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What are land-related (FLAG/AFLOU) greenhouse gas emissions?

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April 2024

food & drink federation
passionate about food & drink

SLR

Poll

How is your understanding of FLAG?

a) Completely new, no idea what it is
b) Reasonable understanding of the concept, not sure of the technical aspects
c) Confident enough to have a go at estimating FLAG emissions

Agenda

1. Key Information
2. Why is FLAG important?
3. What is FLAG?
4. How do we estimate FLAG?
5. SBTi FLAG Targets (What does SBTi’s update mean for food & drink companies?)
6. How do we reduce FLAG emissions?
7. Q&A

Key Information

- **FLAG** - Farming, Land and Agriculture
- **AFOLU** - Agriculture, Forestry and Other Land Use
- **LULUCF** - Land Use, Land-Use Change and Forestry
- **SBTi** – Science Based Targets initiative, a global organisation who sets and validates science based climate targets and the most widely accepted net zero standard
- **Biogenic emissions** - emissions that originate from biological sources such as plants, trees and soil.
- Land Sector and Removals Guidance | GHG Protocol – Source for majority of diagrams
- Corporate Accounting and Reporting Standard | GHG Protocol
- Corporate Value Chain (Scope 3) Standard | GHG Protocol
- Forests, Land and Agriculture - Science Based Targets
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Vol 4: Agriculture, Forestry and Other Land Use - IPCC-TFI (iges.or.jp)
- 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - IPCC-TFI (iges.or.jp)

Why is FLAG important?

Why is FLAG important?

1. **Updated Guidance** meaning we can now estimate emissions & removals *(consistently and in line with other corporate standards)*

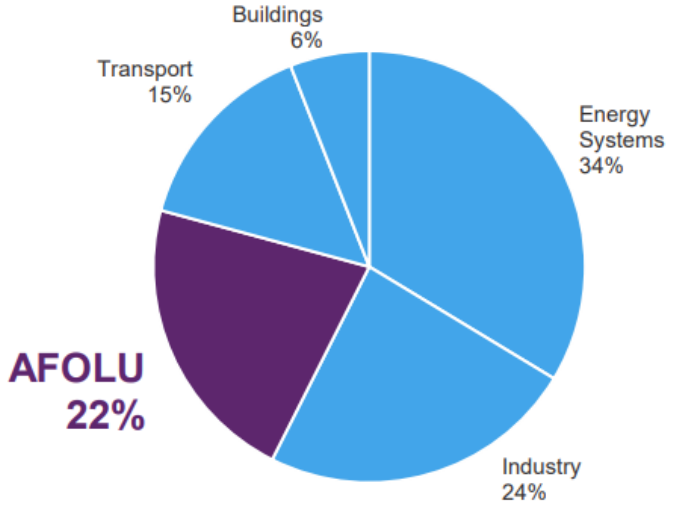
Why is FLAG important?

2. **22% of global greenhouse gas emissions** that have not previously been reported consistently & comprehensively.
   - Key to near term reduction in emissions globally

3. **Removals…**

SBTi Coverage After FLAG

SBTi targets comprehensively cover all IPCC categories of GHG emissions



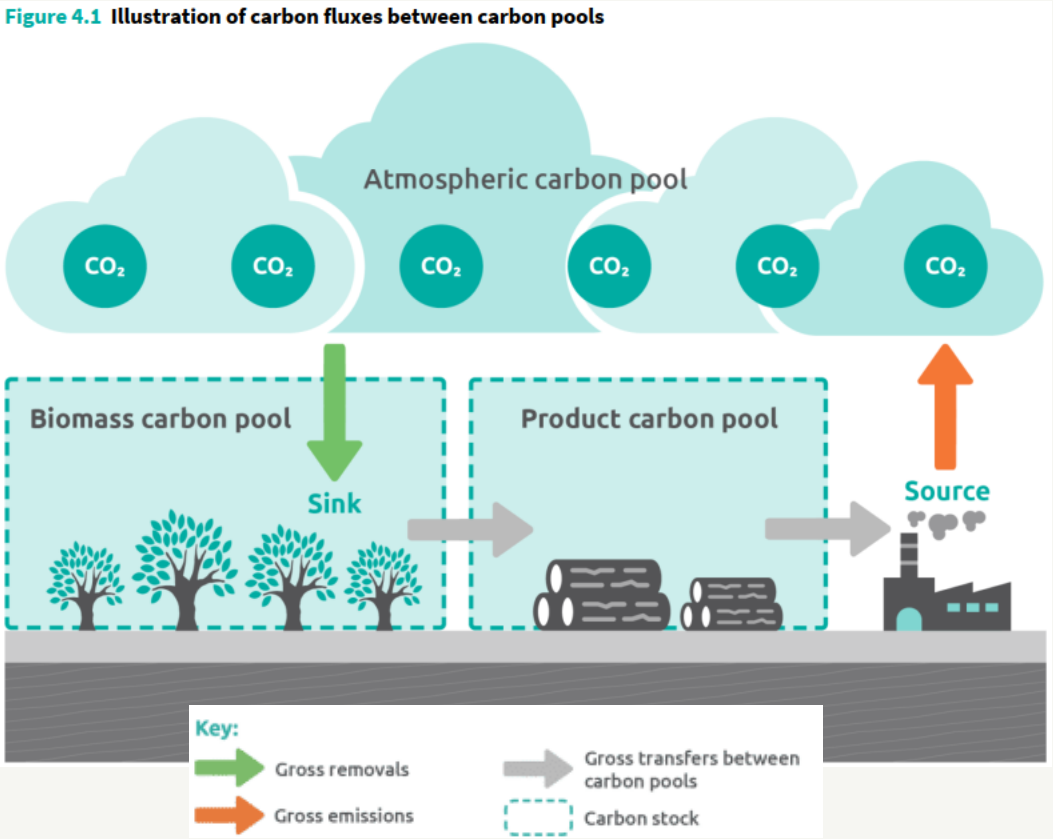
Data Source: IPCC AR6

Source: SBTi's FLAG Launch (September 2022)

What is FLAG?

