IFC Greenhouse Gas Reduction Accounting Guidance For Climate-Related Projects

IFC CLIMATE BUSINESS DEPARTMENT

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INTRODUCTION

The following is a technical guidance for IFC investment and advisory staff to conduct greenhouse gas (GHG) emission reduction calculations for climate-related projects. Such calculations are required in order to consider the project as mitigation as described in IFC Climate Definitions.[1]

KEY CONSIDERATIONS

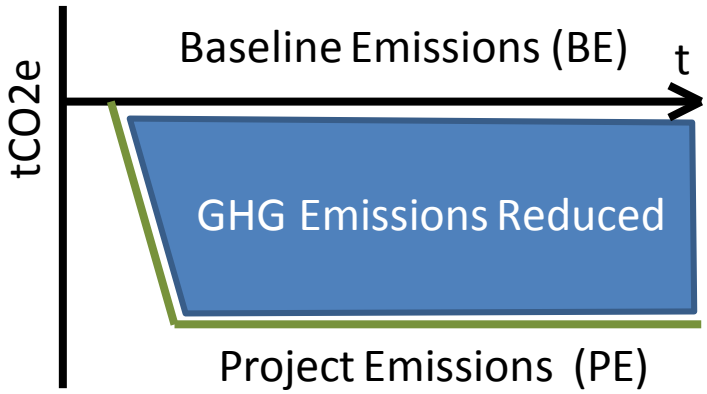
Each methodology described below is subject to these overarching principles:

- Each methodology and this document are subject to refinement and expansion based on testing and implementation feedback
- All methodologies described within this document apply to GHG reductions through IFC Investment Services (IS) as well as IFC Advisory Services (AS)
- If an IFC project is approved for generating certified emissions reduction credits by an internationally recognized third party, such as the UNFCCC's Clean Development Mechanism (CDM) Executive Board, or any other carbon credit mechanism requiring a higher level of rigor than the simplified methodologies included in this document, the below methodologies are to be superseded by the certified emission reduction GHG calculation for the project
- As per the GHG Protocol for Project Accounting, GHG reductions include the primary effects (the intended change caused by the project activity) as well as any significant secondary effects (leakage) that may result from the project activity[2]
- GHGs considered are: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6)
- GHG emission reduction calculation boundaries are addressed in each methodology below
- Additionality in support of GHG reduction claims is defined in each methodology below
- Conservativeness is to be followed in all calculations to address uncertainty and is detailed in calculations when applicable. Given ex ante calculations often require some level of assumption, staff should assume the project options and emission factors resulting in the lowest GHG reduction in order to not overstate project GHG emission reductions[3]
- GHG emission sources that constitute less than 3% of the GHG reduction calculation can be excluded from GHG emission reduction calculation

[1] IFC Climate Definitions and GHG tools can be retrieved from https://www.ifc.org/ghgaccounting.
[2] Retrieve from: http://www.ghgprotocol.org/files/ghgp/ghg_project_protocol.pdf.
[3] As an example, consider an IFC project scenario displacing coal as a fuel where uncertainty exists if the new fuel will eventually be natural gas or liquefied petroleum gas (LPG), based on future market pricing. The GHG reduction calculation, in this case, would assume that LPG will be the fuel substituting coal in order to follow conservativeness, as this results in the lowest GHG reduction (natural gas is less GHG-intensive than LPG when combusted) and is least likely to overstate GHG emission reductions.

METHODOLOGICAL OVERVIEW

GHG reductions will be calculated as compared to a baseline scenario or the scenario or activity that would have been implemented in the absence of the IFC project, as illustrated in the graphic below.



First, estimate expected project emissions, based on appraisal data and the client's business plan at the time of project approval, and then compare to a baseline scenario. Project and baseline emissions are calculated as follows:

I. Project Emissions (PE)

The project activity is the GHG emission scenario expected to result from the IFC activity. Any source of GHG emissions that will change as a result of the implementation of the project needs be considered. GHG emissions sources that do not change or are negligible can be excluded from the calculation.[4] The project emissions are calculated based on the below equation considering various GHG emission sources:

Project Emissions (PE) = Upstream Emissions + Operational Emissions + Downstream Emissions + Leakage

A. Upstream Emissions can include one-time construction emissions, upstream extractive industries, or upstream manufacturing or production emissions of materials and equipment, among other upstream GHG emission sources that may be related to the project. These are, in most cases, excluded from GHG emissions reduction calculations unless otherwise specified.[5]

[4] Emission sources that remain constant between the project and baseline scenario result do not affect the GHG reduction calculation and can be excluded. Negligible GHG emissions are those that constitute less than 3% of the GHG reduction calculation.

[5] The underlying assumptions are: 1) The IFC project will not materially affect these upstream emissions and 2) These one-time GHG emissions, if annualized over the life of the project, would likely constitute less than 3% of the

Where upstream GHG emission sources need be included and as these GHG emissions sources may not be available for measurement, they can be estimated based on external research and/or standard industry practices.

B. **Operational Emissions** include GHG emission sources associated with onsite processes and activities by IFC clients. These GHG emissions should be calculated as part of IFC appraisal processes and included where significant. Ensure to consider the following, as applicable:
   - Mobile fuel combustion
   - Stationary fuel combustion, used for back-up power or other purposes
   - Electricity, heat, and steam purchased from third parties
   - Onsite non-energy-related processes
   - Other emission sources[6]

C. **Downstream Emissions** can include GHG emission sources beyond an IFC client's activity such as transportation, downstream third party operations related to the IFC project, or disposal-related GHG emissions. These are, in most cases, excluded from GHG emission reduction calculations.[7] Where downstream GHG emission sources need be included and as these GHG emissions may not be available for measurement, they can be estimated based on research and/or standard industry practices.

