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Sustainable
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Plantation

GHG INVENTORY METHODOLOGY STATEMENT

23 APRIL 2024

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INTRODUCTION

This document outlines the boundaries, calculation rationale, methodology, key assumptions, and key references used in accounting Sime Darby Plantation's (SD Plantation) Scope 1, 2 and 3 greenhouse gas (GHG) emissions inventory as published in our 2023 Sustainability Report and available on SD Plantation's website.

The quantification methodology for our Scope 1, 2 and 3 emissions are aligned with internationally recognised methodologies, such as the Greenhouse Gas Protocol (GHG Protocol) Corporate Accounting and Reporting Standard, GHG Protocol Scope 3 Calculation Guidance, the draft GHG Protocol Land Sector and Removal Guidance (Draft for Pilot Testing and Review, September 2022) and 2019 IPCC Refinement guidelines.

Different scopes of emissions

The GHG Protocol Corporate Accounting and Reporting Standard categorises GHG emissions into three (3) scopes:

- Scope 1: Direct Emissions – Emissions from sources owned or controlled by the reporting entity
- Scope 2: Energy Indirect Emissions – Emissions from the generation of imported electricity, heat or steam consumed by the reporting entity
- Scope 3: Other Indirect Emissions – Emissions, other than energy indirect emissions, which are a consequence of the reporting entity's activities, but arise from emissions sources that are owned or controlled by other organisations.

Defining boundaries

The "operational control" approach is applied in preparation of SD Plantation's emissions inventory. SD Plantation emissions cover two sectors which are:

- FLAG (Forest, Land and Agriculture): All emissions related to agriculture to the farm gate (excluding processing) i.e. land use change, managed soils, enteric fermentation, fertilisers and fuel use in estates
- Energy & Industrial: Emissions from operational activities beyond the farm gate, i.e. emissions from fossil fuels combustion and processing of agricultural products in mills and refineries

SD Plantation reports three (3) of the six (6) greenhouse gases, namely carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) as these are material to SD Plantation operations. Fugitive HFC emissions (from refrigeration & air conditioning systems) represent 0.01% of SD Plantation's total scope 1 and scope 2 emissions and have been excluded. The nature of SD Plantation's operations does not release PFC, SF₆ and NF₃ emissions, as we do not use these fluorinated compounds in our operations. For reporting, all the relevant greenhouse gases will be converted as carbon dioxide equivalent (tCO₂e) emissions by using the respective greenhouse warming potential.

Our boundary includes operating assets that SD Plantation has operational control, of which 100% of the Scope 1 and 2 emissions are accounted. The following operations are included in SD Plantation's GHG inventory:

- Our upstream operations encompass estates and palm oil mills located in Malaysia, Indonesia (Minamas Plantation), Papua New Guinea and the Solomon Islands (New Britain Palm Oil Limited)
- Our downstream operations, represented by Sime Darby Oils (SDO)
- Headquarters and Sime Darby Plantation Research & Development (R&D) office

We account for operations that we do not have direct operational control but are part of our value chain as Scope 3. This includes upstream emissions relating to the goods and services that we purchase and downstream emissions relating to the transportation, use, processing, and end-of-life of our sold products. We apply the same boundary when accounting for third party emissions where relevant Scope 1 and 2 emissions are accounted for based on an operational control basis.

Base year recalculation

SD Plantation has set FY2020 as the base year for our greenhouse gas (GHG) emission calculations for SD Plantation's Net Zero commitments. SD Plantation's definition of significance threshold is 5% and this threshold is applied for deciding on base year GHG emissions recalculation to account for significant changes, in accordance with the GHG Protocol's guidance on recalculating base year emissions. The significant impact of the following cases shall trigger recalculation of SD Plantation's base year emissions:

- Structural changes - Structural changes such as mergers, acquisitions, and divestments that significantly impact our base year GHG emissions may trigger the adjustment of the base year emissions. Emissions should be recalculated for the entire year for the base and current year. If complete and accurate data are not available, recalculation may be carried out in the following year.
- Calculation methodology changes - Updates in calculation methodology and emission factors as well as improved data access that result in a significant impact on the base year GHG emissions may trigger the adjustment of the baseline.
- Data errors - The discovery of a significant error, or several cumulative errors that are collectively significant may trigger the adjustment of the baseline.

Article I. Carbon Emissions Calculation Methodology

This section describes the calculation boundaries as well as exclusions, methodologies, assumptions, and references used to calculate emissions for Scope 1, 2 & 3 emissions.

Section 01 Scope 1: Direct Emission – Forest, Land and Agricultural (FLAG)

(a) Land Use Change

Description: Emissions (primarily from carbon stock losses) due to land conversion or land use change (LUC) on land owned/controlled by SD Plantation in the past 25 years.

Calculation boundary: Covers land conversion activities of oil palm plantations in Malaysia, Indonesia, Papua New Guinea and Solomon Islands as well as rubber plantations in Malaysia.

Exclusion: Sugarcane plantation

Rationale: LUC emissions from sugarcane operation are immaterial.

Calculation Methodology: Emissions from LUC are computed based on the land area replanted/planted (in hectare) experiencing LUC multiplied by the change in carbon stock before and after LUC activity. The change in carbon stock will be dependent on the previous land use prior to replanting/planting. The N₂O emissions from LUC are calculated based on two factors - N₂O emissions from peatland (calculated by multiplying the peatland planted area with the direct N₂O emission factor) and emissions from the amount of nitrogen mineralised due to the change in soil organic carbon between the beginning and the end of the crop cycle.

Significant assumptions: The determination of the previous land use for certain planted areas involve significant judgment by internal experts which involves direct observation and/or analysis of satellite images and geo-spatial data.

References:

- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4
- Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022)
- RSPO Historical CO₂ Emissions from Land Use and Land Use Change from the Oil Palm Industry in Indonesia, Malaysia and Papua New Guinea.

(b) Peat-related Emissions

Description: CO₂ emissions from draining of peatlands to plant oil palm and continuous N₂O emissions from planting on peat soil.

Calculation boundary: This emissions source covers oil palm plantations in Malaysia, Indonesia, Papua New Guinea and Solomon Islands. No planting on peatland occurs for SD Plantation's rubber, sugarcane and other crops.

Exclusion: N/A.

Rationale: N/A.

Calculation Methodology: CO₂ emissions from peat oxidation is calculated by multiplying the hectareage planted on peat, drainage depth and emission factor. The N₂O emissions from peat is calculated by multiplying the hectareage planted on peat with the emission factor, which is then subsequently converted to CO₂.

