with or without electrical energy methodology, AMS-II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities, and Gold Standard's Drip irrigation methodology.

### ***Manure Methane Digester***

Installing biodigesters to capture methane that would otherwise be released to the atmosphere from livestock waste.

Projects may use ARB's Livestock protocol, CDM protocols such as AMS-III.D. Methane recovery in animal manure, ACM0010 GHG emission reduction from manure, AMS-I.C. Thermal energy production with or without electricity, Gold Standard's Revised methodology for manure management systems and MSW methodologies, as well as the ACR Methane recovery in animal manure management systems, CAR Livestock, and CAR Organic waste digestion protocols. This is one of California's six compliance offset protocols.

### ***Nitrogen Management***

Improving application efficiency of nitrogen fertilizer application on agricultural fields by reducing fertilizer application and revising the application timing.

Projects may use the CAR Nitrogen management protocol, ACR Methodology for quantifying nitrous oxide (N<sub>2</sub>O) emissions reductions from reduced use of nitrogen fertilizer on agricultural crop, CDM's AMS-III.BF. Reduction of N<sub>2</sub>O emissions from use of Nitrogen use efficient (NUE) seeds that require less fertilizer application, and VCS's VM0022 Quantifying N<sub>2</sub>O Emissions Reductions in Agricultural Crops through Nitrogen Fertilizer Rate Reduction methodology.

### ***Rice Emission Reductions***

Changing field management and flood irrigation timing to reduce methane, CO<sub>2</sub>, and N<sub>2</sub>O emissions from rice cultivation.

Projects may use ACR's Emission reductions in rice management systems protocol as well as CDM's AMS-III.AU. Methane emission reduction by adjusted water management practice in

rice cultivation and AMS-III.AO. Methane recovery through controlled anaerobic digestion methodologies. This is one of California's six compliance offset protocols.

### ***Solid Waste Separation***

Removing volatile solids from agricultural waste streams thus avoiding methane emissions and decay from anaerobic decomposition. Mechanical separation systems are installed, isolating solids from farm manure slurries for processing, recycling, and selling off-site.

Projects may use CDM's AMS-III.Y. Methane avoidance through separation of solids from wastewater or manure treatment systems methodology and VCS's VMR0003 Included use of organic bedding material in AMS-III.Y. methodology.

### ***Sustainable Agriculture***

Increasing above- and below-ground carbon in agricultural areas, through a variety of practices including manure application, returning compost residuals to fields, cover crops, and introducing trees to landscapes.

Projects may use the following VCS protocols: VM0017 Adoption of sustainable agricultural land management, VM0021 Soil carbon quantification, and VM0042 Methodology for improved agricultural land management, as well as the CAR Soil enrichment protocol and Gold Standard's Soil organic carbon framework methodology.

## **Carbon Capture & Storage**

Projects capture CO<sub>2</sub> released in high concentrations from industrial processes for permanent storage underground or in manufactured products.

### ***Carbon Capture & Enhanced Oil Recovery***

Capturing carbon dioxide from industrial processes followed by compression, transport and injection for permanent storage underground while also enhancing oil recovery.

Projects may use the ACR Carbon capture and storage protocol.

### ***Carbon Capture in Concrete***

Capturing carbon dioxide from industrial waste gas to facilitate mineralization into concrete during the concrete manufacturing process. This project type can also involve reducing the proportion of carbon-intensive cement in concrete. [Note that the mineralization of CO<sub>2</sub> from biogenic sources is considered \*Carbon-Absorbing Concrete\* in the \*Industrial & Commercial\* scope.](#)

Projects may use the VCS VM0043 Methodology for CO<sub>2</sub> utilization in concrete production.

### ***Carbon Capture in Plastic***

Capturing carbon dioxide and methane from industrial processes for permanent sequestration in plastics.

Projects may use the VCS VM0040 Methodology for greenhouse gas capture and utilization in plastic materials.

## Chemical Processes

Projects reduce, capture, and/or reuse high potency gasses from manufacturing, consumer goods, and chemical and fuel production.

### ***N<sub>2</sub>O Destruction in Adipic Acid Production***

Transforming N<sub>2</sub>O emissions via catalytic decomposition at high temperatures into harmless nitrogen and oxygen. Nitrous oxides generated during adipic acid production (a key component for manufacturing nylon) are diverted into this destruction technology.