D. **Leakage** is a change in GHG emissions beyond the project boundary and can result from displacing a source of GHG emissions off-site or causing an unrelated increase in GHG emissions at a third party operation. For the most part, leakage is negligible unless otherwise described in specific project-type methodologies.

II. Baseline Emissions (BE)

The baseline activity is the scenario that would occurred in the absence of the IFC project. To determine baseline GHG emissions, consider the same GHG emission sources as those considered in the project scenario (above) at the pre-IFC GHG emission levels. Also ensure to include other GHG emission sources that changed as a result of the IFC project.

Baseline GHG Emissions (BE) = Upstream Emissions + Operational Emissions + Downstream Emissions + Leakage

III. GHG Reduction

Calculate the GHG emission reduction by subtracting the IFC project emissions (PE) from the baseline scenario emissions (BE):

GHG Reduction = Δ Upstream + Δ Operational + Δ Downstream + Δ Leakage

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GHG reduction reported annually. Where either of these assumptions do not apply, upstream GHG emission sources need be included.

[6] Other GHG emissions can be associated with onsite land use, waste, wastewater, and cooling and refrigeration.

[7] The underlying assumptions are: 1) These one-time GHG emissions, if annualized over the life of the project, would likely constitute less than 3% of the GHG reduction reported annually and 2) These downstream, project scenario-related emissions are usually equal or less than the baseline scenario. Where either of these assumptions do not apply, downstream GHG emission sources need be included.

IV. Timeline

GHG reduction calculations are to be completed ex ante project implementation based on expected performance. Based on the IFC intervention type, GHG reductions will be reported at the following stages:

ACTIVITY TYPE	GHG REDUCTION REPORTED
Investment Services	Financial Commitment
Advisory Services	Up to 1-year after Implementation Plan Approval

Once reported, GHG emission reductions will be achieved and ex post verified for 5 fiscal years.[8]

Other reporting considerations:

a) Projects will report GHG reductions as a single, representative year of operations

b) For projects with construction lags or a ramp up to expected operations, select the highest operating capacity within the timeline

c) IS projects will report ex ante GHG reductions in the iDesk Climate Related tab and actual GHG reductions will be verified through the Development Outcome Tracking System (DOTS). AS projects will use the Advisory Services Operational Portal (ASOP) for both ex ante reporting and ex post results monitoring

d) Upload the GHG reduction calculation and/or GHG tool in iDesk or ASOP in support of GHG reduction claims

[8] A maximum timeline of 7-years is applicable for projects with extended construction times, such as large hydroelectric projects and geothermal.

PROJECT GUIDANCE

In view of the definitions and guidance set forth in the Methodological Overview section, the following section addresses project-type issues and considerations for undertaking GHG reduction calculations.

1. Renewable Energy Generation (RE)

1.1 Wind, Geothermal, Solar, Run-of-River Hydropower, Small Hydropower[9] Generation Projects

RE generation projects are derived from natural processes and replenished constantly, where increasing RE generation reduces generation demands from more GHG-emission intense sources. These projects are grouped under a single methodology given their low-impact on surrounding activities and GHG emission sources.

Requirements: Wind, solar, run-of-river hydro, small hydro and geothermal generation are treated as inherently additional given their low GHG emissions and limited impact on surrounding areas. These generation projects are not subject to any further requirements or additionality tests.

Methodological Considerations:

Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources are considered negligible and generally excluded from GHG calculations.[10]
Baseline Emissions (BE)	For Grid-Connected RE: IFC follows the International Finance Institution (IFI) Approach to GHG Assessment in Renewable Energy Sector where a default combined margin emission factor is calculated based on CDM practices[11]: **For Solar and Wind Generation:** CM = [0.75 x Operating Margin (OM)] + [0.25 x Build Margin (BM)] **For All Other RE Generation:** CM = [0.50 x OM] + [0.50 x BM] Each country OM is assumed to be the average CO2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system as published by the International Energy Agency (IEA) CO2 emissions per kWh from electricity generation.[12] Each country BM is assumed to be the most efficient fossil fuel electricity generation available by country according to the IEA.

[9] Less than 10MW.

[10] Upstream and downstream emissions are excluded as negligible. For example, upstream emissions such as construction or embedded GHG emissions in materials can be large in some cases (e.g. hydro); however, these one-time emissions when annualized over the project life constitute less than 1% of the GHG reduction calculation in most cases. Leakage is also excluded from these smaller RE project-types as they will not materially affect third party behavior.

[11] United Nations Framework Convention on Climate Change (October 2013). Methodological Tool: Tool to Calculate the Emission Factor for an Electricity System. Version 04.0.
Retrieve from: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

[12] OECD/IEA. CO_2 Emissions from Fuel Combustion – Highlights. Retrieve from:
http://www.iea.org/publications/freepublications/publication/name,32870,en.html

	The above CM calculation can be superseded by either of the following: 1) A country grid emission factor for electricity supply based on UNFCCC (CDM) methodology, third party validated, and published by the host country no more than 2-years old; or 2) An authoritative, transparent, project-specific study. Non-Grid Connected RE: The baseline activity displaced by the project is the power generation (such as diesel, kerosene, etc.) based combustion used to provide electricity, heat and/or steam to the end-users.
Project Emissions (PE)	RE project emissions include RE operational emissions, in most cases are minimal, and may include mobile vehicles, backup power, or own energy use. Geothermal may also account for GHG mixed with steam and fugitive emissions.

1.2 Biomass Projects

These RE generation projects are also derived from natural processes and replenished constantly, where increasing RE generation reduces generation demands from more GHG-emission intense sources. Given additional leakage considerations, biomass generation projects follow a separate RE guidance.