References:

- Current and future CO₂ emissions from drained peatlands in Southeast Asia, Hoojier et al. (2009);
- IPCC 2006 Vol 4 Chapter 11
- IPCC 2019 Supplement to IPCC 2006 Guidelines for National Greenhouse Gas Inventories: Wetlands and PalmGHG v4.

(c) **Managed Soils**

Description: Soil management emits N₂O due to the nitrogen inputs (i.e. crop residues) to soils. There are two types of N₂O emissions, direct and indirect. The indirect emissions arise from leaching and volatilisation of nitrogen inputs. The direct emissions arising from N₂O emissions from synthetic fertiliser inputs is covered in the next section.

Calculation boundary: This emission source covers oil palm plantations in Malaysia, Indonesia, Papua New Guinea and Solomon Islands as well as rubber plantations in Malaysia. In Papua New Guinea, cattle rearing activity takes place on the same land as our oil palm plantation.

Exclusion: Sugarcane plantation.

Rationale: Indirect N₂O emissions arising from managed soil in sugarcane operation is immaterial.

Calculation Methodology: The emissions are computed from several factors of nitrogen inputs:

- The amount of nitrogen mineralised due to the change in soil organic carbon between the beginning and the end of the crop cycle. This factor is calculated using the 1999 and 2023 replanted hectareage multiplied by emission factors and the difference is the difference between nitrogen mineralised in year 2023 and year 1999.
- The amount of nitrogen from crop residues such as fronds and trunks left on the ground during maintenance or replanting.
- The amount of nitrogen from mulching of Empty Fruit Bunch (EFB), the application of treated POME (estimated from volume of FFB processed) and the application of compost onto soils.
- The amount of nitrogen sourced from the unmanaged dung and urine left on the soils from the cattle rearing activity. The amount of nitrogen from these sources is then multiplied by direct and indirect N₂O emission factors.

Significant assumptions:

- For Indonesia estates, the 1999 planted hectareage is assumed to be the same as 2001 as this was the year when Kumpulan Guthrie Berhad, a wholly owned subsidiary of SD Plantation, acquired Salim Plantation, laying the foundation of modern day Minamas Plantation.
- For the application of EFB to soil, it is assumed that the EFB supplied from mills are applied to nearby estates.

References:

- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4
- Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022)

(d) Fertiliser

Description: Emissions from the application of synthetic fertilisers onto soil on land that SD Plantation owns/controls.

Calculation boundary: The emissions are calculated based on the consumption of fertilisers multiplied by the emission factors specific to a selected type of fertiliser applied in SD Plantation's estates. The emission factors are dependent on the nitrogen content of each type of fertiliser.

Where required, the CO₂ emission from liming demand will be included in the emission. Liming demand refers to the amount of agricultural lime needed to raise the pH level of soil to a desired level for optimal plant growth.

Exclusion: Sugarcane plantation.

Rationale: Emissions from application of synthetic fertilisers on Sugarcane plantations are immaterial.

Significant assumptions: Liming demand is used together with the following fertilisers: NPK7, NPK 10, NPK 11, NPK 12, NPK 13, NPK 14, NPK 15, NPK 16, NPK 17, NPK 18 and NPK 19. The CO₂ emissions from liming activities for all of the NPK types are calculated using the same emission factor as NPK15, with the assumption that the rate is comparable.

References:

- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4
- Energy efficiency and greenhouse gas emissions in European mineral fertilizer production and use published by Fertiliser Europe (2011)

(e) Manure Management

Description: Methane emissions from manure left uncovered on land are that SD Plantation owns/controls (direct and indirect N₂O emissions from manure left unattended on the ground are accounted for under managed soils category).

Calculation boundary: This emissions source covers the cattle rearing activity that takes place on the same land as oil palm plantations located in Papua New Guinea.

Exclusion: N/A

Rationale: N/A

Calculation Methodology: The emissions are calculated based on the month-end average number of cattle heads multiplied by the manure management emission factors.

References: IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4; and Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022).

(f) Enteric Fermentation

Description: Emissions from CH₄ produced in ruminant livestock cattle as a by-product of enteric fermentation where carbohydrates are broken down by bacteria in the cattle's digestive tract. These emissions come from cattle owned by SD Plantation.

Calculation boundary: This emissions source covers the cattle rearing activity that takes place on the same land as oil palm plantations located in Papua New Guinea.

Exclusion: N/A.

Rationale: N/A.

Calculation Methodology: The emissions are calculated based on the month-end average number of cattle heads multiplied by the enteric fermentation emission factor.

References: IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4; and Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022).

(g) Fuel Consumption

Description: Emissions arising from the usage of fuel (i.e. petrol, diesel, biodiesel) during the operation of controlled vehicles, heavy machineries, and agricultural machineries within the estates and cattle operations.

Calculation boundary: This emissions source covers fuel usage for controlled vehicles, heavy machineries and agricultural machineries in Malaysia, Indonesia, Papua New Guinea and Solomon Islands.

Exclusion: Sugarcane plantation.

Rationale: Fuel consumption emissions arising from sugarcane operations are immaterial.

Calculation methodology: Emission from fuel consumption is computed based on the volume of fuel consumption multiplied with the relevant emission factors based on the type of fuel.

Significant assumptions: All biodiesel used in mills and estates in Malaysia and Indonesia are assumed to be using B10 blend (10% biofuel & 90% diesel) and B30 blend (30% biofuel & 70% diesel) respectively.

Reference:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA).

Section 02 Scope 1: Direct Emission – Energy and Industrial (E&I) Processes

(a) Effluent treatment and Composting

(i) Effluent Treatment

Description: This emissions source refers to the emissions from effluent or wastewater treatment in facilities that SD Plantation owns/controls which can be a source of CH₄ (Methane) emissions when treated or disposed anaerobically. Wastewater as well as its sludge components can produce CH₄ if it degrades anaerobically which is determined by the amount of degradable organic material in the wastewater such as Chemical Oxygen Demand (COD).

Calculation boundary: This emissions source covers the palm oil mills in Malaysia, Indonesia, Papua New Guinea and Solomon Islands as well as palm oil refineries in Malaysia, Indonesia, Papua New Guinea and Solomon Islands, Thailand, Netherlands and South Africa.

Exclusion: Sugarcane plantation.

Rationale: Effluent and waste treatment emission arising from sugarcane operation is immaterial.