Projects may use the ACR Destruction of ozone depleting substances and high-GWP foam and the CAR Adipic acid production protocols.

### ***N<sub>2</sub>O Destruction in Nitric Acid Production***

Installing abatement measures and catalytic reduction units to destroy N<sub>2</sub>O emissions from nitric acid factories and caprolactam production plants. Nitric acid (HNO<sub>3</sub>) and caprolactam are crucial components of fertilizer and synthetic fiber production, respectively.

Projects may use CDM methodologies: ACM0019 N<sub>2</sub>O abatement from nitric acid production, AM0028 N<sub>2</sub>O destruction in the tail gas of Caprolactam production plants, AM0034 Catalytic reduction of N<sub>2</sub>O inside the ammonia burner of nitric acid plants, and the CAR Nitric acid production protocol.

### ***Propylene Oxide Production***

Synthesizing propylene oxide (a globally predominant intermediate chemical for manufacturing polyurethanes across many industries from textiles to aerospace) out of hydrogen peroxide through a new process coined HPPO technology, with reduced energy consumption and waste generation. Compared to traditional propylene oxide production, there are significantly fewer GHG-intensive reagents involved and reduced process energy requirements.

Projects may use VCS's VM0023 Reduction of GHG emissions in propylene oxide production protocol.

### ***SF<sub>6</sub> Replacement***

Avoiding SF<sub>6</sub> emissions by full/partial replacement of SF<sub>6</sub> cover gas to alternate cover gasses (also known as shielding gasses, which insulate molten metals from rapid oxidation and thus hazardous combustion). Substitute gasses include HFC134a, Perfluoro-2-methyl-3-pentanone and SO<sub>2</sub>. Additional activities include combustion or thermal destruction of SF<sub>6</sub> emissions and reuse of recaptured SF<sub>6</sub>.

Projects may use CDM methodologies: AM0035 SF<sub>6</sub> Emission reductions in electrical grids, AM0065 Replacement of SF<sub>6</sub> with alternate cover gas in the magnesium industry, and AM0079 Recovery of SF<sub>6</sub> from gas insulated electrical equipment in testing facilities.

**\*\* Refrigerant-related project types \*\***

***Advanced Refrigerants***

Utilizing low global warming potential refrigerants like carbon dioxide, ammonia & propane.

Projects may use the ACR Advanced refrigerator systems protocol.

***HFC Refrigerants Reclamation***

Replacing virgin hydrofluorocarbon (HFC) refrigerants with refrigerants that are reclaimed and reused.

Projects may use the ACR Certified reclaimed HFC refrigerants protocol.

***HFC Replacement in Foam Production***

Replacing the use of blowing agents that contain HFCs in foam manufacturing with alternative lower impact foam manufacturing processes.

Projects may use the ACR Transition to advanced formulation blowing agents in foam manufacturing and use protocol.

***HFC23 Destruction***

Capturing and destroying HFC23 produced as a byproduct of refrigerant manufacturing. This project type produced a large share of credits under the Clean Development Mechanism.

Projects may use the CDM AM0001 Decomposition of fluoroform (HFC-23) waste streams methodology.

***Ozone Depleting Substances Recovery & Destruction***

Collecting and destroying refrigerants that are ozone depleting substances with high GWPs from discarded equipment, particularly air conditioners, refrigerators, and insulation foam.

This project type is accepted under California's cap-and-trade program. Registries have versions of this methodology for voluntary market use: CAR Mexico halocarbon protocol, CAR Ozone depleting substances protocol, ACR Destruction of ozone depleting substances and high-global warming potential foam protocol, and VCS's VM0016 Recovery and destruction of ozone-depleting substances (ODS) from products methodology.

***Refrigerant Leak Detection***

Utilizing infrared real-time leak detection systems to reduce leaks of hydrofluorocarbon refrigerants from commercial refrigeration systems in the United States.

Projects may use the VCS VM0001 Infrared automatic refrigerant leak detection efficiency project methodology.

# Forestry & Land Use

## ***Afforestation/Reforestation***

Planting trees and reducing barriers to natural regeneration in non-urban areas.