What are land-related (FLAG/AFLOU) greenhouse gas emissions?

What is FLAG?



Quick Definition:

Greenhouse gas emissions that include emissions associated with **land use change (LUC)**, emissions from **land management** and **biogenic removals**.

What is FLAG?

Land Use Change (LUC)

I.e., biomass and soil carbon losses from deforestation, conversion of coastal wetlands, conversion/draining and burning of peatlands, conversion of savannas and natural grasslands.

Land Management (non-LUC),

I.e., nitrous oxide and methane from enteric fermentation, biomass burning, nutrient management, fertilizer use and manure management.

Carbon removals and storage

I.e., forest restoration, silvopasture, improved forest management, agroforestry and soil carbon sequestration.

What is FLAG? - Land Use Change

- Carbon stock losses occurring in the conversion or transition from one land use category to another (e.g. from forest to grassland or cropland)

Figure 7.1 Land Use Categories and Subcategories, and Relationship to Accounting Approaches

Pre-Conversion Land Use Category	Post-Conversion Land Use Category: Forest Land	Grassland	Cropland	Wetland	Settlement	Other Land
Forest Land	F > F	F > G	F > C	F > W	F > S	F > O
Grassland	G > F	G > G	G > C	G > W	G > S	G > O
Cropland	C > F	C > G	C > C	C > W	C > S	C > O
Wetland	W > F	W > G	W > C	W > W	W > S	W > O
Settlement	S > F	S > G	S > C	S > W	S > S	S > O
Other Land	O > F	O > G	O > C	O > W	O > S	O > O

Forest Subcategories	Natural Forest	Planted Forest
Natural Forest	NF > NF	NF > PF
Planted Forest	PF > NF	PF > PF

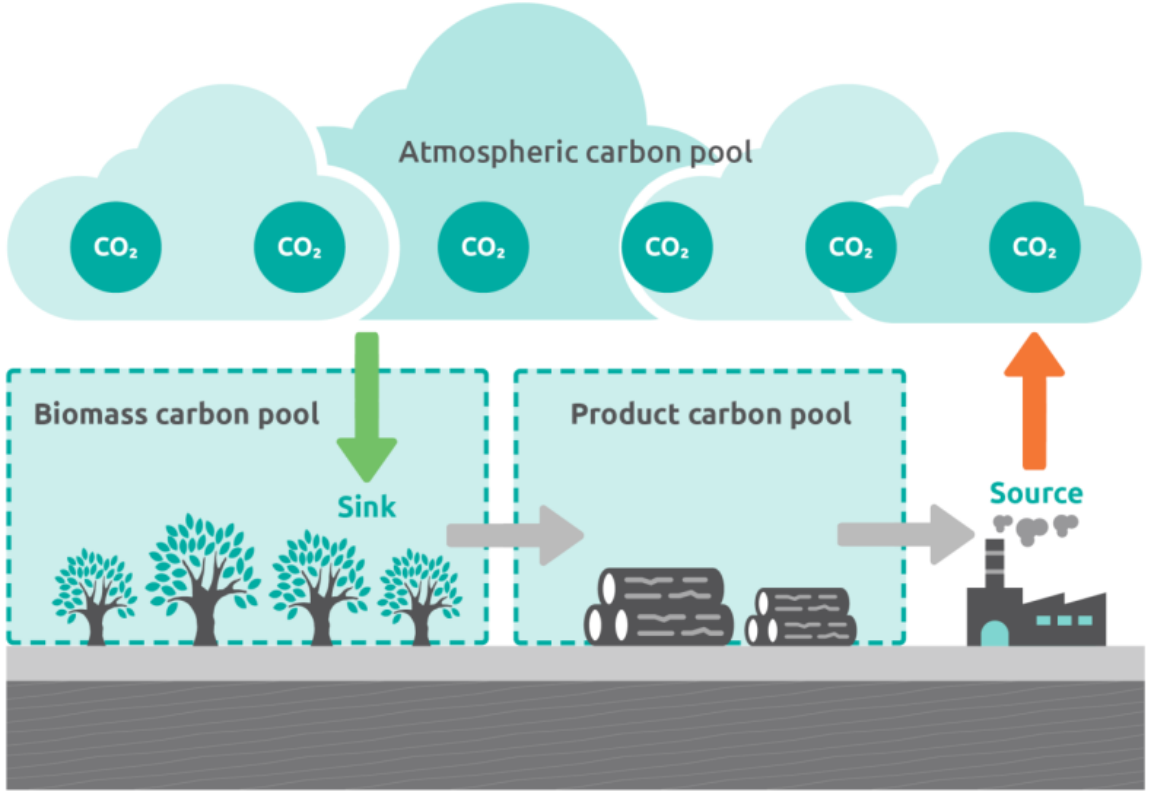
Grassland & Wetland Subcategories	Natural Ecosystem	Intensively Managed Land
Natural Ecosystem	NE > NE	NE > IML
Intensively Managed Land	IML > NE	IML > IML

Key:
- Land use change with carbon stock losses (Chapter 7)
- Land management and/or land use change with carbon stock gain (Chapter 8)
- Forest Subcategories
- Grassland & Wetland Subcategories

What is FLAG? - Land Management

- Net CO_2 Emissions (biogenic)
  - Biogenic CO_2 emissions resulting from net carbon stock losses due to ongoing land management practices
  - Carbon stock losses on croplands and forestlands remaining in the same land use; emissions from forest degradation