Requirements: Biomass generation is treated as inherently additional given its low GHG emissions and, for the most part, limited impact on surrounding areas (see "Scope 3 Emissions consideration). These generation projects are not subject to any further requirements or additionality tests.

Methodological Considerations:

Scope 3 Emissions	Downstream GHG emission sources are generally excluded from the GHG reduction calculation. Most upstream GHG emission sources are generally excluded from the GHG reduction calculation except for biomass feedstock produced by a third-party according to the following: For Waste Biomass:[13] Upstream biomass production and associated GHG emissions can be excluded as this biomass feedstock production is the same in the project as in the baseline scenario. For Non-Waste Biomass:[14] GHG emissions associated with biomass production need be included in the GHG reduction calculation, including land use, harvest, and other GHG emission sources. Leakage may be significant and needs be considered given the impact biomass can have on surrounding areas.[15]

[13] Biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries.
[14] Biomass grown and harvested for the sole purpose of electricity and/or heat generation.
[15] For example, new biomass production can affect other third party land use and local water resources.

Baseline Emissions (BE)	For Grid-Connected RE: IFC follows the International Finance Institution (IFI) Approach to GHG Assessment in Renewable Energy Sector where a default combined margin emission factor is calculated based on CDM practices[16]: **For Solar and Wind Generation:** CM = [0.75 x Operating Margin (OM)] + [0.25 x Build Margin (BM)] **For All Other RE Generation:** CM = [0.50 x OM] + [0.50 x BM] Each country OM is assumed to be the average CO2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system as published by the International Energy Agency (IEA) CO2 emissions per kWh from electricity generation.[17] Each country BM is assumed to be the most efficient fossil fuel electricity generation available by country according to the IEA. The above CM calculation can be superseded by either of the following: 1) A country grid emission factor for electricity supply based on UNFCCC (CDM) methodology, third party validated, and published by the host country no more than 2-years old; or 2) An authoritative, transparent, project-specific study. Non-Grid Connected RE: The baseline activity displaced by the project is the power generation (such as diesel, kerosene, etc.) based combustion used to provide electricity, heat and/or steam to the end-users.
Project Emissions (PE)	RE project emissions include RE operational emissions and may include mobile vehicles, backup power, or own energy use. Do not include emissions associated with biomass combustion as these are accounted for through biomass stock changes in associated carbon pools.

2. Energy Efficiency

2.1 Brownfield Energy Efficiency

This methodology applies to energy efficiency improvements in existing industrial facilities, industrial processes or commercial/residential buildings. Projects involving technological and operational improvements to efficiency of energy use (greenfield projects and project expansions) are subject of another methodology.

Requirements: EE projects are assessed using a forward-looking estimates of reduction in energy consumption, in accordance with the following:

a) EE may consist of reductions in the consumption of electricity or thermal energy.

b) EE projects consist of technological and operational improvements to an existing operation to reduce energy consumption[16] at the facility or sub-process level including multiple energy generation and/or energy use processes.

c) The EE project can be part of a simultaneous project expansion. EE only applies to original construction and any expansion is excluded from the calculation.

d) If the EE project results in a production increase due to increased efficiency within an existing plant (not due to a plant expansion), the EE GHG reduction calculation only applies to the original level of production.

e) For EE GHG reduction sub-projects **through FIs**, EE project must achieve any of the following minimum thresholds within the project boundary to qualify as EE[17]:

- Reduce absolute energy consumption by at least 15%, or
- Reduce GHG emissions by at least 25,000 tCO2e/year, or
- Reduce electricity consumption by at least 50 GWh/year.

Methodological Considerations:

Project Boundary	The EE boundary is limited to the EE project impacts. As IFC activities can often include multiple facilities and processes, the EE boundary can be a sub-component of a larger project.[18] When defining a project boundary for EE, the following two criteria must be met: **1) The EE boundary is defined by the process(es) affected by the EE improvements.** In most cases, the boundary encompasses the whole facility given that multiple equipment changes and process improvements may affect energy use facility-wide and these impacts need be accounted for.[19] However, for facilities comprised of multiple, independent sub-processes, the EE boundary can be defined at the sub-process level. A sub-process is a stand-alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.[20] **2) The EE boundary is defined by energy data availability.** As energy use measurement and ex post verification are an IFC requirement, a sub-process is also a stand-alone system for which metered and reported energy use

[16] Specific guidance on what to include in project documentation or EE assessment of the reduction in energy consumption will be developed with each industry team.

[17] Energy consumption or efficiency label in appliances and/or lighting devices can be used only if the respective labels/standards have been cleared by the IFC Climate Policy Team. To be cleared, the scoring scale of labels/standards will be assessed to assure that they only grant their best score to top 20% performers. Financed sub-projects with the top20% score can be classified as climate related.

[18] For example, a project may include EE improvements as well as a production expansion by adding a new production line. The GHG boundary would be limited to only the activities undertaking EE improvements.

[19] For example, installing EE lighting upgrades may lead to changes in building heating and cooling requirements or an efficient boiler upgrade with reduced excess air can lead to a decrease in effectiveness of a combined heat and power system, to name a few examples.

[20] For example, a cement production facility may contain multiple, stand-alone production lines for different products and the EE project may be limited to only one of these independent lines while not affecting other lines. In this case, the EE boundary can be limited to the single production line undertaking energy efficiency improvements.

	information is available on an annual basis.[21] As such, a sub-process boundary can only be defined if separate energy use data is metered and reported independent from other facility energy data. Otherwise, the whole facility energy use needs to be included in the EE boundary for reporting purposes.
Scope 3 Emissions	**Upstream, downstream, and leakage GHG emission sources for these project types are considered negligible and generally excluded from GHG calculations.**
Baseline Emissions (BE)	The baseline activity is the pre-IFC GHG emission scenario before the EE project was implemented and should include all GHG emission sources within the EE project boundary.[22] Also ensure to include GHG emission sources that ended as a result of the EE project.
Project Emissions (PE)	**The project scenario should consider all GHG emission sources included in the baseline, but at post-IFC project emission levels.**

2.1.1 Energy Efficiency in processes requiring periodical overhaul

The specific consideration applies to processes requiring periodical unit refurbishing to continue operations. This includes but it is not limited to:

A. Cold repair of glass production furnaces.
B. Metal production.

To be considered climate related, the project will document (e.g. Industry Specialist Report) expected reduction in energy consumption beyond the business-as-usual energy consumption improvements associated with periodic overhauling.