Projects use large and small-scale CDM afforestation and reforestation methodologies like AR-AMS0007 Afforestation and reforestation project activities implemented on lands other than wetlands, Gold Standard's Afforestation/reforestation (A/R) GHG emissions reduction & sequestration methodology, ACR Afforestation and reforestation of degraded land protocol, CAR Forest Projects protocol (version 4.0 and earlier), CAR Urban tree planting protocol, and ARB's Forest Projects offset protocol. This is one of California's six compliance offset protocols.

## ***Avoided Forest Conversion***

Preserving forests and preventing conversion to other land uses like agriculture or development. Avoided conversion is similar to REDD+ which also focuses on reducing forest conversion but generally is applied to projects in the global south. We distinguish the two by location; avoided forest conversion projects use protocols focused mainly on avoiding forest conversion in the global north.

Projects may use ARB's Forest protocol and CAR Forest protocol.

## ***Avoided Grassland Conversion***

Preserving grasslands and shrublands to avoid conversion to row crops or other types of agricultural production.

Projects may use CAR's Canada and US Grassland protocol and ACR's Avoided conversion of grasslands and shrublands to crop production protocol.

## ***Improved Forest Management***

Applying practices which increase above and below ground carbon stocks including reducing timber harvest levels, extending timber harvest rotations, designating reserves, fuel load treatments, enrichment planting, and stand irrigation or fertilization.

Projects may use ARB's Forest protocol, ACR's Improved forest management on non-federal U.S. land protocol, CAR's Improved forest management and Mexico forest protocols, and several VCS protocols including VM0003 Methodology for improved forest management through extension of rotation age, VM0005 Methodology for improved forest management: conversion of low productive to high productive forest, VM0010 Methodology for improved forest management: conversion from logged to protected forest, and VM0012 Improved forest management in temperate and boreal forests.

## ***REDD+ (Reducing Emissions from Deforestation and Forest Degradation)***

Reducing deforestation and forest degradation in the global south. Many REDD+ projects bundle several activities that together reduce deforestation and forest degradation, expand forests, and increase stocks in existing forests, including improved forest management, afforestation/

reforestation, re-vegetation, alternative livelihood programs, and clean cookstoves. The “+” in REDD+ refers to the many project co-benefits in addition to climate mitigation including biodiversity protection and livelihood betterment.

Projects primarily use the following VCS protocols: VM0006 Carbon accounting for mosaic and landscape-scale REDD projects, VM0007 REDD+ methodology framework, VM0009 Avoided ecosystem conversion, VM0015 Avoided unplanned deforestation, and VM0037 Implementation of REDD+ activities in landscapes affected by mosaic deforestation and degradation.

### ***REDD+ Jurisdictional***

REDD+ projects which monitor and credit changes in carbon stocks across an entire national or subnational jurisdiction, focusing on governmental policies and programs that address drivers of deforestation and protect forests.

### ***Sustainable Grassland Management***

Applying practices which increase above and below ground carbon stocks by optimizing grazing rotation, protecting degraded land from grazing until regrowth, restoring severely degraded pasture through replanting, and reducing fire frequency through prescribed burns.

Projects primarily use Verra’s VM0026 Methodology for sustainable grassland management (SGM), VM0032 Methodology for the adoption of sustainable grasslands through adjustment of fire and grazing, and VM0042 Methodology for improved agricultural land management.

### ***Wetland Restoration***

Restoring deltaic and coastal wetlands, including mangrove ecosystems. Restoration can include switching from row crops to rice cultivation designed for deltaic areas and tidal wetland creation.

VCS projects may use CDM’s AR-AM0014 Afforestation and reforestation of mangrove habitats protocol, VM0007 REDD+ Methodology Framework, VM0033 Methodology for tidal wetland and seagrass restoration, & VM0036 Methodology for Rewetting Drained Temperate Peatlands. ACR projects use the Restoration of California deltaic and coastal wetlands and Restoration of pocosin wetlands protocols.

## **Household & Community**

### ***Biodigesters***

Collecting organic material, such as animal waste, in household and community-scale biodigesters to use in cooking and other local applications such as heating and effluent as crop fertilizer.

Projects use several CDM methodologies including AMS-I.E. Switch from non renewable biomass for thermal applications, AMS-I.F. Renewable electricity generation for captive use, AMS-I.C. Thermal energy production with or without electricity, AMS-III.AO. Methane

recovery through controlled anaerobic digestion, and AMS-III.R. Methane recovery in agricultural activities at household/small farm level.