Calculation methodology: Emissions reported = Gross emissions from effluent or wastewater – Emissions reduction from biogas capture + Emission from biogas combustion

Activity	Methodology
Gross emissions from effluent or wastewater	The gross emissions from a mill without a biogas plant is calculated using the volume of Palm Oil Mill Effluent (POME) multiplied by the emission factor. The CH ₄ emissions from the discharge of treated wastewater at mills without biogas capture is immaterial. The gross emissions from refineries' wastewater treatment reported in the inventory are from anaerobic wastewater treatment. This is computed based on volume of COD treated multiplied with emission factor.
Emission reduction from biogas capture	<p>The emissions reduction from biogas capture can be calculated based on two approaches which are COD and actual CH₄ captured and destroyed.</p> <p>The emissions from approach 1 is deriving from the following activity:</p> <ul style="list-style-type: none"> • Emissions from anaerobic digestion of effluent is calculated based on COD untreated multiplied by volume of POME and the emission factor. • Emissions from discharge of treated effluent into river is calculated based on COD discharge multiplied by volume of POME and the emission factor. • Emissions from flaring from processing of biogas is calculated based on volume of biogas sent to the gas engine multiplied by COD treated after biogas treatment and the emission factor. • Emissions from fugitive from processing of biogas is calculated based on COD treated after biogas treatment multiplied by volume of POME and the emission factor. <p>The emission from approach 2 is deriving from the following activity:</p>

Activity	Methodology
	<ul style="list-style-type: none"> • Emissions from flaring from processing of biogas - Volume of biogas sent to flaring multiplied by the emission factor. • Emissions from fugitive from processing of biogas - Volume of biogas sent to the gas engine multiplied by the emission factor. <p>According to Carbon Development Mechanism in AMS-III. H. version 19, the lower number of these two approaches will be taken as the final reduction.</p>
Emission from Combustion of Biogas	Emission from biogas combustion is calculated based on the volume of biogas generated multiplied by the emission factor.

Significant assumptions: For mills without biogas capture, the volume of effluent is assumed to be 67.25% of the volume of FFB processed based on external research. Concentration of biogas is assumed to be 60% of methane which is supported by external research.

References:

- Clean Development Mechanism (CDM) AMS-III. H.: Methane Recovery Wastewater Treatment Version 19.0
- CDM Project emissions from flaring
- IPCC 2019 Refinement Vol 5 Chapter 6; US EPA Emission Factors for Greenhouse Gas Inventories
- United Nations Framework Convention on Climate Change (UNFCCC FCCC/SBSTA/2003/10/Add.2)
- Journal of Environmental Management 149 (2015): Conventional methods and emerging wastewater polishing technologies for palm oil mill effluent treatment

(ii) Composting

Description: Emissions arising from the composting treatment of SD Plantation's agricultural waste, EFB into compost.

Calculation boundary: Composting plant operated by Lavang mill in Malaysia. This composting plant is located within SD Plantation land and controlled by SD Plantation.

Exclusions: Waste treatment emissions from in-situ dumpsite:

- Some SD Plantation's operations in Malaysia which dispose their municipal waste within the estate boundary.
- All SD Plantation's operations in Indonesia which dispose their municipal waste within the estate boundary.
- All SD Plantation's operations in Papua New Guinea and Solomon Islands which dispose their municipal waste and scheduled waste within the estate boundary.

Rationale: Waste treatment emissions from in-situ dumpsites are immaterial.

Calculation methodology: The emissions are computed based on the amount of EFB for composting multiplied by the emission factor of composting treatment.

Reference: UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)

(b) Fuel Consumption

Description: Emissions arising from the usage of fuel (i.e. petrol, diesel, biodiesel, natural gas) during the operation of controlled vehicles, heavy machinery, stationary machineries, electricity generation and boiler. This section covers usage of fuel of all SD Plantation operations under the Energy and Industrial (mills and refineries) category.

Calculation boundary: This emissions source covers the consumption of fuel in oil palm mills and downstream operation in Malaysia, Indonesia, Papua New Guinea & Solomon Islands, Thailand, South Africa, United Kingdom and Netherlands.

Exclusion: Sugarcane plantation.

Rationale: Fuel consumption emissions from Sugarcane operation is immaterial.

Calculation methodology: Emission from fuel consumption is computed based on the volume of fuel consumption multiplied with the relevant emission factors based on the type of fuel.

Significant assumptions: All biodiesel used in mills and estates in Malaysia and Indonesia are assumed to be using B10 blend (10% biofuel & 90% diesel) and B30 blend (30% biofuel & 70% diesel) respectively.

Reference:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA); and
- Netherlands list of energy carriers and standard CO₂ emission factors, January 2023.

Section 03 Scope 2: Energy Indirect emissions – Energy & Industrial (E&I) Processes

(a) Purchased electricity

Description: Emissions from the generation of purchased electricity that is consumed in SD Plantation's owned or controlled equipment and operations. SD Plantation uses the location-based method in tracking our Scope 2 emissions.

Calculation boundary: This emissions source covers all upstream and downstream operations of SD Plantation Malaysia, Indonesia, Papua New Guinea & Solomon Island, Thailand, United Kingdom, Netherlands, and South Africa.

Exclusion: Sugarcane plantation and processing factory.

Rationale: Sugarcane operation in Papua New Guinea is immaterial.

Calculation methodology: Emission from electricity consumption is computed based on the quantity of electricity consumption, in kilowatt-hour (kWh), multiplied by the location-based purchased electricity EF.

Significant assumptions: Where actual kWh consumption data is not available, electricity tariffs, based on average tariff for the country, are used to convert electricity costs to kWh consumption.

References:

- Malaysia: Grid Emission Factor (GEF) in Malaysia, 2017-2021, Energy Commission Publications
- Indonesia: Faktor Emisi GRK Sistem Ketenagalistirikan Tahun 2019, Ministry of Energy and Mineral Resources
- Thailand: Energy Policy and Planning Office, Ministry of Energy
- South Africa, Indonesia, and Vietnam: IGES List of Emission Factors as of 21 October 2023
- The Netherlands: Table 2, GHG Emission Factors for Electricity Consumption, JRC Technical report: 2020; United Kingdom: DEFRA, published 28 June 2023
- Solomon Island: Energy Profile Solomon Islands, IRENA; and Papua New Guinea: Energy Profile Papua New Guinea, IRENA.

(b) Purchased Steam

Description: Emissions from the generation of purchased steam that is consumed in SD Plantation's owned or controlled operations. SD Plantation uses the location-based method in tracking our Scope 2 emissions.

Calculation boundary: This emissions source covers our refinery operations in South Africa, Malaysia, and Indonesia.

Exclusion: N/A

Rationale: N/A

Calculation methodology: Emission from purchased steam consumption is computed based on the volume of steam consumed multiplied by the emission factor of the given fuel used for steam generation.

Significant assumptions: The emission factor of combustion of coal/natural/medium fuel oil gas for steam generation is assumed to be similar to the combustion of coal/natural gas/ fuel oil for electricity generation.