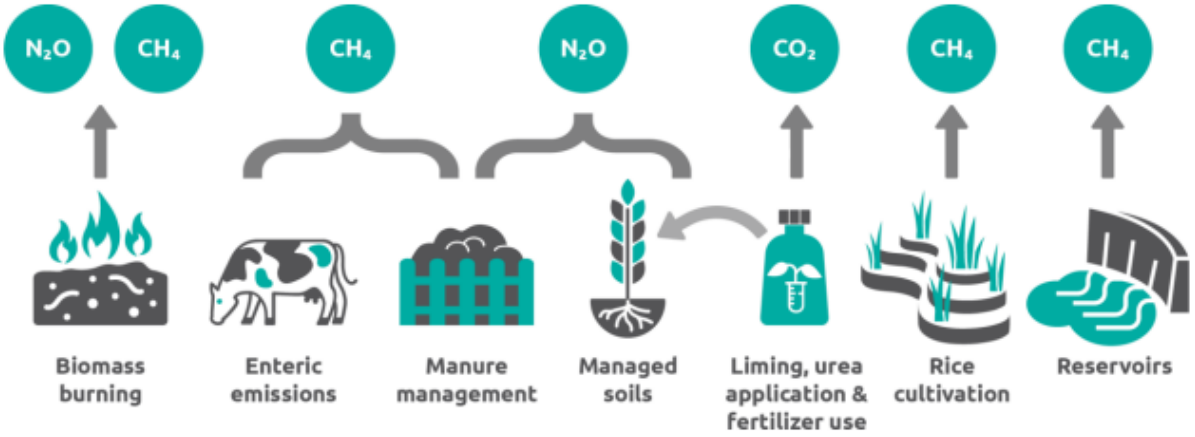
Figure 4.1 **Illustration of carbon fluxes between carbon pools**



What is FLAG? - Land Management

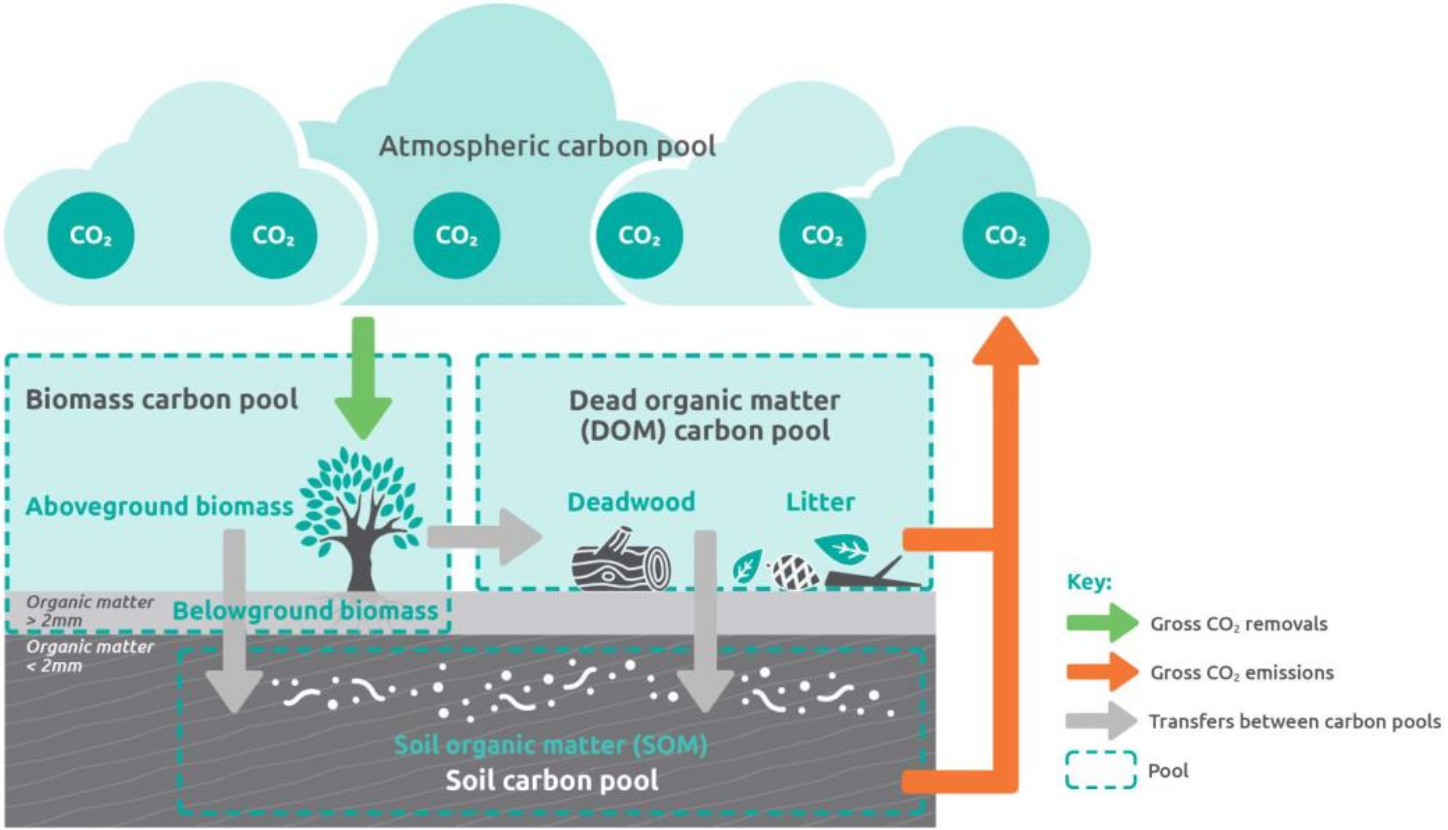
- Non-CO_2 *(and non-biogenic CO_2)* emissions:
  - CH_4, N_2O and non-biogenic CO_2 emissions due to ongoing land management practices
  - Livestock CH_4 emissions, manure CH_4 and CH_4 emissions, fertiliser N_2O emissions, CH_4 emissions from rice and other flooded crops, wildfire and prescribed burning CH_4 and N_2O emissions