### ***Bundled Energy Efficiency***

Installing multiple energy efficient technologies in residential and non-industrial buildings including weatherization, lighting, refrigeration, air conditioning, heating, pumping, etc.

Projects may use the same protocols as lighting and weatherization including VCS protocols: AMS-II.J. Demand side activities for efficient lighting, AMS-II.E. Energy efficiency and fuel switching for buildings, and VM0008 Weatherization of single family and multi-family buildings.

### ***Clean Water***

Providing safe drinking water through purification technologies like water filtration and access to centralized water systems, which reduces the need for firewood to boil/purify water. Most community borehole projects are categorized under the Community Borehole category, but some borehole projects are included here if they are combined with other forms of clean water provision.

Projects may use the Gold Standard's Water access and WASH methodology, TPDDTEC Technologies and practices to displace decentralized thermal energy consumption, as well as CDM's AMS-III.AV. Low greenhouse emitting safe drinking water production systems and AMS-III.BG. Emission reduction through sustainable charcoal production and consumption methodologies.

### ***Community Boreholes***

Building or rehabilitating community boreholes for clean drinking water. The carbon benefits are realized from emissions avoided from the harvest and burning of non-renewable firewood to boil drinking water.

Projects exclusively use the Gold Standard's TPDDTEC Technologies and practices to displace decentralized thermal energy consumption methodology.

### ***Cookstoves***

Building improved cookstoves to replace or minimize the use of dung or firewood for cooking. Carbon benefits are realized in the form of reduced emissions from burning biomass as well as reducing deforestation. Stoves generally lessen smoke during cooking, leading to additional health benefits. Cookstoves type includes equipment distribution of residential solar-powered cooking systems, which are not grid-connected.

Projects may use the Gold Standard protocols: Methodology for Metered & Measured Energy Cooking Devices, TPDDTEC Technologies and practices to displace decentralized thermal energy consumption, and the Simplified methodology for efficiency cookstoves; CDM protocols: AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass, AMS-I.E. Switch from non-renewable biomass for thermal applications by the user; and VCS's VMR0006 Methodology for installation of high

efficiency firewood cookstoves. Solar cookers may use CDM's AMS-I.C. Thermal energy production with or without electricity and Gold Standard's Methodology for improved cook stoves and kitchen regimes.

### ***Lighting***

Installing new, energy efficient lighting systems in residential and other non-industrial buildings.

Projects may use CDM's AMS-II.C. Demand-side energy efficiency activities for specific technologies and AMS-II.J. Demand side activities for efficient lighting methodologies.

### ***Weatherization***

Installing heating appliances and insulation in residential and other non-industrial buildings.

Projects primarily use CDM's AMS-II.E. Energy efficiency and fuel switching measures for buildings and Verra's VM0008 Weatherization of single family and multi-family buildings.

Gold Standard projects use the GS Thermal performance improvements in low-income dwelling structures methodology.

## **Industrial & Commercial**

Projects include industrial energy efficiency, fuel substitution, manufacturing process improvement, and waste recovery, and efficiency in commercial and municipal building infrastructure.

### ***Aluminum Smelters Emission Reductions***

Reducing PFC emissions from aluminum smelting manufacturing through computerized controls, implementation of anode effect mitigation and upgraded algorithm automation of smelting pots.

Equipment efficiency improvements and avoided PFC emissions lower energy consumption.

Projects may use CDM's AM0030 PFC emission reductions from anode effect mitigation at primary aluminum smelting facilities and AM0059 Reduction in GHGs emission from primary aluminum smelters methodologies.

### ***Brick Manufacturing Emission Reductions***

Reducing energy consumption in brick manufacturing with lower carbon intensity fuels, such as transitioning from fossil fuels to renewable biomass/less-carbon-intensive fossil fuel/non-renewable biomass. Manufacturing improvements include improved composition, kiln upgrades, chemistry design and electricity from renewable sources. Primarily implemented greenfield or replacement.

Projects specifically use CDM's AMS-III.Z. Fuel Switch, process improvement, and energy efficiency in brick manufacture methodology.