Reference: UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)

Section 04 Scope 3: Other indirect emissions – FLAG

(a) Category 1: Purchased Goods and Services

Description: Category 1 of the GHG Protocol Scope 3 focuses on emissions resulting from SD Plantation's purchases of goods and services that are not covered in other specific categories (categories 2 through 8) of upstream Scope 3 emissions. It includes all upstream (i.e., cradle-to-gate) emissions associated with the production of products, including both goods (tangible products) and services (intangible products) acquired by SD Plantation during a reporting year.

Calculation boundary: This category covers emissions generated upstream (cradle-to-gate) of SD Plantation's operations associated with the extraction and production of goods and services purchased or acquired by SD Plantation during the reporting year. It covers:

- the upstream emissions from feedstock purchases such as third-party palm FFB (LUC, managed soils, fertiliser applied to soil, fuel consumption, peat oxidation and N₂O emissions from peat);
- palm supply and non-palm supply purchases; and
- non-feedstock purchases (estate tools and equipment, fertiliser, and purchased seedlings).

Emissions associated with goods and services related to fuel and energy-related activities, upstream transportation, business travel and employee commuting are not included in this category. These are assigned to separate emissions categories (categories 3, 4, 6 and 7, respectively) as recommended by the GHG Scope 3 Standard.

Exclusions: N/A

Rationale: N/A

Calculation methodology: Upstream Emission from Feedstock Purchases. Upstream emissions from feedstock purchases are accounted for by estimating the direct emission anticipated from its production by SD Plantation's suppliers. This involves recomputing emissions expected within an oil palm plantation.

Feedstock Palm FFB (LUC):

Emissions from LUC are computed based on the area of third-party replanted/planted land area experiencing land use change multiplied by the change in carbon stock before and after LUC activity. The change in carbon stock will be dependent on the type of land use prior to replanting/planting. The planted land areas of third-party estates are estimated based on the volume of FFB purchased from those estates.

Feedstock Palm FFB (peat oxidation and peat N₂O)

Emissions from peat oxidation are calculated based on third-party planted land area on peat soil multiplied by the default emission factor and peat drainage depth. The N₂O emissions from peat are calculated by multiplying the peat planted area and emission factors for N₂O emissions from drained/managed organic soils.

Feedstock Palm FFB (managed soils, fertiliser applied to soil, fuel-related emissions)

Emissions from managed soil, fertiliser applied to soil and fuel-related emissions are calculated by multiplying the volume of third-party purchased FFB (t) with the expected Scope 1 emissions intensity.

For this purpose, Scope 2 emission is not expected to be material and hence have not been included in the assumptions.

Feedstock Palm Supply

Emissions from palm products purchased are calculated based on the volume of third-party feedstock purchased, multiplied with the corresponding company/mill's emissions intensity. Where actual data is not available, industry-average covering Scope 1,2 and 3 emission factor for palm production is applied to the volume of purchases to calculate the emissions for this category.

Feedstock Non-palm Supply

Emissions from feedstock non-palm supply are calculated based on the volume of these purchases, multiplied with relevant emission factors. Where actual data is not available, industry-average covering Scope 1,2 and 3 emission factor is applied to the volume of non-palm purchases to calculate the emissions for this category.

Non-feedstock (LUC from purchased seedlings)

Emissions from LUC from purchased seedlings is computed based on the size of the third-party planted hectareage (that consists of mother palm) that experience LUC multiplied by the change in carbon stock before and after the LUC activity. The change in carbon stock will be dependent on the types of the land prior to replanting/planting which is assumed to be oil palm.

Non-feedstock (tools and equipment, chemicals, fertilisers)

Emissions from non-feedstock purchases (i.e. tools and equipment, chemicals, fertilisers) are calculated using the spend-based method, whereby the spend amount is converted to USD and multiplied with relevant emission factors based on the type of purchases.

Significant assumptions:

Sub-categories	Assumptions
Upstream Emission from feedstock Purchases	
Feedstock Palm FFB (LUC)	<ul style="list-style-type: none"> The planted land area of third-party estates are estimated using the average yields per hectare in the reporting year. Where actual yield per hectare information is not available, market yield per hectare rate will be used (i.e. as sourced from Malaysia Palm Oil Board (MPOB) for Malaysia). For historical hectareage at third-party estates, it was assumed to have a similar land growth trajectory as SD Plantation.

	<ul style="list-style-type: none"> To estimate the percentage of land that is replanted at third-party estates, it was assumed that it is of the same percentage as SD Plantation. To estimate LUC emissions at third-party estates, it was assumed that the previous land use at third-party estates were oil palm.
Feedstock Palm FFB (peat oxidation and peat N ₂ O)	<ul style="list-style-type: none"> The determination of third-party peatland involves significant judgement by internal experts which involves direct observation and/or analysis of satellite images and geo-spatial data.
Feedstock Palm FFB (managed soils, fertiliser applied to soil, fuel-related emissions)	<ul style="list-style-type: none"> To estimate the managed soils, fertiliser applied to soil and fuel-related emissions at third-party estates, SD Plantation emissions intensity is used as a basis. It was assumed that the emissions intensity of managed soil, fertiliser applied to soil and fuel-related emissions are comparable to SD Plantation.
Non-feedstock	
Non-feedstock (LUC from purchased seedlings)	<ul style="list-style-type: none"> To estimate LUC emissions from seedlings purchased by SD Plantation from third-party estates, seedling production volume over mother palm hectare ratio is assumed to be comparable to SD Plantation.

References:

- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4
- 2013 Supplement to IPCC 2006; Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022)
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4
- IPCC Climate Change 2022; Migration of Climate Change
- Current and future CO₂ emissions from drained peatlands in Southeast Asia, Hoojier et al. (2009)
- Certified Palm Oil Reduces Greenhouse Gas Emissions Compared to Non-Certified, Jannick Schmidt and De Rosa (2020)
- RSPO Annual Communication Of Progress report (2022)
- Life cycle assessment of coconut oil product; IOP Conference Series: Earth and Environmental Science. Vol. 1063. No. 1. IOP Publishing (2022)
- A model of indirect land-use change. 8th International Conference on LCA in the Agri-Food Sector, Schmidt J H, et al. (2012)
- Life cycle assessment of five vegetable oils; Journal of Cleaner Production, Schmidt J H (2014)
- Life cycle analysis of shea buer use in cosmetics: From parklands to product, low carbon opportunities; Journal of Clean Production, Glew et al. (2014)
- USEPA Supply Chain Greenhouse Gas Emission Factors for US Commodities

Section 05 Scope 3: Other indirect emissions – Energy & Industrial (E&I) Processes

(a) Category 1: Purchased Goods and Services

Description: Category 1 of the GHG Protocol Scope 3 focuses on emissions resulting from SD Plantation's purchases of goods and services that are not covered in other specific categories (categories 2 through 8) of upstream Scope 3 emissions. It includes material upstream (i.e., cradle-to-gate) emissions associated with the production of products, including both goods (tangible products) and services (intangible products) acquired by SD Plantation during a reporting year.