2.2 Greenfield Energy Efficiency (New Construction and Operations)

2.2.1 Green Buildings

Green buildings include activities that lead to reduced consumption of electricity and other fossil fuels in new, grid connected buildings through the use of more efficient building design practices and technologies.

Requirements: Additionality is determined by applying forward-looking energy reduction thresholds to be achieved, in addition to the following considerations:

a) The project must reduce absolute energy use by at least 20% compared to the baseline scenario[23]

b) Staff to use IFC's Excellence in Design for Greater Efficiencies (EDGE) tool to calculate GHG reductions [24,25]

[21] As energy use is most often tracked and reported to IFC through annual billing cycles, the project boundary is most often at the facility level and includes all energy inputs to the facility. Where energy use can be disaggregated from the larger facility and is actively metered on an annual basis, sub-process reporting is possible for targeted retrofits. Therefore, a first step in identifying the EE project boundary is for IFC staff to consider what data are available and verifiable.

[22] Baseline emissions (BE) include the before-project emissions from the equipment that is modified, as defined by the EE project boundary not the whole project site.

[23] Achieving certification through IFC-approved green building standards such as LEED, BREEAM, etc. without verifying an absolute 20% energy use reduction would be classified as Special Climate (see IFC Climate Definitions at https://www.ifc.org/ghgaccounting for more information).

[24] For more information, please visit www.ifc.org/greenbuildings.

[25] For building types not currently covered by the EDGE tool, an individual calculation following EDGE principles will be required.

c) This methodology applies to new (greenfield) construction and not retrofits or refurbishments of existing buildings

d) All technologies (e.g. equipment or appliances) used in the project must be new and not transferred from another project activity

e) This methodology is not applicable to activities that affect off-site district heating and/or cooling plants or distribution networks even if they supply energy to the subject building(s)

f) GHG reduction calculations are based solely on the energy savings resulting from the activity

Methodological Considerations:

Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources are considered negligible and excluded from GHG calculations.
Baseline Scenario (BE)	IFC's EDGE tool automatically establishes the baseline scenario using standardized assumptions for weather, building operating characteristics, building control strategies and settings, occupancy, and socio-economic conditions of the tenants. **Where there is a legally mandated building code on energy performance**, the baseline scenario is based on minimum energy requirements in the building code for the subject building type(s) or classification(s) in the same climate zone (e.g. in kWh/m^2/year) **Where there is no legally mandated building code on energy performance**, the baseline scenario is based on expected energy use by building of similar type, usage, or classification as the subject building(s) within the same climate zone.
Project Scenario (PE)	IFC's EDGE tool automatically establishes the project scenario by using the standardized assumptions as determined for the baseline scenario as well as the EE measures to be implemented by the project.

Post-commitment monitoring

For Green Building projects the only monitoring required is to provide copy of corresponding Green Building certificate standard.

[26] For more information, please visit www.ifc.org/greenbuildings.

[27] For building types not currently covered by the EDGE tool, an individual calculation following EDGE principles will be required.

2.2.2 Cement Sector

This category includes greenfield activities that lead to reduced consumption of electricity and fossil fuels in new facilities through the use of more efficient technologies.

Requirements: Additionality is determined by achieving forward-looking energy use thresholds that represent best-in-class technologies in the Cement Sector and providing demonstration value within the market of operation, in addition to the following considerations:

a) The plant must fully achieve the energy use target; partial credit is not applicable

b) EE in the pyroprocessing system and EE in the power systems of the cement production line are not mutually exclusive in that EE can apply to either, or both, as long as the target energy use thresholds are achieved

c) The pyroprocessing system must include the following technologies: 6th stage pre-heater and pre-calciner

d) The power system in the cement production line may include any the following technologies: cement grinding systems using roller presses, Horomill or vertical roller mills, high efficiency separators, high efficiency and low pressure drop cyclones, power management systems, variable speed drives, and advanced automation systems

e) As a basis for the EE performance to be achieved, in addition to confirmation from IFC's cement industry specialist, the project must be subject to either of the following documentation requirements: i) A supplier guarantee requiring the target energy use or ii) A written client agreement and a tendering contract to both include the required energy use[28]

f) A description of demonstration value must be provided to illustrate the project is a departure from common practices in the market of operation

g) This guidance note applies only to new cement plants (greenfield), and not to retrofits which follow a separate GHG reduction guidance note

h) All technologies (e.g. equipment or appliances) used in the project must be new and not transferred from another project activity

i) The amount of GHG emissions reduced applies to the energy savings component of the project and can be complemented with other GHG reduction measures, such as on-site use of renewable energy and/or slag blending

Methodological Considerations:

Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources are considered negligible and excluded from GHG calculations.

[28] A supplier confirmation that the plant is able to meet the target energy intensity is an acceptable substitute for a tendering contract when not available.