Figure 8.4: Overview of land management non-CO_2 emissions source categories



What is FLAG? - Removals

Figure 4.2 Land-based carbon pools and fluxes



What is FLAG? - Removals

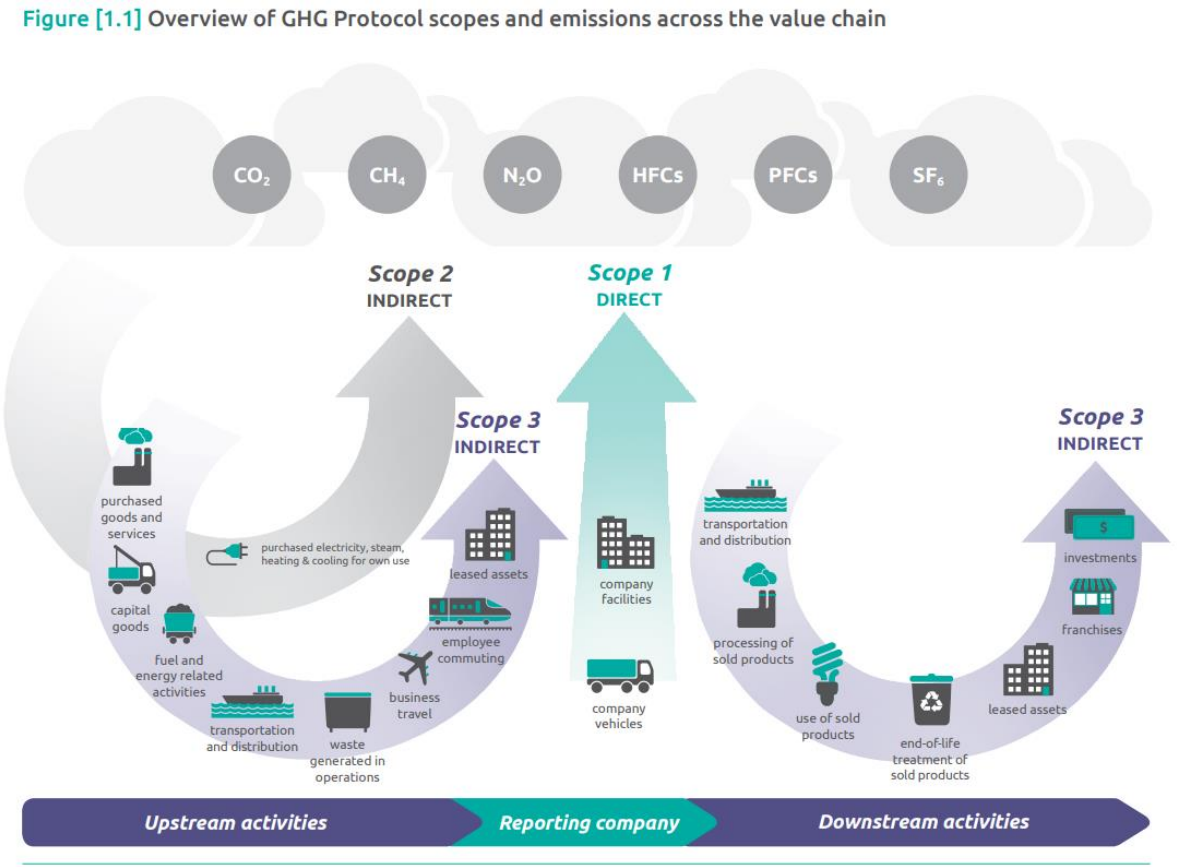
Table 6.1 Removal accounting subcategories

Sink	Storage	Accounting subcategory	Examples
Biogenic	Land-based carbon pools	Land management net removals	Biomass carbon stock increases on forest lands; soil carbon stock increases on croplands
	Product carbon pools	Net biogenic removals with product storage *(subject to open question #2, box 6.3)*	Increases to the total carbon stock stored in wood products sold by a reporting company in the use phase or end-of-life phase.
	Geologic carbon pools	Net biogenic removals with geologic storage	Bioenergy carbon capture and geologic storage (BECCS)
Technological	Product carbon pools	Net technological removals with product storage *(subject to open question #2, box 6.3)*	Increases to the total carbon stock stored in direct air capture-based cement or plastics sold by a reporting company in the use phase or end-of-life phase
	Geologic carbon pools	Net technological removals with geologic storage	Direct air carbon capture and geologic storage (DACCS)

Excluded from SBTi FLAG

How do we estimate FLAG?

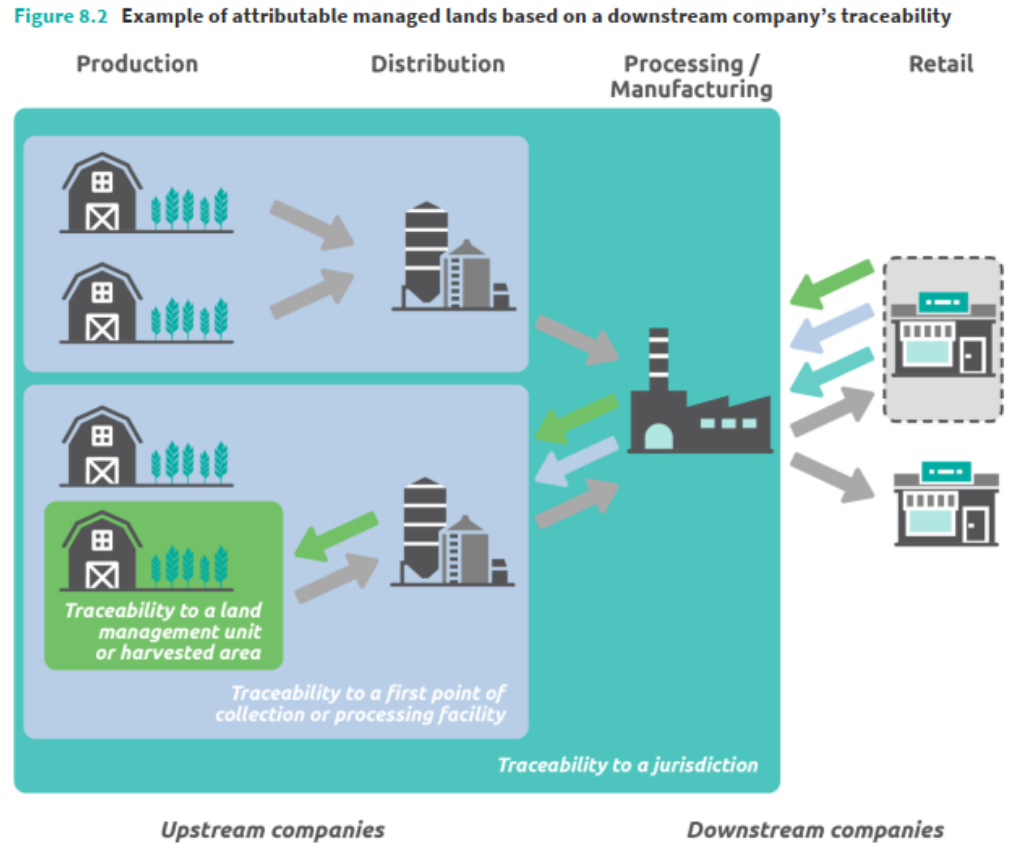
How do we estimate FLAG? – Value Chain



Source:
[Corporate Value Chain (Scope 3) Standard | GHG Protocol]