Calculation boundary: This category covers emissions generated upstream (cradle-to-gate) of SD Plantation's operations associated with the extraction and production of goods and services purchased or acquired by SD Plantation during the reporting year. It covers:

- palm supply purchases
- non-feedstock purchases (mills tools and equipment, chemicals, maintenance services, machineries spare parts, packaging, building and construction, safety equipment, office supplies, PPE, medical equipment); and
- outsourced tolling production.

Emissions associated with goods and services related to fuel and energy-related activities, upstream transportation, business travel and employee commuting are not included in this category. These are assigned to separate emissions categories (categories 3, 4, 6 and 7, respectively) as recommended by the GHG Scope 3 Standard.

Exclusions: Emissions from purchase of coconut for Papua New Guinea & Solomon Islands mills.

Rationale: Scope 3 Category 1 Emissions from purchase of coconut are immaterial.

Calculation methodology:

Feedstock Palm Supply

Emissions from palm product purchases are calculated based on the volume of third-party feedstock purchases, multiplied with the corresponding company / mill's emissions intensity. Where actual data is not available, industry-average Scope 3 emission factor is applied to the volume of third-party purchases to calculate the emissions for this category.

Non-feedstock purchases

Emissions from non-feedstock purchases (i.e. mills tools and equipment, chemicals, maintenance services, machineries spare parts, packaging, building and construction, safety equipment, office supplies, PPE, medical equipment) are calculated using the spend-based method, whereby the spend amount is converted to USD and multiplied with relevant emission factors based on the type of purchases. .

Outsourced tolling production

Emissions from tolling are calculated based on the volume of refined palm oil tolled by a third party refinery multiplied by the relevant emissions intensity.

Significant assumptions: For outsourced tolling, the emissions from third party refineries are assumed to be comparable with SDO refineries.

References:

- Certified Palm Oil Reduces Greenhouse Gas Emissions Compared to Non-Certified by Jannick Schmidt and De Rosa (2020)
- USEPA Supply Chain Greenhouse Gas Emission Factors for US Commodities
- RSPO Annual Communication of Progress Report (2022)

(b) Category 2: Capital Goods

Description: Category 2 of the GHG Protocol Scope 3 encompasses emissions related to the upstream (i.e. cradle-to-gate) extraction, production, and transportation of capital goods that SD Plantation purchased or acquired in the reporting year.

Calculation boundary: Capital goods are final products with an extended operational lifespan and are used in the production of goods, provision of services, or in the management of merchandise sales, storage, and delivery. Examples include machinery, equipment, building, facilities, and vehicles. From a financial accounting perspective, these capital goods are categorised as Property, Plant and Equipment (PPE), Investment Properties (IP), Rights of Use Assets (ROU), and Intangible Assets.

Exclusions: N/A

Rationale: N/A

Calculation methodology: Emissions from capital goods are calculated using the spend-based method, whereby the spend amount is converted to USD and multiplied with relevant emission factors based on the type of capital goods.

Reference:

- USEPA Supply Chain Greenhouse Gas Emission Factors for US Commodities

(c) **Category 3: Fuel and Energy-related Activities**

Description: Category 3 in the GHG Protocol Scope 3 framework addresses emissions related to SD Plantation's fuel and energy-related activities. This category encompasses emissions resulting from the extraction, production, and transportation of fuels and energy sources that SD Plantation directly uses or purchases. It includes emissions from activities such as the extraction of fossil fuels, electricity generation, and the production and transportation of purchased fuels and energy. For example, SD Plantation accounts for CO₂, N₂O and CH₄ emissions from the production (i.e. land use change, land management, purchased goods and services, transportation) of biodiesel purchased by SD Plantation and consumed within SD Plantation operations. This category includes emissions from the following activities:

- For upstream emissions of purchased fuels: All upstream (well-to-tank (WTT)) emissions of purchased fuels (from raw material extraction up to the point of, but excluding, combustion).
- For upstream emissions of purchased electricity: All upstream emissions (i.e. extraction, refining and transportation of primary fuels before their use in the generation of electricity) of purchased fuels (from raw material extraction up to the point of, but excluding, combustion by a power generator) - WTT-Transmission & Distribution)
- For transmission and distribution (T&D) losses: The energy loss that occurs in getting the electricity from the power plant to SD Plantation. All upstream emissions of energy consumed in a T&D system, where available.

Calculation boundary: This emissions source covers the offices, plantation, mills, factories and refineries in Malaysia, Indonesia, Papua New Guinea and Solomon Islands, Thailand, South Africa, United Kingdom and Netherlands.

Exclusion: T&D losses from purchased steam at SDO South Africa, SDO Nutrition and SDO Pulau Laut as the steam generation is near to the refinery.

Rationale: The T&D losses emissions will be immaterial as the generation is in proximity with SDO South Africa, SDO South Africa, SDO Nutrition and SDO Pulau Laut.

Calculation methodology: Emission from fuel and energy related activities are calculated based on the average data method, which involves estimating emissions by using secondary data (i.e. industry-average) as opposed to supplier specific. This emission is calculated based on the actual purchases of fuels and electricity multiplied by the appropriate emission factor for WTT emission, T&D emission and T&D losses emission.

Significant assumptions: Where country specific T&D losses emission factor is not available, the emission factor for UK T&D losses will be used.

References:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)
- GHG Protocol Quantis Scope 3 Evaluator tool (Quantis tool).

(d) Category 4: Upstream Transportation and Distribution

Description: Category 4 of the GHG Protocol Scope 3 focuses on emissions from the transportation and distribution of products purchased by SD Plantation, including inbound and outbound logistics that are operated by vehicles and facilities not owned or controlled by SD Plantation.

Calculation boundary:

This emission source covers the transportation involved in the overall upstream transportation for SD Plantation's operations in Malaysia, Indonesia and Papua New Guinea & Solomon Islands. This covers the following outsourced transportation:

- Road transport for Fresh Fruit Bunches (FFB) purchase (from internal and third-party estates) from farm (estate) to gate (mill) by our Upstream business units.
- Road and marine transport for internal and third-party feedstock palm and non-palm purchases by our Downstream business units.
- Road and marine transport for fertiliser transportation from suppliers to SD Plantation

Exclusions: Upstream transportation of non-fertiliser purchased goods.