Baseline Scenario (BE)	The IFC Industry Department minimum energy intensity standard for the cement sector: **For the thermal energy consumption in the pyroprocessing system:** a maximum of 3.30 GJ per tonne of clinker produced. **For electricity consumption in the cement line:** a maximum of 105 kWh per tonne of cement produced.
Project Scenario (PE)	Target energy use benchmarks are: **For thermal energy consumption in the pyroprocessing system:** a maximum 3.00 GJ per tonne of clinker produced.[29] **For electricity consumption in the cement line:** a maximum of 90 kWh per tonne of cement produced.[30]

2.2.3 Waste Heat Recovery

Projects involving technological and operational improvements to convert waste heat into useful energy.

Requirements: Projects that convert waste heat into useful energy are additional as energy is generated without an increase in GHG emissions, in accordance with the following requirements:

a) Energy from waste heat, waste gas or waste pressure in an existing or new industrial facility is recovered and used for in-house consumption or for export, by installation of a new power and/or heat and/or mechanical energy generation equipment, or by installation of a more-efficient electricity generation equipment than already existing

b) For power plants, this methodology only applies to conversion of existing single-cycle power plants to combined cycle power generation

c) Applicable waste heat streams are:
   - Cogeneration
   - Direct use as process heat source
   - Generation of heat in element process
   - Supply of heat of reaction with or without process heating

d) In the absence of the IFC project activity, the waste heat stream would not be recovered and therefore would be flared, released to atmosphere or remain unutilized in the absence of the project activity at the existing or greenfield project facility

[29] This target energy use represents the top 7.5% of the Cement Sustainability Initiative (CSI) members globally based on the Get the Numbers Right (GNR) database 2011 data. Retrieve from: http://www.wbcsdcement.org/index.php/key-issues/climate-protection/gnr-database.

[30] This target electricity consumption represents the top 11% of the CSI data base, corresponding to 720 million tonnes cement production or 22% of world production in 2011.

e) In the absence of the IFC project activity, the waste heat stream would be partially recovered, and the unrecovered portion of waste heat stream would be flared, vented or remained unutilized at the existing or greenfield project facility

f) Project activities improving the waste heat recovery (WHR) may (i) capture and utilize a larger quantity of waste heat as compared to the historical situation in the existing facility and/or (ii) apply more energy efficient equipment to replace/modify/expand waste heat recovery equipment

g) For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable

h) If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a greenfield facility

Methodological Considerations:

Project Boundary	The WHR boundary is limited to the activity or facility that the project impacts. In most cases, the boundary is limited to the WHR intervention and associated equipment and processes.[31] Where the WHR project affects other emission sources onsite, the boundary should consider other energy use and process emissions facility-wide.
Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources for these project types are considered negligible and generally excluded from GHG calculations.
Baseline Emissions (BE)	The baseline activity includes all GHG emissions that are affected by the WHR activity. It should also consider the energy recovered that would have been delivered by the existing power grid but which will now be delivered by the project. The grid emission factor to be used is the International Energy Agency (IEA) national grid average CO2 emissions per kWh from electricity and heat generation.[32]
Project Emissions (PE)	The project scenario is to include all GHG emission source included in the baseline but at post-IFC project emission levels. The GHG reduction will be based on the energy recovered, at the same or similar emission levels as the baseline scenario.

[31] Applicable only if the WHR intervention does not impact other emission sources onsite or beyond.

[32] Source: *CO2 Emissions from Fuel Combustion Highlights* (2012 Edition), ©OECD/IEA, Paris, 2012, page 111-122. Retrieve from: http://www.iea.org/co2highlights/CO2highlights.pdf

3 Agriculture, Forestry, and Land Use (AFOLU)

3.1 Afforestation and Reforestation

Afforestation and Reforestation (A/R) projects establish a forest on previously non-forestry land.

Requirements: Additionality for A/R is achieved with a net GHG reduction resulting from the project, in accordance with the requirements below:

a) Afforestation is planting a forest on land that has not been previously used as forest land over the past 50-years. Reforestation is planting a forest on land that has contained a forest but not for the past 10-years. As such, A/R projects are limited to establishing forests on lands without forest cover over the past 10-years

b) "Forest" is a minimum area of land of 0.05 - 1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest[33]

c) Project must result in a net GHG reduction, or a net carbon sink considering all carbon pools[34]

d) Staff should use the World Bank Carbon Assessment Tool for Afforestation and Reforestation (CAT-AR) for GHG reduction calculation[35]

Methodological Considerations:

Project Boundary	IFC activities can often include multiple projects and facilities, both forestry-related and non-forestry related. However, for the purposes of GHG reduction calculations, project boundaries are limited to operations on the forestry plantations alone.[36]
Scope 3 Emissions	Upstream and downstream GHG emission sources are generally excluded from the GHG reduction calculation. Leakage may be significant and needs be considered given the impact biomass can have on surrounding areas. Forestry projects should ensure to consider "activity shifting" leakage, the displacement of materials, livestock, or equipment offsite resulting from the project.
Baseline (BE) and Project Emissions (PE)	A/R project BE and PE include all onsite GHG emission sources and sinks. The World Bank CAT-AR tool automatically establishes the baseline emissions (BE) and project emissions (PE) for the GHG reduction calculation.

[33] Definitions, modalities, rules and guidelines relating to land use, land-use change and forestry activities under the Kyoto Protocol. Retrieve from: http://unfccc.int/methods_and_science/lulucf/items/1084.php

[34] Project resulting in a lower, net positive GHG increase are not to be considered

[35] Retrieve from: https://spark.worldbank.org/docs/DOC-52208.

[36] This excludes related downstream forestry industry.

4 Waste Management

4.1 Landfill Gas Capture

Projects include measures to capture and combust methane from landfills (i.e. solid waste disposal sites) used for the disposal of residues from human activities including municipal, industrial, and other solid wastes containing biodegradable organic matter.