See also:
[Corporate Accounting and Reporting Standard | GHG Protocol]

How do we estimate FLAG? – Value Chain

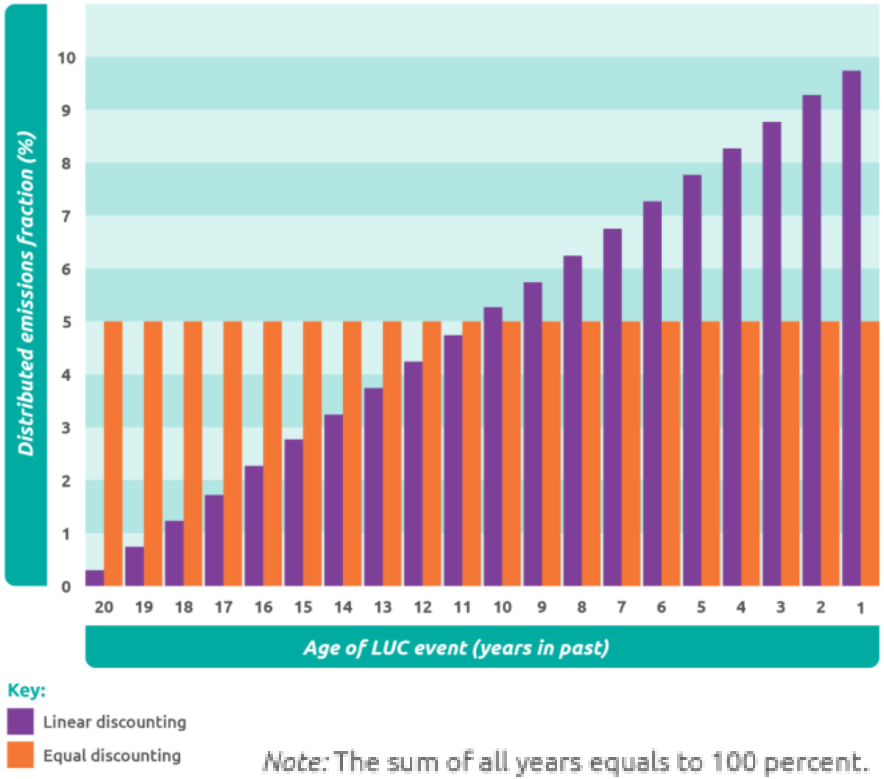


How do we estimate FLAG? - Land Use Change

Accounting by:

- Direct land use change (dLUC) - Calculated at the farm or land management unit level.
- Statistical land use change (sLUC) - Calculated at a landscape or jurisdictional level;
- An assessment period of **20 years or greater.**
- Emissions are distributed across time after the LUC events have been identified

Figure 7.2 **Illustration of the linear and equal discounting approaches across 20 years**



Note: The sum of all years equals to 100 percent.

How do we estimate FLAG? - Land Use Change

Tracking metrics:

- Indirect land use change (iLUC) - Change occurring elsewhere as a consequence
- Carbon opportunity costs (coc) - Total historical carbon losses from plants and soils on lands productively used
- Land occupation - The amount of land occupied for a certain time to produce a product (hectares)
- Reported separately & consistently across inventory

Table 7.7 Comparison of all land use change (LUC) and land tracking metrics to support decision about which metrics to track

Metric	Data Needs/ Availability	Levers/ Incentives	Benefits	Challenges	Product Types
Direct land use change (dLUC)	Farm-level geospatial data, land-use-change (e.g., deforestation) data from recent 20-year period in same location	Incentivizes production/sourcing from lands not recently deforested	More spatially precise information than sLUC, easy to communicate	More data-intensive than sLUC, does not necessarily incentivize more efficient uses of land	All agricultural and forest products
Statistical land use change (sLUC)	Data on region/country/province of production or sourcing, emission factors matching that location (or global if unknown)	Incentivizes production/sourcing from geographical areas not recently deforested	Relatively easy and non-data-intensive to calculate; captures some indirect LUC effects across a broader landscape	Because it captures actions of many actors over a landscape, it is a less spatially precise indicator than dLUC of a company's actions or performance over time	All agricultural and forest products
Indirect land use change (iLUC) (based on econometrics)	Maps of existing land use and yields, population projections, GDP, cross-elasticities between food and energy (Default emission factors sometimes available)	Helps identify products with lower iLUC risk (e.g., incentivizes use of residues, yield gains)	Models LUC effects due to changes in demand based on economic relationships	Econometric models can be complicated, cross elasticities and market effects can be uncertain, historically mostly used for bioenergy feedstocks	Mainly used for bioenergy feedstocks
Indirect land use change (iLUC) (biophysical only)	Global or regional product-specific productivity (NPP or otherwise)	Incentivizes yield gains, and the use of less-productive land	More transparent than econometric models, can be applied to many products	Most methods are still only used in the context of energy, not widely used outside of academia	All agricultural products
Carbon opportunity costs (COC)	Estimates of native and current carbon stocks, production amounts, yields	Incentivizes yield gains, use of less land-intensive products, use of less carbon-rich lands, and management practices that increase carbon stocks	Translates land occupation metric into GHG metric	More complex to calculate/communicate than land occupation and dLUC, native vegetation model requires assumptions, need more tools to make calculation easier for companies	All agricultural products