Rationale: The emissions arising from the transportation of non-fertiliser purchased goods are immaterial.

Calculation methodology: The emissions are calculated based on the number of trips multiplied by the distance travelled and the emission factor of the relevant mode of transport.

References:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)
- Roundtable on Sustainable Palm Oil (RSPO) PalmGHG v4

(e) Category 5: Waste Generated in Operations

Description: Category 5 encompasses emissions from third-party disposal and treatment of waste generated in SD Plantation's operations during the reporting year. This category includes emissions from the treatment of SD Plantation's municipal waste and scheduled waste.

Types of waste treatment activities included in the emissions are as follows:

- Disposal in third-party landfill
- Incineration
- Recycling
- Composting

Calculation boundary: This emissions source covers wastes generated in SD Plantation's operations that are treated at third-party facilities. Waste disposed of within SD Plantation's operational boundaries is not included in Category 5, as emissions associated with these wastes form part of Scope 1 emissions. For the current reporting year, this emission is not recorded and forms part of SD Plantation's Scope 1 exclusions.

Exclusions:

- SD Plantation's Headquarters in Kuala Lumpur;
- R&D operations in Malaysia, Indonesia, Papua New Guinea & Solomon Island; and
- Rubber plantation in Malaysia

Rationale: The emissions from waste generated in SD Plantation Headquarters, R&D operations and rubber plantation are immaterial.

Calculation methodology: The emission is computed based on the waste-type-specific method, where the volume of waste produced is multiplied with the relevant emission factor based on the waste treatment method.

References:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)

(f) Category 6: Business Travel

Description: Category 6 of the GHG Protocol Scope 3 relates to emissions from the transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by SD Plantation).

Calculation boundary: This category covers emissions from road and air travel. Air travel covers both domestic and international flights. For road travel, it covers the emissions from the following business travel:

- Use of employees' own vehicles which are subsequently claimed from SD Plantation
- Travel using vehicles owned or operated by third parties.

Emissions from employee transportation to and from work are classified under Scope 3, Category 7 (Employee Commuting). Emissions generated from business travel using vehicles owned or directly managed by SD Plantation are allocated within either Scope 1, in the case of fuel consumption, or within scope 2 for electric vehicles (for electricity use).

Exclusions: N/A

Rationale: N/A

Calculation methodology: The emissions are calculated using the spend based method where the amount spent on business travel by mode of transport is multiplied by the relevant emission factor.

Reference: GHG Protocol Quantis Tool Scope 3 Evaluator (Quantis Tool)

(g) Category 7: Employee Commuting

Description: Category 7 of the GHG Protocol Scope 3 covers emissions from the transportation of employees between their homes and worksites during the reporting year (in vehicles not owned or operated by SD Plantation).

Calculation boundary: This emissions source covers all upstream and downstream operations of SD Plantation in Malaysia, Indonesia, Papua New Guinea & Solomon Islands, Thailand, United Kingdom, Netherlands, and South Africa.

Emissions arising from employee commuting at upstream operations in Papua New Guinea and Solomon Islands are captured under Scope 1 fuel consumption, as these employees commute via SD Plantation owned transport.

Exclusions: N/A

Rationale: N/A

Calculation methodology: The employee commuting emissions are calculated by estimating the round-trip distance between the employees' homes and worksites, multiplied by the emission factor of the mode of transport. The computation also incorporates the anticipated annual number of working days at SD Plantation's operational locations.

As for employees who commute via vehicles owned or directly managed by SD Plantation, it is captured either in Scope 1 or Scope 2 for electric vehicles.

Reference: UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA).

(h) Category 8: Upstream Leased Assets

Description: Category 8 of the GHG Protocol Scope 3 includes emissions from the operation of assets leased by SD Plantation in the reporting year that is not included in the Scope 1 or Scope 2 emission reported by SD Plantation.

Calculation boundary: Not relevant, not calculated.

Rationale: Emissions are not calculated for this category as all leased upstream assets in the reporting year are included into Scope 1 and Scope 2 emissions.

(i) Category 9: Downstream Transportation And Distribution

Description: Category 9 of the GHG Protocol Scope 3 focuses on emissions from the transportation and distribution of goods sold by SD Plantation, including outbound logistics that are operated by vehicles and facilities not owned or controlled by SD Plantation.

Calculation boundary: This emission source covers the transportation involved in downstream operations in Malaysia, Indonesia, Papua New Guinea & Solomon Islands, Thailand, United Kingdom, The Netherlands and South Africa. This covers outsourced road and marine transport for palm and refined products sold to external customers that are not part of SD Plantation.

Exclusions:

- The transportation and distribution emissions of the refined palm products after reaching the discharge port are not accounted for as the end destination is not known (to the distribution centre as well as last-mile deliveries).
- The transportation and distribution (including retail) emissions of the final goods after further processing by SD Plantation's customers are not included in the calculation as the end destination is not known.

Rationale: The emission arising from the exclusions are immaterial.

Calculation methodology: The downstream transportation and distribution emission are calculated based on the volume of refineries products sold (in metric tonne), multiplied by the distance travelled and emission factor of the relevant types of transportation.

References:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)
- Direct observation and/or analysis of satellite images and geo-spatial data

(k) Category 10: Processing of Sold Products

Description: Category 10 of the GHG Protocol Scope 3 covers emissions from the following:

- Processing of intermediate palm and non-palm products sold by SD Plantation's Downstream business units to business customers. Intermediate products in this context refer to items that require further processing, transformation, or inclusion in another product before use, and therefore result in emissions from further processing after sale by SD Plantation and before use by the end consumer.
- Fugitive and flaring emissions from processing of POME in customer's biogas plant.

Calculation boundary: This emissions source covers the intermediate palm and non-palm products sold by Downstream business units in Malaysia, Indonesia, Papua New Guinea & Solomon Islands, Thailand, United Kingdom, Netherlands and South Africa. The processing emissions of the final goods after further processing by SD Plantation's direct customers are not accounted for as the end destination is not known.

Exclusions: Products that are sold between SD Plantation's own subsidiaries and used as part of own's operations are excluded from Category 10.

Rationale: The processing emissions of the final goods after further processing by SD Plantation's direct customers are not accounted for as the end destination is not known. SD Plantation customers are mostly global conglomerates and therefore it is not always clear the final products SD Plantation's oils end up and what processing steps our oils undergo.