Requirements: Projects that capture and combust methane in the waste sector are inherently additional as the absence of the project would result in a large global warming potential:

a) Staff should use the World Bank Simplified Toolkit for Landfill Gas Capture Projects for GHG reduction calculation[37]

b) The project must result in a net GHG reduction through GHG capture, flaring and energy generation, as per the methods[38]

Methodological Considerations:

Project Boundary	In most cases, the boundary encompasses the whole facility. However, for facilities comprised of multiple, independent sub-processes, the waste-handling boundary can be defined at the sub-process level. A sub-process is a stand-alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.
Scope 3 Emissions	For waste projects, ensure to consider "activity shifting" leakage, the displacement of waste, materials, or equipment offsite resulting from the project.
Baseline (BE) and Project Emissions (PE)	Project BE and PE include all onsite GHG emission sources and sinks. The World Bank Simplified Toolkit for Landfill Gas Capture Projects tool automatically establishes the baseline emissions (BE) and project emissions (PE) for the GHG reduction calculation.

4.2 Solid Waste Management

Projects avoid methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment.

Requirements: Projects that avoid methane production in the waste sector are inherently additional as the absence of the project would result in a large global warming potential:

a) Staff to use the World Bank Simplified Toolkit for Solid Waste Management Projects for GHG reduction calculation[39]

[37] Retrieve from: http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Simplified_SOLID_WASTE_management_toolkit.xlsx.

[38] Project resulting in a lower, net positive GHG increase are not to be considered.

b) The project must result in a net GHG reduction through GHG capture, flaring and energy generation, as per the methods[40]

Methodological Considerations:

Project Boundary	In most cases, the boundary encompasses the whole facility. However, for facilities comprised of multiple, independent sub-processes, the waste-handling boundary can be defined at the sub-process level. A sub-process is a stand-alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.
Scope 3 Emissions	For waste projects, ensure to consider "activity shifting" leakage, the displacement of waste, materials, or equipment offsite resulting from the project.
Baseline (BE) and Project Emissions (PE)	Project BE and PE include all onsite GHG emission sources and sinks. The World Bank Simplified Toolkit for Solid Waste Management Projects tool automatically establishes the baseline emissions (BE) and project emissions (PE) for the GHG reduction calculation.

4.3 Wastewater Treatment

Projects include measures to capture and combust methane from wastewater projects.

Requirements: Projects that capture and combust methane in the waste sector are inherently additional as the absence of the project would result in a large global warming potential:

a) Staff should use the World Bank Simplified Toolkit for Wastewater Treatment Projects for GHG reduction calculation[41]
b) The project must result in a net GHG reduction through GHG capture, flaring and energy generation, as per the methods[42]

Methodological Considerations:

Project Boundary	In most cases, the boundary encompasses the whole facility. However, for facilities comprised of multiple, independent sub-processes, the waste-handling boundary can be defined at the sub-process level. A sub-process is a stand-alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.

[39] Retrieve from: http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Simplified_SOLID_WASTE_management_toolkit.xlsx.
[40] Project resulting in a lower, net positive GHG increase are not to be considered.
[41] Retrieve from: http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Simplified_SOLID_WASTE_management_toolkit.xlsx.
[42] Project resulting in a lower, net positive GHG increase are not to be considered.

Scope 3 Emissions	For wastewater projects, ensure to consider "activity shifting" leakage, the displacement of waste, materials, or equipment offsite resulting from the project.
Baseline (BE) and Project Emissions (PE)	Project BE and PE include all onsite GHG emission sources and sinks. The World Bank Simplified Toolkit for Wastewater Treatment Projects tool automatically establishes the baseline emissions (BE) and project emissions (PE) for the GHG reduction calculation.

4.4 Manure Management

Project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms and achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane.

Requirements: Projects that capture and combust methane in the waste sector are inherently additional as the absence of the project would result in a large global warming potential:

a) Staff should use the World Bank Simplified Toolkit for Manure Management Processes for GHG reduction calculation[43]
b) The project must result in a net GHG reduction through GHG capture, flaring and energy generation, as per the methods[44]

Methodological Considerations:

Project Boundary	In most cases, the boundary encompasses the whole facility. However, for facilities comprised of multiple, independent sub-processes, the waste-handling boundary can be defined at the sub-process level. A sub-process is a stand-alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.
Scope 3 Emissions	For waste projects, ensure to consider "activity shifting" leakage, the displacement of waste, materials, or equipment offsite resulting from the project.
Baseline (BE) and Project Emissions (PE)	Project BE and PE include all onsite GHG emission sources and sinks. The World Bank Simplified Toolkit for Manure Management Processes tool automatically establishes the baseline emissions (BE) and project emissions (PE) for the GHG reduction calculation.

[43] Retrieve from: http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Simplified_SOLID_WASTE_management_toolkit.xlsx.
[44] Project resulting in a lower, net positive GHG increase are not to be considered.

5 Transport

5.1 Modal Shift

Projects involve a shift in the mode of transport of cargo from an existing road-based system to a water or rail-based alternative.

Requirements: Rail or water based system are considered to be additional compared to the more GHG-intensive road based transport system on a per unit basis given the bulk movement of cargo using the former. In addition, the following considerations apply:

a) Cargo includes materials and products and excludes passengers

b) Cargo must originally be shipped using road transport before shifting to rail/water transport

c) The points of origin and destination are the same in baseline and project scenarios

d) This only applies to projects that shift existing cargo from road to rail or water

Methodological Considerations:

Project Boundary	It includes the route from point of origin to the point of destination, including complementary routes (from origin to port or port to destination). It does not include the facility where the production activity takes place or sites where the cargo will ultimately be used.
Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources are considered negligible and excluded from GHG calculations.
Baseline Emissions (BE)	The baseline activity displaced by the project is road-based transportation resulting in GHG emissions arising from the consumption of fossil fuels. It includes the following sources: - Amount of cargo transported, - One-way distance between the point of origin and point of destination, and - Baseline emission factor in grams of CO2 per kilometer and ton of cargo transported.
Project Emissions (PE)	The project scenario includes all water or rail transport-related GHG emissions resulting from the following sources: - Fossil fuel consumption during transportation between the points of origin and destination - Fossil fuel consumption during transportation through the complementary routes - Electricity consumption, in case of trains, between the points of origin and destination.