### ***Carbon-Absorbing Concrete***

The production and use of concrete that absorbs carbon dioxide from the ambient air or by exposing the material to air with high concentrations of biogenic CO<sub>2</sub>. Projects commonly also reduce the emissions associated with concrete production such as by reducing the proportion of carbon-intensive cement. [Note that projects that mineralize concentrated CO<sub>2</sub> from non-biogenic](#)

sources, such as industrial waste gas from fossil fuel combustion, fall under the *Carbon Capture & Storage* scope.

Projects may use the VCS VM0043 Methodology for CO<sub>2</sub> utilization in concrete production, and the Gold Standard methodology: Carbon sequestration through accelerated carbonation of concrete aggregate. The current version of this methodology specifies that any concentrated CO<sub>2</sub> used should be from biogenic sources.

### ***Energy Efficiency***

Increasing energy efficiency in a variety of industrial processes. Improvements in energy efficiency span from mechanical upgrades of energy conversion equipment (e.g. boiler, motor) to process improvements affecting singular production elements (e.g. furnace, kiln) or multi-step production series.

Projects may use CDM methodologies: AMS-II.B. Supply side energy efficiency improvements, AMS-II.D. Energy efficiency and fuel switching measures for industrial facilities, AMS-II.E. Energy efficiency and fuel switching measures for buildings and AMS-III.M. Reduction of energy consumption by recovering soda from paper production methodologies.

### ***Fuel Switching***

Switching from higher GHG-intensity fuels to lower GHG-intensity non-biomass fuels, primarily through equipment retrofit and replacement, such as from coal/petroleum to natural gas.

Projects may use CDM methodologies: AMS-III.B. Switching fossil fuels, ACM0009 Fuel switching from coal or petroleum fuel to natural gas, and ACM0003 Partial substitution of fossil fuels in cement or quicklime manufacture.

### ***Grid Expansion & Mini-Grids***

Expansion of electricity service through grid extension and the construction of new mini-grids.

Projects may use CDM methodologies: AMS-III.BB. Electrification of communities through grid extension or construction of new mini-grids, AMS-III.AW. Electrification of rural communities by grid extension, and AMS-I.F. Renewable electricity generation for captive use and mini-grid.

### ***Leak Detection & Repair in Gas Systems***

Identifying and repairing natural gas/refinery gas leaks affecting above-ground process equipment in natural gas production, processing, transmission, storage, distribution systems and refinery facilities.

Projects exclusively use CDM's AM0023 Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities methodology.

### ***Mine Methane Capture***

Capturing and destroying or using mine methane that would otherwise be released to the

atmosphere from active and abandoned coal, trona, and precious and base metal mines.

Projects may use two large-scale CDM methodologies: ACM0008 Abatement of methane from coal mines and AM0064 Capture and utilization or destruction of mine methane (excluding coal mines) or non mine methane. Verra projects use VCS's VM0014 Interception and destruction of fugitive methane from coal bed methane (CBM) Seeps, VMR0001 Revisions to ACM0008 to include pre-drainage of methane from an active open cast mine as a methane emission reduction activity methodology and VMR0002 Revisions to ACM0008 to include methane capture and destruction from abandoned coal mines methodology. Projects also use the ACR Capturing and destroying methane from coal and trona mines in North America protocol. Mine Methane Capture is one of ARB's compliance offset protocols.

### ***Natural Gas Electricity Generation***

Constructing new natural gas fired grid-connected electricity generation plants replacing higher greenhouse gas intensity fuels like coal. The fuel sources for the plants are fossil fuel natural gas, distinctly different from renewable natural gas harvested through decomposition processes.

Projects may use CDM's AM0029 Methodology for grid connected electricity generation plants using natural gas and ACM0011 Fuel switching from coal and/or petroleum fuels to natural gas in existing power plants for electricity generation methodologies.

### ***Oil Recycling***

Reclaiming transformer oil and re-refining used lubricant oils to virgin-quality. Emissions are avoided from baseline operation associated with the traditional disposal of waste oil through incineration.

Projects may use the ACR Re-refining used lubricating oils protocol and ACR Recycling of transformer oil protocol.

### ***Plugging Oil & Gas Wells***

Plugging oil and gas wells to prevent methane release.

Projects use ACR Plugging Orphan Oil and Gas Wells in the U.S. and Canada.