How do we estimate FLAG? -

Equation 8.1 Stock-difference method for net land carbon stoc

$$\Delta C_L = \frac{C_{L,f} - C_{L,i}}{t_f - t_i}$$

ΔC_L	=	Net lar
C	=	Land c
t	=	time a

Equation 8.2 Gain-loss method for net land carb

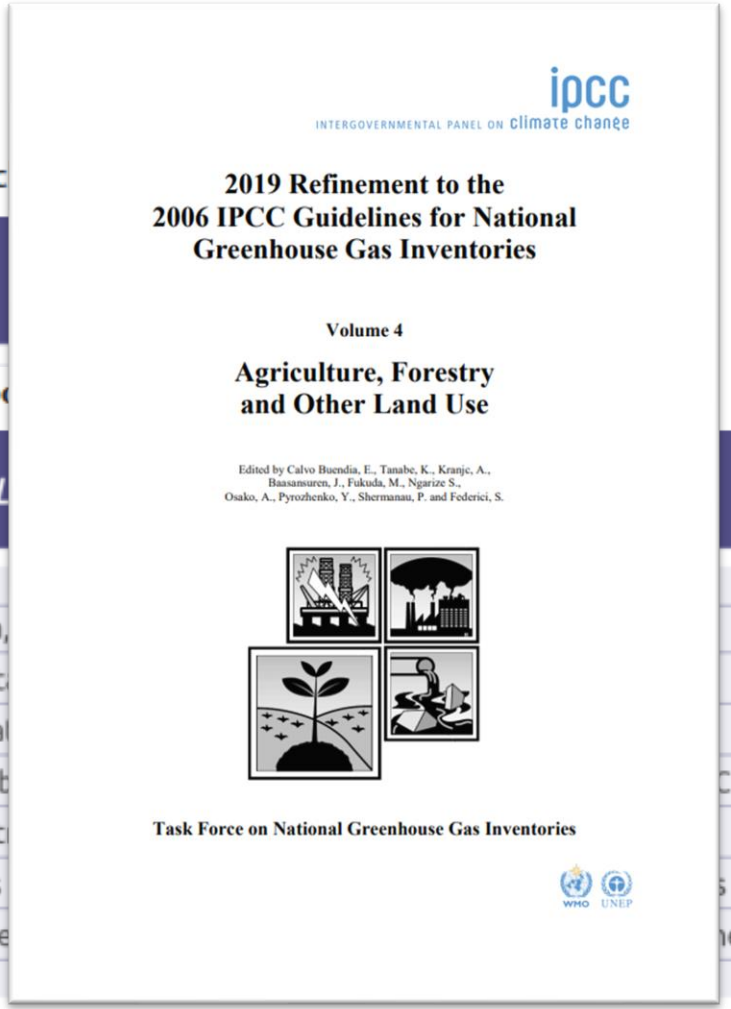
$$\Delta C_L = G - L$$

ΔC_L	=	Net land carbon stock change in land strata,
G_L	=	Annual land carbon stock gains in land strat
L_L	=	Annual land carbon stock losses in land stra
R_L	=	Annual land carbon stock gains from gross t
I_L	=	Annual land carbon stock gains from non-at
E_L	=	Annual land carbon stock losses from gross
T_L	=	Annual land carbon stock losses due to harve

C yr^{-1})

s C yr^{-1})

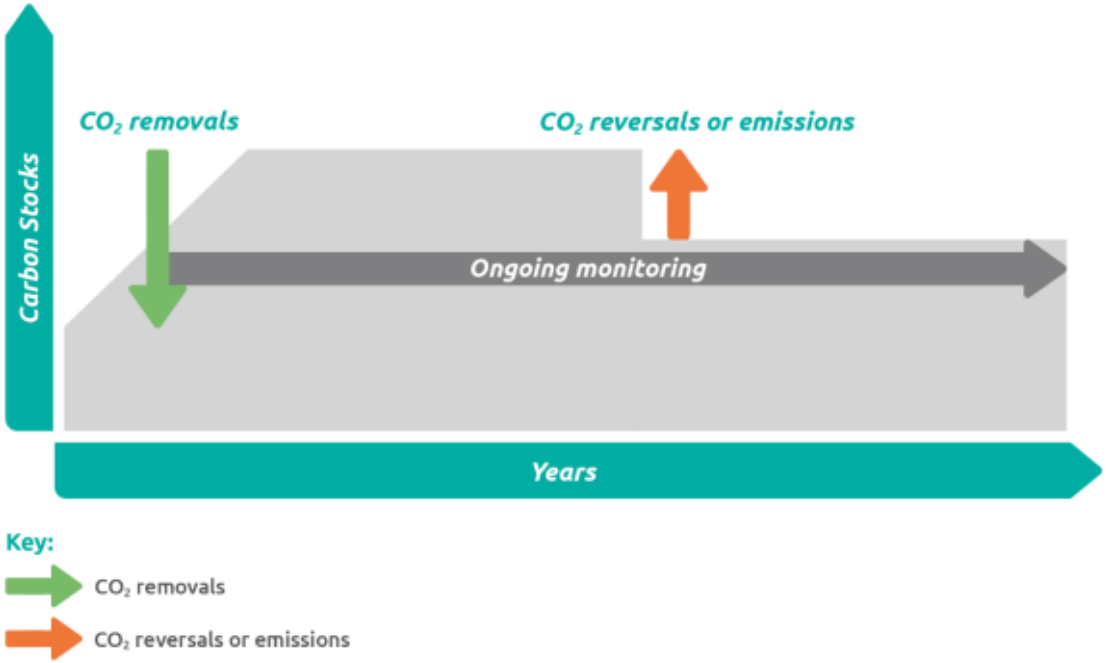
es C yr-1)



How do we estimate FLAG? - Removals

- Optional (for now…)
- Report based on sink process and storage pool
- Key requirements:
  - **Ongoing storage monitoring**
  - **Traceability**
  - **Primary data**
  - **Uncertainty**
  - **Reversals accounting**