6 Other Mitigation

6.1 Fuel Switch Projects

Fuel switch (FS) projects are retrofits to existing utility and industrial activities that shift away from one fuel-type currently in use to another, lower-GHG emission fuel-type.

Requirements: Additionality for FS projects is determined by applying forward-looking GHG reduction threshold to be achieved, in accordance with following:

a) FS projects must consist of onsite changes enabling the use of a different fuel

b) FS projects are limited to existing operations and greenfield projects and expansions are excluded from this methodology

c) FS projects must reduce GHG emissions by at least 10% between fuels being switched[45]

d) Fuel switches are limited to fuel switches to other fuel types[46]

e) FS projects can be part of a simultaneous project expansion. FS only applies to original construction and any expansion is excluded from the calculation[47]

f) If the FS project results in a production increase due to increased efficiency within an existing plant (not due to a plant expansion), the FS GHG reduction calculation also only applies to the original level of production as any additional production is excluded

Methodological Considerations:

Project Boundary The FS boundary is limited to the activity or facility that the FS project impacts. In most cases, the boundary encompasses the whole facility given that FS-related equipment changes may affect energy use and process emissions facility-wide and these impacts need be accounted for.[48] However, for facilities comprised of multiple, independent sub-processes, the FS boundary can be defined at the sub-process level. A sub-process is a stand- alone process with no interaction with other sub-processes, that has inputs, outputs, and energy that are independent from other sub-processes.[49]

[45] The 10% threshold applies to generation-related GHG emissions and any associated GHG emission increase or decreases. It does not require a 10% reduction across the whole plant.

[46] An example of a fuel switch would be switching from coal to natural gas; on the other hand, as an example, switching between two types of coal does not apply.

[47] In some GHG accounting methods, production is often required to remain constant to be considered an efficiency improvement. However, due to suppressed demand conditions in developing countries, FS measures are often implemented along with larger plant expansions and IFC should include FS measures during plant expansion where possible. Therefore, FS GHG reduction calculations are limited to the original plant and production level and disaggregated from any production increases or expansion, as the latter are treated as business-as-usual.

[48] For example, a boiler upgrade with reduced excess air can lead to a decrease in effectiveness of a combined heat and power system or, in ammonia production, changing feedstock from coal to natural gas will affect production and process emissions, to name a few examples.

[49] For example, a cement production facility may contain multiple, stand-alone production lines for different products and the FS project may be limited to only one of these independent lines while not affecting other lines. In this case, the FS boundary can be limited to the single production switching fuels.

Scope 3 Emissions	Upstream, downstream, and leakage GHG emission sources for these project types are considered negligible and generally excluded from GHG calculations. IF FS is to RE biomass, GHG emissions associated with biomass production need be included in the GHG reduction calculation, including land use, harvest, and other GHG emission sources.
Baseline Emissions (BE)	The baseline activity is the pre-IFC GHG emission scenario before the FS project was implemented and should include all onsite GHG emission sources as well as electricity, heat, or steam purchased from third parties.50 Also ensure to include GHG emission sources that ended as a result of the FS project.
Project Emissions (PE)	The project scenario is to include all GHG emission source include in the baseline but at post-IFC project emission levels.

7 Indirect Mitigation

7.1 RE Climate-Related Products

Renewable Energy Climate-Related Products (RECRP) reduce GHG emissions through RE generation in downstream consumers. Such products typically include solar panels, wind turbines, biomass gasifiers, or similar technologies.

Requirements: RECRPs that support RE projects (see Section 1.1 and 1.2) are treated as inherently additional given their low GHG emissions and limited impact on surrounding areas. In addition, the following considerations apply:

a) The climate related product must generate electricity, heat, or steam from a renewable energy source

b) The RECRP product must consist of the manufacture and/or distribution of "finished products" ready for sale and implementation by third parties, and not the manufacture or production of inputs or components that later could be used in the RECRP[51]

Methodological Considerations:

Scope 3 Emissions	Given the Scope 3 impact of RECRPSs, upstream, downstream, and leakage GHG emission sources need to be considered in the GHG reduction calculation.[52]
Baseline Emissions (BE)	For Grid-Connected RE: IFC follows the International Finance Institution (IFI) Approach to GHG Assessment in Renewable Energy Sector where a default combined margin emission factor is calculated based on CDM practices[53]:

[50] For example, onsite GHG emission sources may be onsite vehicle use, onsite electricity and heat generation, industrial process related emissions, or any other GHG emission resulting from operations.

[51] Components and other inputs to a final product are treated as Special Climate and not Mitigation, according to IFC Definitions and Metrics for Climate-Related Activities.

[52] The underlying assumptions are that these projects are intended for market transformation and, as such, their large scale impact will impact upstream and downstream GHG emission sources.