Calculation methodology: SD Plantation uses the average-data method to derive the emissions intensity of its customers to estimate the emissions arising from the further processing of sold products. The computation involves volume of sold intermediate product (in metric tonne) multiplied by the emission factors associated with the processing of sold products (tCO₂e/tonne of final products)

Processing of intermediate products (palm and non-palm):

SD Plantation has calculated the emissions from the processing of sold products based on the volume of products sold to customers and applying the respective emission factors relevant to the customers' industries in accordance with the following classification: "Food", "Non-food" and "Raw Materials" (where it is expected to be used for further processing).

Fugitive and flaring emissions of biogas sold:

This emission is computed based on the amount of biogas sold multiplied by the process-specific emission factors.

Significant assumptions:

- For food and non-food categories, emission factor is determined by averaging the emissions intensity of SD Plantation's selected global priority customers. The classification of the processing of intermediate products by SD Plantation's customers into "Food", "Non-food" and "Raw Materials" is determined by reference to the available external study and market research.

References:

- Average emission factors of SD Plantation's selected global priority customers are obtained from public sources such as Annual Report and CDP platform
- Certified palm oil reduces greenhouse gas emissions compared to non-certified by Jannick Schmidt and Michelle De Rosa (2020)
- UNFCCC – Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activities categories (III-H) Version 19
- IPCC 2019 Refinement Vol 5 Chapter 6
- UNFCCC FCCC/SBSTA/2003/10/Add.2

(I) Category 11: Use of Sold Products

Description: Category 11 of the GHG Protocol Scope 3 covers emissions from the use of goods and services sold by SD Plantation within the reporting year. This entails both the Scope 1 and Scope 2 emissions generated by end users (i.e., both consumers and business customers utilising biogas and biodiesel). Category 11 for SD Plantation includes the direct use-phase emissions of sold products.

Calculation boundary: This emissions source covers the non-biogenic emissions from the combustion of biodiesel and biogas (by-products) sold by SD Plantation in Malaysia.

Exclusions: N/A

Rationale: N/A

Calculation methodology: The emissions from biodiesel combustion is calculated based on multiplying the sales volume for biodiesel with its combustion emission factor.

Similarly, the emissions from biogas combustion, fugitive and flaring are computed from the amount of biogas generated multiplied by biogas emission factors.

References:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA)
- US EPA Emission Factors for Greenhouse Gas Inventories

(m) Category 12: End-of-life Treatment Of Sold Products

Description: Category 12 of the GHG Protocol Scope 3 covers emissions arising from the waste disposal and treatment of products sold by SD Plantation during the reporting year at the end of their life.

Calculation boundary: Downstream Sime Darby Oils (SDO) refineries which produce cooking oils and/or utilise packaging located in Malaysia, Indonesia, Thailand and Netherlands.

In the case of intermediate products that have been sold, SD Plantation considers emissions from disposing of intermediate products sold to customers at the end of its life, rather than the final product.

Exclusions: N/A

Rationale: N/A

Calculation methodology: The emission is calculated by multiplying the volume of waste (i.e. used cooking oil, box packaging waste and plastic packaging waste) by the proportion of waste treatment methods (i.e. landfilling, incineration and recycling) and the emission factor of the relevant waste treatment method.

Significant assumptions: The packaging end-of-life treatment methods adopted by end consumers is estimated based on literature review, where the proportion of waste treatment between landfilled, recycled and incinerated are allocated at 70%, 19% and 11% respectively.

Margarine, stearin and shortening are assumed to be consumed in confectioneries and bakeries. Refined palm oil is assumed to be used as raw material for further processing. The end products are assumed to not end up as waste to landfill and have been excluded from the calculation of emissions.

The proportion of used cooking oil expected to be disposed of in a landfill is determined by referencing the rate of wasted cooking oil that is disposed without proper treatment in Malaysia.

Reference:

- UK GHG Conversion Factors 2023, Department for Environment, Food and Rural Affairs (DEFRA);
- What a Waste 2.0, World Bank;
- Production of cooking oil in Malaysia 2014-2023; and
- The awareness of recycling the used of cooking oil, Daud et al, 2020,

(n) Category 13: Downstream Leased Assets

Description: Category 13 of the GHG Protocol Scope 3 comprises emissions from operating assets owned by SD Plantation (acting as the lessor) and leased to other entities during the reporting year, which are not already accounted for in Scope 1 or Scope 2 emissions. This category pertains to lessors (i.e., SD Plantation receives payments from lessees). For SD Plantation operating leased assets (i.e., lessees), refer to Category 8 (Upstream leased assets).

Calculation boundary: SD Plantation leases lands to third-party where SD Plantation holds no operational control over the activities on these lands. Emissions arising from land conversion would represent the largest emission component of the lessor's operations. Therefore, only land conversion emissions will be accounted for.

Exclusion: Other Scope 1 and Scope 2 emissions of the lessor will be excluded.

Rationale: Other Scope 1 and Scope 2 emissions of the lessor are immaterial.

Calculation methodology: Only the LUC emissions are being accounted for in this category. The emissions from LUC are computed based on the land area of the experiencing LUC multiplied by the change in carbon stock before and after land conversion. The change in carbon stock will be dependent on the previous land use prior to land being cleared before being leased to third-party.

References:

- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol 4
- Greenhouse Gas Protocol Land Sector and Removals Guidance (Draft for Pilot Testing and Review, September 2022)

(o) Category 14: Franchises

Description: Category 14 of the GHG Protocol Scope 3 covers emissions resulting from franchise operations that are not encompassed within Scope 1 or Scope 2. A franchise refers to a business that operates under a license to market or distribute another company's products or services within a certain location. This category is relevant to franchisors (i.e., entities that authorise others to sell or distribute franchisor products or services in exchange for payments like royalties for trademark usage and related services). Franchisors need to consider emissions arising from franchise operations (i.e., scope 1 and scope 2 emissions of franchisees) within this category.

Calculation boundary: Not relevant, not calculated.

Rationale: Emissions are not calculated for this category as SD Plantation does not have franchised operations.

(p) Category 15: Investments

Description: Category 15 of GHG Protocol Scope 3 encompasses emissions tied to the investments made by SD Plantation during the reporting year, which have not been accounted for in Scope 1 or Scope 2 emissions.