Figure 6.1 Representation of a storage monitoring framework



How do we estimate FLAG? – Traceability is key

Identify volumes

Identify:

- Quantity of different types of commodities
- Suppliers purchased from

Establish traceability

Prioritise the highest volume:

- Desk-based research
- Identify supplier tiers
- Establish land-related impacts

Calculate impacts

Good traceability:

- Use appropriate localised factors

Limited traceability:

- Use national/regional estimates

Example Categorisation of Data (taken from FAOSTAT database):

Commodity Types		
Abaca, manila hemp, raw	Cashewapple	Eggs from other birds in shell, fresh, n.e.c.
Agave fibres, raw, n.e.c.	Cassava leaves	Figs
Almonds, in shell	Cassava, fresh	Flax, processed but not spun
Anise, badian, coriander, cumin, caraway, fennel and juniper berries, raw		Fonio
Apples	Cherries	Ginger, raw
Apricots	Chestnuts, in shell	Gooseberries
Areca nuts	Chick peas, dry	Grapes
Artichokes	Chicory roots	Green corn (maize)
Asparagus	Chillies and peppers, dry (Capsicum spp., Pimenta spp.), raw	Green garlic
Avocados	Chillies and peppers, green (Capsicum spp. and Pimenta spp.)	Groundnuts, excluding shelled
Bambara beans, dry	Cinnamon and cinnamon-tree flowers, raw	Hazelnuts, in shell
Bananas	Cloves (whole stems), raw	Hempseed
Barley	Cocoa beans	Hen eggs in shell, fresh
Beans, dry	Coconuts, in shell	Hen eggs in shell, fresh
Blueberries	Coffee, green	Hop cones
Broad beans and horse beans, dry	Cow peas, dry	Horse meat, fresh or chilled
Broad beans and horse beans, green	Cranberries	Jojoba seeds
Buckwheat	Cucumbers and gherkins	Jute, raw or retted
Cabbages	Currants	Kapok fruit
Canary seed	Dates	Karite nuts (sheanuts)
Cantaloupes and other melons	Edible roots and tubers with high starch or inulin content, n.e.c., fresh	Kenaf, and other textile bast fibres, raw or retted
Carrots and turnips	Eggplants (aubergines)	Kiwi fruit
Cashew nuts, in shell	Eggs from other birds in shell, fresh, n.e.c.	Kola nuts

GHG Protocol '[List of Land Sector Calculation Resources - Version 1.2]'

SBTi FLAG Targets

What does SBTi’s update mean for food & drink companies?

SBTi FLAG Targets – What are SBTi targets?

Prioritise emission reduction

1. Near-term SBT

Set an emissions reduction target for the next 5-10 years.

This drives immediate emission reduction activities in line with a 1.5°C climate pathway.

2. Long-term SBT

Set a **deep decarbonisation** target to **reduce scope 1, 2 & 3 emissions by >90%** by no later than 2050.

...over reductions beyond the company's value chain

3. Beyond value chain mitigation *(optional)*

Companies are encouraged to contribute to initiatives that **reduce emissions outside their value chain**. E.g., offsetting.

This is in addition to, not instead of, abatement.

4. Neutralisation of residual emissions

The remaining residual emissions (10%) must be counterbalanced through the **permanent removal & storage of equivalent GHGs**, to legitimately claim "Net Zero".

Short-term actions (to ~2030) → ***Long-term actions (to ~2050)***

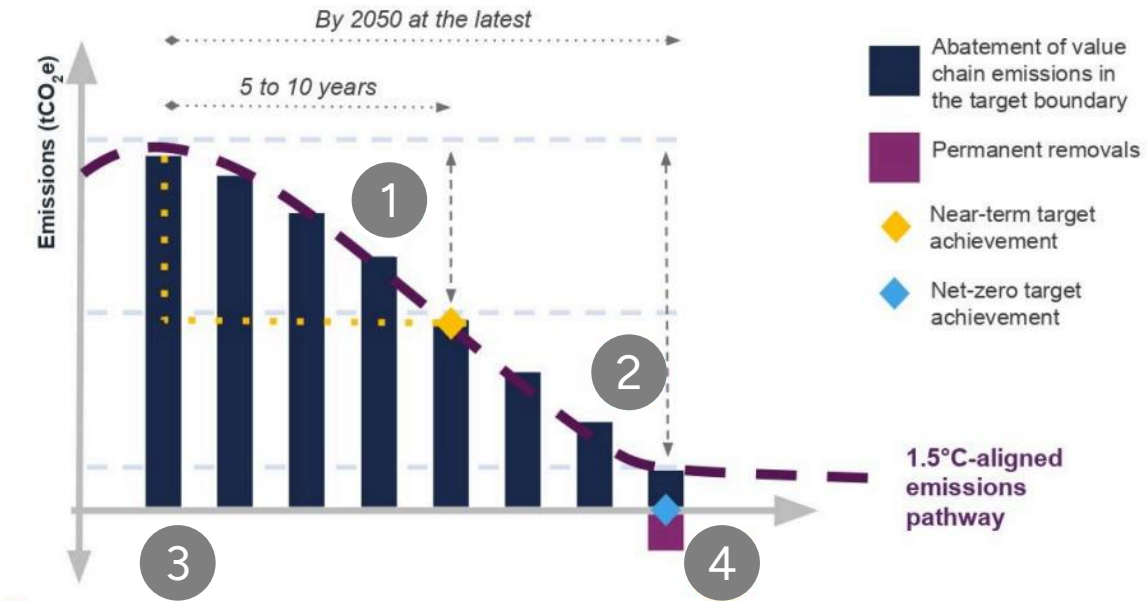
The guidance follows the **IPCC**'s science-based targets for a global Net Zero pathway not exceeding **1.5°C** of global warming, and incorporate the following key milestones:

- **Halve emissions by (around) 2030** (near-term target)
- **Achieve Net Zero emissions no later than 2050** (long-term target)

SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

SBTi FLAG Targets – What are SBTi targets?