	For Solar and Wind Generation: CM = [0.75 x Operating Margin (OM)] + [0.25 x Build Margin (BM)] **For All Other RE Generation:** CM = [0.50 x OM] + [0.50 x BM] Each country OM is assumed to be the average CO2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system as published by the International Energy Agency (IEA) CO2 emissions per kWh from electricity generation.[54] Each country BM is assumed to be the most efficient fossil fuel electricity generation available by country according to the IEA. The above CM calculation can be superseded by either of the following: 1) A country grid emission factor for electricity supply based on UNFCCC (CDM) methodology, third party validated, and published by the host country no more than 2-years old; or 2) An authoritative, transparent, project-specific study. For Non-Grid Connected RE: The baseline activity displaced by the project is the power generation (such as diesel, kerosene, etc.) based combustion used to provide electricity, heat and/or steam to the end-users.
Project Emissions (PE)	Upstream, downstream, and leakage need to be consider as follows: - Upstream GHG emissions resulting from the production of material and/or energy inputs from non-dedicated, third parties can be excluded - GHG emissions associated with manufacture of the RECRP and its components need to be included[55] - Transportation and installation-related GHG emissions associated with transport from the production site to wholesale/retail, to the point of installation, and to the point of disposal can be excluded - GHG emissions related to the operation of the RECRP need to be included, where applicable[56] - Disposal GHG emissions include end-of-life associated emissions required for the decommission of the product can be excluded - Leakage or any other change in GHG emissions beyond the project boundary is generally excluded[57]

[53] United Nations Framework Convention on Climate Change (October 2013). Methodological Tool: Tool to Calculate the Emission Factor for an Electricity System. Version 04.0.
Retrieve from: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

[54] OECD/IEA. CO_2 Emissions from Fuel Combustion – Highlights. Retrieve from:
http://www.iea.org/publications/freepublications/publication/name,32870,en.html

[55] This is usually the activity being financed or advised by IFC and project data should be available through the client.

[56] In most cases, these are negligible as most RE projects have very low (if any) operational emissions. For products where fossil fuels may be a supplement or other associated emission sources need be included.

[57] Leakage associated with biomass needs to be considered.

	For IFC investments where the above Scope 3 GHG emissions are not available for measurement, these can be estimated based on external research and/or standard industry practices.

7.2 EE Climate-Related Products

Energy Efficiency Climate-Related Products (EECRP) reduce GHG emissions through energy efficiency in downstream consumers. Such products would typically include insulation products, higher-efficiency equipment and products, automated industrial processes, or similar products.

Requirements: Additionality for this project type is based on the assumption and requirements below:

a) EECRPs result in a GHG emission reduction through energy savings in downstream consumers. Products where this is not apparent do not qualify[58]

b) EECRP activities that result in product substitution imply that the EECRP is more EE than a similar product and its implementation is evidence of the intended displacement of the less efficient product. Products where this is not apparent do not qualify[59]

c) For EECRP activities that are not a product substitution, the absence of the EECRP would clearly result in an increase in GHG emission scenario[60]

d) To be considered EECRP, product must consist of the manufacture of "finished products" ready for sale and implementation by third parties, and not the manufacture or production of inputs or components that later could be used in the EECRP

Methodological Considerations:

Scope 3 Emissions	Given the Scope 3 impact of EECRPSs, some upstream, downstream, and leakage GHG emission sources need to be considered in the GHG reduction calculation.[61]
Baseline Emissions (BE)	The baseline activity is the pre-IFC GHG emission scenario before the EECRP was implemented and should include all affected GHG emission sources as well as electricity, heat, or steam purchased from third parties.[62]

[58] Projects must demonstrate through independently published research, offset methodologies, or industry studies that the activity in question is considered is the least GHG-emission intensive relative to alternatives, and that such activities are accepted elements of a low-carbon growth strategy.

[59] For example, not installing a low-e window would likely result in the installation of a non-low-e window. On the other hand, the purchase of one LED TV does not indicate the displacement of a less efficient TV as: a) The LED TV may be purchased in addition to older TVs still in use in the household; b) Several LED TVs can be installed in one household; c) LED TVs are only marginally more EE than other LCDs; d) Are mainly purchased based on consumer picture quality preferences. On the other hand, products (i.e. insulation, water heaters, HVAC, windows, etc) required for commercial and residential spaces and of single-application (only one heater per household) usually result in an either/or choice between EE and non-EE, and, thus, are a most defensible EECRPs indicating the displacement of the non-EE scenario.

[60] A non-product substitute is an EE product with an alternative baseline scenario being the absence of any product at all.

[61] The underlying assumptions are that these projects are intended for market transformation and, as such, their large scale impact will impact upstream and downstream GHG emission sources.

Project Emissions (PE)	GHG emissions associated with the EECRP upstream inputs, transport, installation, implementation, dismantling, and disposal should be accounted for according to the following two scenarios: For EECRP (product substitute): if associated GHG emissions in product manufacture are similar to or lower than the baseline product, these can be excluded from the GHG calculation For EECRP (non-product substitution): project emissions from manufacture are additional to the project scenario and need to be accounted for in the GHG reduction calculation. In addition to these, the following GHG emission sources should be treated as follows: - Upstream GHG emissions resulting from the production of material and/or energy inputs from non-dedicated, third parties can be excluded - Transportation and installation GHG emissions associated with transport from the production site to wholesale/retail, to the point of installation, and to the point of disposal can be excluded if negligible - GHG emissions related to the operation of the EECRP need be included, where applicable[63] - Disposal GHG emissions include end-of-life associated emissions required for the decommission of the product can be excluded[64] - Leakage or any other change in GHG emissions beyond the project boundary is generally excluded For IFC investments where the above Scope 3 GHG emissions are not available for measurement, these can be estimated based on external research and/or standard industry practices.

[62] For example, onsite GHG emission sources may be onsite vehicle use, onsite electricity and heat generation, industrial process related emissions, or any other GHG emissions resulting from operations.

[63] In some cases, the EECRP will have GHG emissions associated with its own operation (i.e. equipment) and these need to be included. In other cases, the EECRP will affect other GHG emission sources (i.e. insulation, low-e windows, or smart grid technology). Consider both scenarios where applicable as operational emissions.

[64] The assumption being that these are either negligible or similar to comparable baseline GHG emissions.

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For more information, please visit:
http://www.ifc.org/ghgaccounting