### ***Pneumatic Retrofit***

Installing or upgrading high-bleed and low-bleed pneumatic controllers (mechanical devices for automatic industrial gas processing like pressure, temperature, & flow regulation) to circumvent methane leaks from gas systems. Encompasses leak monitoring and repairs to further reduce methane leakage.

Projects may use the ACR Emission reduction measurement and monitoring methodology for the conversion of high-bleed pneumatic controllers in oil and natural gas systems protocol.

### ***Road Construction Emission Reductions***

Reducing emissions in the process of road construction using alternative materials for concrete mix and reduced usage of Portland cement.

Projects use VCS's VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application.

### ***University Campus Emission Reductions***

Increasing energy efficiency and renewable energy deployment on college, university, or school campuses in the United States.

Projects may use VCS's VM0025 Campus clean energy and energy efficiency protocol.

### ***Waste Gas Recovery***

Collecting and processing byproduct gas from cement and cogeneration plants for reuse, most often for electricity generation.

Projects may use CDM methodologies: ACM0012 Waste energy recovery and due to repurposing of energy recaptured into electricity and AM0009 Recovery and utilization of gas from oil fields that would otherwise be flared or vented, and additionally the ACM0002 Grid-connected electricity generation from renewable sources methodology.

### ***Waste Heat Recovery***

Installing waste heat recapture systems capturing byproduct heat from thermal power plants and centralized boilers to supply continuous heat, hot water, and climate control to regional residential, commercial and institutional buildings.

Projects may use CDM methodologies: ACM0012 Waste energy recovery, AMS-III.Q. Waste energy recovery (gas/heat/pressure) projects, AM0024 Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants, and AM0058 Introduction of a new primary district heating system.

## **Renewable Energy**

### ***Biomass***

Generating heat, electricity (grid connected or direct use), and/or biogas from renewable biomass, commonly utilizing agricultural waste biomass. These projects can involve biomass combustion or anaerobic digestion to produce biogas.

Projects may use a variety of CDM methodologies: AM0036 Fuel switch to renewable biomass for thermal applications, ACM0006 Electricity and heat generation from biomass, ACM0018 Electricity generation from biomass in power-only plants, ACM0022 Alternative waste treatment processes, AMS-I.A. Electricity generated by the user, AMS-I.C. Thermal energy production with or without electricity, AMS-I.D. Grid connected renewable electricity generation, AMS-I.E. Switch from non-renewable biomass for thermal applications by user, AMS-III.E. Avoidance of methane production from decay of biomass through controlled

combustion, gasification or mechanical/thermal treatment, AMS-III.AQ. Introduction of Bio-CNG in transportation applications, AMS-III.AS. Switch from fossil fuel to biomass in existing manufacturing facilities for non-energy applications, and Gold Standard's Ecologically sound fuel switch to biomass with reduced energy requirement methodology.

### ***Geothermal***

Installing geothermal energy plants. Primarily utilizes gas-steam combined cycle turbines in cogeneration plants, which may be natural gas fired.

Projects may use CDM's AMS-I.D. Grid connected renewable electricity generation, ACM0002 Grid-connected electricity generation from renewable sources, and AM0072 Fossil fuel displacement by geothermal resources for space heating methodologies.

### ***Hydropower***

Installing large and small-scale hydroelectric power plant (HEPP) turbines to generate electricity through regular dam flow operations or hydropower additions to multipurpose reservoirs.

Projects may use CDM's AMS-I.D. Grid connected renewable electricity generation and ACM0002 Grid-connected electricity generation from renewable sources methodologies.

### ***RE Bundled (Bundled Renewables)***

Multiple forms of renewable energy involved/grouped within a single project, typically a combination of wind & solar. Geothermal energy may be grouped in.

Projects may use CDM methodologies: AMS-I.D. Grid connected renewable electricity generation, ACM0002 Grid-connected electricity generation from renewable sources methodology, ACM0006 Electricity and heat generation from biomass, ACM0012 Waste energy recovery/Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system, AMS-I.L. Electrification of rural communities using renewable energy, and AMS-I.F. Renewable electricity generation for captive use and mini-grid.

\*Due to the grouped nature of these projects, there are often multiple methodologies listed for these projects.

### ***Solar - Centralized***

Installing solar modules as electricity production for grid-connected large scale energy.