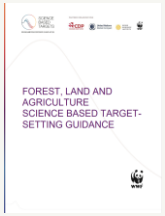


1. **Near-term SBT**
2. **Long-term SBT**
3. **Beyond value chain mitigation (optional)**
4. **Neutralisation of residual emissions**

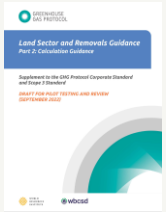
Source: SBTi CORPORATE NET-ZERO STANDARD Version 1.2

SBTi FLAG Targets – Timeline

SBTi release FLAG guidance



September 2022



GHG Protocol release Land Sector and Removals Draft Guidance

April 2023

Companies setting their first SBTi targets must also set FLAG targets after this date

December 2023

SBTi published updated guidance, forms & templates.

Clarification over removals requirement*

Today

Mid (?) 2024

FINAL

GHG Protocol Land Sector and Removals guidance to be released

six months later

Deadline for companies with existing SBTi targets to add a FLAG target & include removals (?)

*Removals requirement: *Within six months of updated GHGP published guidance, report removals in line with standard or provide a methodology statement as to how this will be done in the future.*

SBTi FLAG Targets –
What does SBTi's update mean for food & drink companies?

Must set FLAG targets:

- **Forest & paper products (forestry, timber, pulp and paper, rubber)**
- **Food production (agricultural production)**
- **Food production (animal source)**
- **Food & beverage processing**
- **Food & staples retailing**
- **Tobacco**

May set FLAG targets:

(>20% of total scope 1+2+3 emissions)

Potential sectors:

- Retailing
- Containers and packaging
- Hotels and restaurants
- Leisure, and tourism services
- Textile, manufacturing, spinning, weaving & apparel
- Consumer durables
- Household and personal products
- Tires
- Building products
- Home building
- Construction materials
- Construction and maintenance
- Infrastructure development
- Mining
- Roadbuilding
- Resource extraction

SBTi FLAG Targets –
What does SBTi's update mean for food & drink companies?

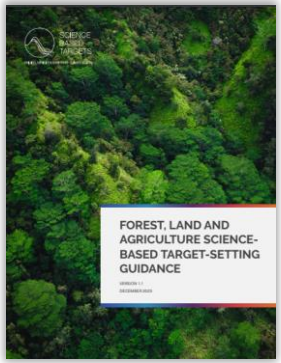
FLAG Targets	Near Term		Net Zero	
	Scope 1 & 2	**Scope 3**	**Scope 1 & 2**	**Scope 3**
Coverage	≥95%	≥67%	≥95%	≥90%
Timeframe	5 to 10 years		≤ 2050	
Ambition	3-4% reduction per year (1.5°C)		-72% absolute	-72% absolute -97% intensity
Exclusions	• Carbon credits/offsetting (removals on land owned or operated by a company or within a company's supply only) • Avoided emissions (e.g. carbon intensive a new product to market) • Product carbon storage • Technical removals (e.g. geological CCS) • Bioenergy			
Commitment	Zero-deforestation by no **later than 2025**.			

SBTi FLAG Targets – Approach

1. Calculate FLAG-aligned base year GHG inventory

2. Set FLAG & non-FLAG targets

3. SBTi FLAG target Submission & validation



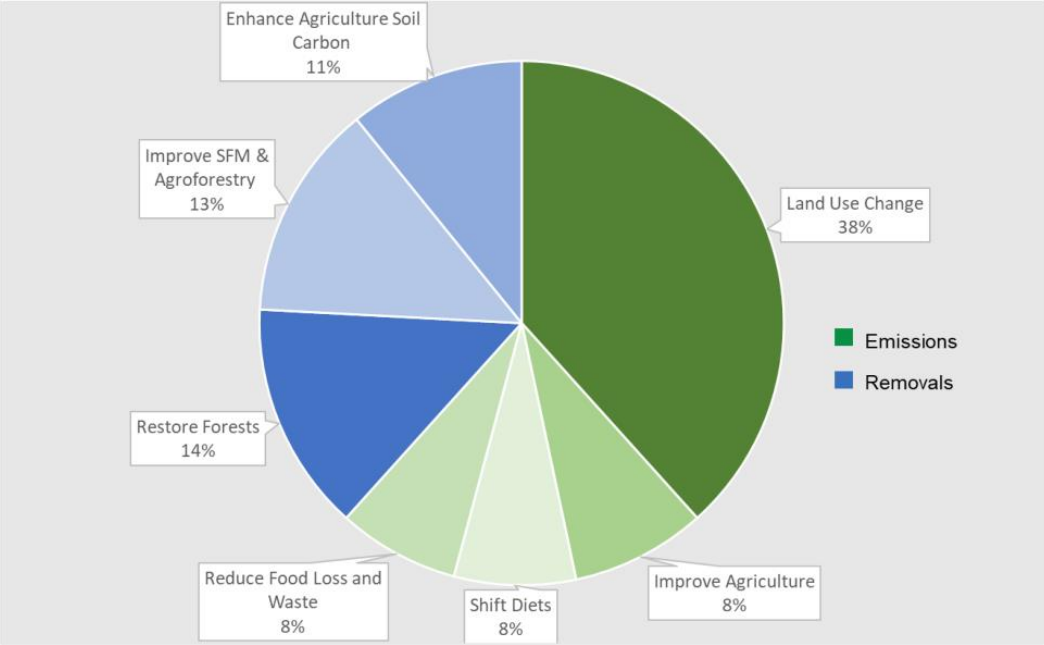
How do we reduce FLAG Emissions?

How do we reduce FLAG Emissions?

The SBTi FLAG sector pathway is based on the review paper by Roe et al (2019) which identified seven priority mitigation measures:

- Reduce LUC
- Improve agriculture
- Shift diets
- Reduce food loss and waste
- Restore forests
- Improve sustainable forest management (SFM) and agroforestry
- Enhance agricultural soil carbon

Figure 4. Land-based mitigation opportunities (12 $GtCO_2e$ by 2050)



Adapted from Roe et al., 2019.

Source: SBTi's FLAG Guidance v0.1

Poll

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c) Confident enough to have a go at estimating FLAG emissions

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Do you have any questions?

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