Calculation boundary: This category covers the Scope 1 and Scope 2 emissions (on an equity basis) from assets that are owned (as a joint venture or associate) but not operated by SD Plantation, as summarised below:

Type	Entities	Percentage of equity
Joint Venture (JV)	Emery Group (Emery Oleochemicals GmbH, Emery Oleochemicals HK Limited, Emery Oleochemicals B.V., Emery Oleochemicals UK Limited, Emery Oleochemicals Asia Sdn Bhd, Emery Oleochemicals LLC)	50%
	SD Plantation TNB Renewables Sdn. Bhd.	51%
	Dongguan Sime Darby Sinograin Oils and Fats Co, Ltd	37%
	Guangzhou Keylink Chemicals Co. Ltd.	49%
	Rizhao Sime Darby Oils & Fats Co. Ltd.	45%
Associate	Barlow Bulking Sdn. Bhd.	32%
	Nescaya Maluri Sdn. Bhd.	40%
	Muang Mai Guthrie Public Company Limited	49%
	Thai Eastern Trat Co., Ltd.	40%

Exclusions: N/A.

Rationale: N/A.

Calculation methodology:

Where information is available, the investment-specific method is used in collecting Scope 1 and Scope 2 emissions data from the companies in which investments are made. These emissions are then proportionally accounted for according to the equity share.

Average data method: There are two approach that is being used:

- Emission of the JV or Associate is estimated based on the entity with similar operation activity in SD Plantation.
- Emission is estimated by multiplying emission per employee with the number of employee,

Significant assumption: If the emissions data of JVs or associates are not available, the emissions are estimated based on available emissions data from other organisations in the same industry with similar location and size.

Section 06 Carbon Removals

(a) Scope 1 and Scope 3 - Carbon Removals

Description: Scope 1 carbon removal consists of the sequestration from planted oil palm, rubber and High Conservation Value (HCV) area. Scope 3 carbon removal consists of the sequestration relating to purchase of oil palm crops from third-party estates.

HCV refers to areas that have significant environmental, biodiversity, or cultural value and need to be protected. These areas may contain critical habitats for endangered species, important ecosystems, or may be culturally significant sites.

Calculation boundary:

Scope 1 carbon removals covers the following:

- Oil palm plantation in Malaysia, Indonesia, and Papua New Guinea & Solomon Islands
- Rubber plantation in Malaysia and Indonesia
- HCV areas in Malaysia, and Papua New Guinea & Solomon Islands

Scope 3 carbon removals relate to purchases of third-party oil palm crops in Malaysia, Indonesia and Papua New Guinea & Solomon Islands.

Exclusion: HCV areas in Indonesia and conservation set-aside (CSA) areas in Malaysia, Indonesia, and Papua New Guinea & Solomon Islands.

Rationale: The carbon removal arising from the exclusions are immaterial.

Calculation methodology: The stock-difference/stock-change method is used to estimate removals by calculating difference in carbon stock estimates at two points in time and dividing it by the number of intervening years. Age-specific data is used in both calculations for oil palm and rubber while HCV uses the time-average data.

References:

- The carbon factor and annual C stock change for oil palm age 1-25 years sourced from RSPO PalmGHG Calculator.;
- Carbon Sequestration, Tree Biomass Growth and Rubber Yield of PB260 Clone of Rubber Tree (*Hevea brasiliensis*) in North Sumatra, *Kosei et. al, 2014*;
- *Greenhouse gas emissions and carbon stock changes in rubber tree plantations in Thailand from 1990 to 2004, Petsri et. al 2013*;
- IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4: Forest Land;
- IPCC 2013 Supplement to the 2006 IPCC Guidelines, Chapter 4: Coastal Wetlands;
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4: Cropland;
- GHG Protocol Land Sector and Removal Guidance, Part 1 and Part 2 (Draft for Pilot Testing and Review, September 2022);and
- High Carbon Stock Approach (HCSA), Forest and vegetation stratification, Module 4 (2017).

Section 07 Refinery Emissions Intensity

(a) Refinery Emissions Intensity

Description: The refinery emissions intensity of the Sime Darby Oils (SDO) takes into account the direct and indirect emissions of the SDO, such as the Refineries and Kernel Crushing Plants (KCPs), as well as the associated emissions attributable to purchase of feedstocks from internal supplying mills and estates and third-party suppliers, the transportation from the suppliers to the refineries, and the transportation from the refineries to SDO customers.

Refinery emissions intensity is expressed in tCO₂e per metric tonne of refinery production.

Calculation boundary: SDO refineries, kernel crushing plants and bulking facilities under SD Plantation's operational control

Exclusion: Emissions associated with the SDO's copra crushing plants and soy crushing plants activities are excluded from refinery intensity.

Rationale: The emissions relating to copra crushing plants and soya crushing plants are relatively immaterial to the SDO's Refinery Emissions Intensity calculations.

Calculation methodology:

Refinery emissions intensity (tCO₂e per metric tonne of refined products) = GHG emissions of the refineries^[1] divided by total refineries production volume (metric tonne)^[2]

Note:

^[1] GHG emissions of SDO refineries and KCP include the following:

- Scope 1 and Scope 2 GHG emissions of the SDO refineries and KCPs
- Scope 3 GHG emissions i.e. Category 1: Purchased Goods and Services (palm and non-palm feedstock supply)^[3]; Category 4: Upstream Transportation and Distribution; and Category 9: Downstream Transportation and Distribution. (Refer to the respective sections for calculation methodology of SDO refineries' and KCPs' Scope 3 emissions)

^[2] Total refineries production volume comprises all refined palm products from the refineries and KCPs such as Refined, Bleached & Deodorized (RBD) Palm Oil, RBD Palm Olein, RBD Palm Stearin, Palm Fatty Acid Distillate, Crude Palm Kernel Oil and Palm Kernel Expeller.

^[3] Emissions for Scope 3 Category 1 of SDO is calculated based on the associated Scope 1 and 2 emissions arising from the purchase of palm and non-palm feedstock supply (in metric tonne) by SDOs in the reporting year, multiplied by the estimated GHG emissions intensity of the supplying mills and estates (refer to "Scope 3: Category 1" in this document for the calculation methodology of SD Plantation of this emission category)

References:

- Comparative Life Cycle Assessment of RSPO-certified and Non-certified Palm Oil, J. Schmidt and M. De Rosa (2020)

Section 08 Glossary

TERMS	DESCRIPTIONS
CH ₄	Methane
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
EF	Emission factor
EFB	Empty Fruit Bunches
FFB	Fresh Fruit Bunches
GHG	Greenhouse gas
IPCC	Intergovernmental Panel of Climate Change
kg	Kilogram
kgCO ₂ e	Kilograms of carbon equivalents
kg-N	Kilogram of nitrogen
kWh	Kilowatt hour
L	Litre
N ₂ O	Nitrous Oxide
POME	Palm Oil Mill Effluent
RSPO	Roundtable on Sustainable Palm Oil
RSPO PalmGHG v4	Roundtable on Sustainable Palm Oil PalmGHG v4
tCO ₂ e	Tonnes of carbon equivalents