Projects may use CDM methodologies: ACM0002 Grid-connected electricity generation from renewable sources, AM0026 Methodology for zero-emissions grid-connected electricity generation from renewable sources, AMS-I.F. Renewable electricity generation for captive use and mini-grid, and AMS-I.D. Grid-connected renewable electricity generation.

### ***Solar - Distributed***

Installing small-scale, independent solar modules for residential production and consumption, including solar home systems and bundled solar programs that involve multiple end uses (e.g. lighting, cooking).

Projects may use the following CDM methodologies: AMS-I.A. Electricity generation by the user, AMS-I.D. Renewable energy for captive use, and AMS-I.F. Renewable electricity generation for captive use and mini-grid.

### ***Solar Lighting***

Distributing small-scale PV panels to charge residential lights and distribution of solar-powered lighting modules for transitions away from carbon-emissive traditional light sources like firewood and kerosene. [This category is distinct from Household & Community > Lighting which credits efficient lighting systems like LEDs.](#)

Projects may use CDM's AMS-III.AR. Substituting fossil fuel based lighting with LED/CFL lighting systems, AMS-I.A. Electricity generation by the user, and AMS-I.L. Electrification of rural communities using renewable energy, and VCS's ACM0002 Grid connected renewable energy methodologies.

### ***Solar Water Heaters***

Disseminating solar water heaters.

Projects may use CDM's AMS-I.J. Solar water heaters protocol and AMS-I.C. Thermal energy production with or without electricity.

### ***Wind***

Installing wind turbines for grid-connected electricity generation replacing traditional, fossil-fuel or natural gas combustion for electricity production.

Projects predominantly use the first two CDM methodologies: AMS-I.D. Grid connected renewable electricity generation, ACM0002 Grid-connected electricity generation from renewable sources methodology, along with the newer AM0019 Renewable energy project activities replacing part of the electricity production of one single fossil-fuel-fired power plant that stands alone or supplies electricity to a grid.

## **Transportation**

Projects include transportation-related initiatives such as mass transit system implementation, fleet efficiency improvements like route or vehicle upgrades, infrastructure for pedal-driven two wheel vehicles, electrification of truck stops, streamlined fuel transport, and expanded electric vehicle charging.

### ***Bicycles***

Expanding bicycle lanes, deployment of bike/e-bike sharing programs, and establishing bike parking as well as repair modules around a metropolitan area to promote alternative transportation modes over fossil-fuel based vehicles.

Projects may use CDM's AMS-III.BM. Lightweight two and three wheeled personal transportation methodology, AMS-III.C. Emission reductions by electric and hybrid vehicles methodology, and VCS's Methodology for determining GHG emission reductions through bicycle sharing projects.

### ***Electric Vehicles & Charging***

Concentrating deployment of EV charging stations around a metropolitan area to support electric vehicle driving range/accessibility and incentivize acquisition of EVs over fossil-fuel based vehicles.

Projects may use VCS's VM0038 Electric vehicle charging systems methodology and CDM's AMS-III.C. Emission reductions by electric and hybrid vehicles or AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets methodologies.

### ***Fleet Efficiency***

Installing upgrades/improvements to fleet infrastructure, vehicle design, accessibility, fuel sources, route expansion, modal shift of cargo transport, substitution to biogas (CNG/LNG) powered fleets, etc.

Projects use a variety of methodologies including: CDM's AMS-III.C. Emission reductions by electric and hybrid vehicles, AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets, AM0090 Modal shift in transportation of cargo from road transportation to water or rail transportation, VCS's VM0019 Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets methodology, and the ACR Transport & fleet efficiency protocol.

### ***Fuel Transport***

Constructing liquid fuel pipelines for improved efficiency in fuel transportation, which provides reductions of GHG incurred from existing liquid fuel transportation via diesel combustion trucks.

Projects use the CDM's AM0110 Modal shift in transportation of liquid fuels methodology.

### ***Mass Transit***

Establishing Mass Rapid Transit (MRT) systems replacing more carbon-intensive personal alternatives like automobiles.

Projects may use CDM's ACM0016 Mass rapid transit projects methodology, AM0031 Bus rapid transit projects, and AMS-III.C. Emission reductions by electric and hybrid vehicles.

Applicable to infrastructure upgrades, projects may use AMS-II.E. Energy efficiency and fuel switching measures for buildings methodology.

### ***Shipping***

Retrofitting ships with energy efficiency upgrades/improvements, such as applying low-resistance ship hull coatings, installing high-flow propeller ducts, and fuel switching, which reduce fuel consumption for ship propulsion.

Projects may use Gold Standard methodologies: Retrofit energy efficiency measures in shipping, Reducing vessel emissions through the use of advanced hull coatings, and Installation of flow improvement equipment on ships.

### ***Truck Stop Electrification***

Reducing direct GHG emissions from diesel engine idling of long-haul trucks, through the installation/use of single-system Truck Stop Electrification (TSE) technologies and must singularly use grid-connected electrical power.

Projects may use the ACR Truck Stop Electrification protocol.

## **Waste Management**

### ***Composting***

Reducing methane emissions by composting biomass or other organic material that would have otherwise been left to decay anaerobically in a traditional waste management system (solid waste, animal waste, or wastewater). [Projects that combine compost production with compost application to soils are categorized under Agriculture > Bundled Compost Production and Soil Application.](#)

Projects may use CDM's AMS-III.F. Avoidance of methane through composting, ACM0022 Alternative waste treatment processes methodologies, and CAR Composting protocol.

### ***Landfill Methane***

Reducing and destroying methane from landfills. Destruction can be through flaring, and/or use including through pipeline injection, on-site use for electricity and heat, and production of vehicle fuel.

Most used protocols are CDM's ACM0001 Flaring or use of landfill gas and AMS-III.G. Landfill methane recovery methodologies, CAR's US and Mexico Landfill protocols, and ACR's Landfill gas destruction & beneficial use projects protocol.

### ***Methane Recovery in Wastewater***

Treating wastewater to capture and flare methane, process with anaerobic digesters, and/or dewater sludge by drying before disposal.

Projects may use CDM methodologies: ACM0014 Treatment of wastewater, AM0080 Mitigation of greenhouse gasses emissions with treatment of wastewater in aerobic wastewater treatment plants, AMS-III.I. Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems methodologies, and AMS-III.H. Methane recovery in wastewater treatment, and CAR Organic waste digestion protocol.

### ***Waste Diversion***

Diverting waste from landfills that do not fit into one of the other waste categories.

Projects may use applicable methodologies from the Waste Management scope category, namely CDM's AMS-III.AO. Methane recovery through controlled anaerobic digestion, AMS-I.I. Biogas/biomass thermal applications for households/small users, and AMS-I.F. Renewable electricity generation for captive use and mini-grid methodologies.

### ***Waste Incineration***

Incinerating waste and controlled pyrolysis at a waste management facility to avoid methane emissions produced from biomass decay and to displace fossil fuel electricity and heat generation. [This activity differs from Renewable Energy > Biomass in that the combusted waste also includes non-organic material.](#)

Projects may use CDM's AMS-III.L. Avoidance of methane production from biomass decay through controlled pyrolysis, AM0025 Avoided emissions from organic waste through alternative waste treatment processes, and ACM0022 Alternative waste treatment processes methodologies.

### ***Waste Recycling***

Diverting non-virgin/recycled materials originally destined for waste disposal to recycling plants. Currently includes process recycling of glass, PET, etc.

Projects may use CDM's AMS-III.AJ. Recovery and recycling of materials from solid wastes, AMS-III.BA. Recovery and recycling of materials from E-waste, ACM0022 Alternative waste treatment processes.

*Note: combustion or anaerobic digestion of organic waste is categorized as Renewable Energy > Biomass.*

## **Index of Methane-related Project Types**

For reference, below are all of the project types that primarily reduce methane emissions:

- Agriculture > Manure Methane Digesters
- Agriculture > Rice Emission Reductions
- Agriculture > Solid Waste Separation
- Household & Community > Biodigesters
- Industrial & Commercial > Leak Detection & Repair in Gas Systems
- Industrial & Commercial > Mine Methane Capture
- Industrial & Commercial > Plugging Oil & Gas Wells
- Industrial & Commercial > Pneumatic Retrofit
- Renewable Energy > Biomass (including biomass combustion and biogas)
- Waste Management > Composting
- Waste Management > Landfill Methane
- Waste Management > Methane Recovery in Wastewater
- Waste Management > Waste Incineration