

## CHAPTER 16.

# Evaluating the impact of actions

*This chapter provides requirements and guidance on estimating the GHG impacts of corporate actions using project or intervention accounting methods. This information should be reported outside the physical GHG inventory, within the GHG report, to inform decision-making, provide transparency, and ultimately help maximize a company's net positive impacts on climate change.*

*If emission reductions or removals from actions are credited for the purpose of transferring GHG claims between entities, companies should refer to Chapter 18 for requirements and guidance on accounting for and reporting on GHG emissions reduction or removal credits. This chapter provides guidance on evaluating the GHG impacts of actions to inform decision-making, rather than crediting.*

## 16.1 Overview

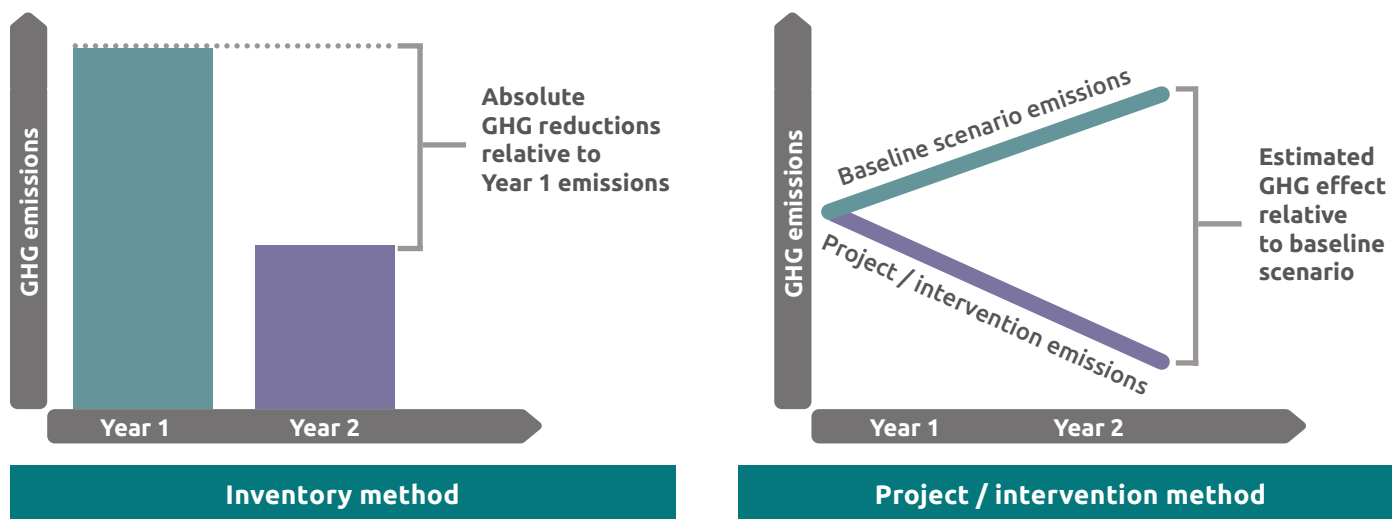
The information in a corporate GHG inventory supports many important business goals. However, as companies evaluate the impacts of their actions on climate change, additional information beyond that contained in the inventory is often important to fully inform decision-making. Each major business decision or action has a potential impact on climate change, but the impact of individual decisions or actions can be difficult to ascertain when aggregated in an annual inventory of emissions and removals.

As companies aim to reduce emissions and/or increase removals, evaluating the impacts of individual corporate actions is important to inform decisions. For companies with operations or value chains in the land sector, potential actions include choosing which land-based products, materials, or energy sources to produce or consume, or which strategies, investments, practices, or activities to implement.

While the overall framework of this *Standard* is based on inventory accounting methods, the subject of this chapter is based on project or intervention accounting methods (the difference is illustrated in Figure 16.1).



**Figure 16.1** Comparison of inventory and project or intervention accounting methods



## 16.2 Requirements

### 16.2.1 Accounting requirements

*Note: There are no accounting requirements for this chapter.*

### 16.2.2 Reporting requirements

#### *Reporting methods used to evaluate the GHG impacts of actions<sup>1</sup>*

If companies estimate and report the GHG impacts of specific actions separately from the inventory, they **shall** disclose the data sources, methods, and assumptions used to quantify the impact(s) of the evaluated action(s), the assessment boundary, the assessment time period, whether it is an ex ante and/or ex post assessment, and whether the results have been third-party verified.

## 16.3 Recommendations

#### *Recommended scope for evaluating GHG impacts of actions*

All major business decisions and actions have a potential impact on climate change. These impacts can occur within a company’s scope 1, scope 2, and scope 3 inventory, as well as beyond the inventory boundary. Companies **should** understand the systemwide impacts of their actions by looking at the potential for avoided emissions, leakage, substitution, and displacement effects, and other impacts of actions that can fall beyond the boundaries of their GHG inventory. In the specific case of land carbon leakage—a negative GHG impact caused by corporate actions that reduce or divert food or feed production on agricultural land—companies are required to account for and report such leakage (see Chapter 8).

When evaluating actions, companies **should** take a full value chain or life cycle perspective to understand whether a given action increases or decreases emissions and removals at different stages of a product’s life

cycle and to avoid tradeoffs. For example, companies **should** generally not implement actions that reduce their scope 1 emissions but increase their scope 3 emissions by a larger amount.

To evaluate the impacts of specific actions, companies **should** use project or intervention accounting methods, which estimate the systemwide GHG impacts of an action relative to a counterfactual baseline scenario in which the action did not occur (Figure 16.1). Assessments may be forward-looking (ex ante) and/or backward-looking (ex post). Companies **should** evaluate actions intended to reduce emissions or increase removals, as well as other significant actions the company takes, which may have positive or negative impacts on emissions and removals.

### *Inform decision-making and disclose GHG impacts of actions*

Companies **should** use the results of project or intervention accounting to maximize emission reductions and removals (and minimize emission increases), taking into account systemwide impacts. If companies implement actions that could have potentially significant negative impacts (i.e., increase GHG emissions and/or decrease removals) outside the inventory boundary, companies **should** estimate the GHG impacts resulting from the action using project or intervention accounting methods and report the impacts separately from the GHG inventory in a GHG report.

*For further guidance on applying intervention accounting methods, refer to the Guidance (Chapter 16), as well as to the GHG Protocol's The GHG Protocol for Project Accounting (2005) and the Policy and Action Standard (2014).*



## 16.4 Guidance on the requirements and recommendations

### 16.4.1 Evaluating the impacts of actions

Evaluating the impacts of actions is a fundamental step to inform corporate decisions, such as choosing which materials or energy sources to produce or consume, or which strategies, investments, practices, or activities to implement. This section provides general guidance that companies should follow to apply intervention accounting methods to evaluate the impacts of significant actions (Table 16.1).

Corporate GHG inventories are based on inventory accounting methods. Intervention accounting, in contrast, is used to estimate the systemwide GHG impacts of actions intended to reduce GHGs relative to counterfactual baseline scenarios or other performance standards. Intervention accounting includes approaches such as project accounting and project-level GHG crediting. Figure 16.1 presents a comparison of inventory and intervention accounting approaches (see Section 3.4.3 for further general discussion of inventory and intervention accounting).

Companies should use both inventory and intervention accounting approaches to inform corporate decisions and mitigation strategies. Inventory accounting provides a complete assessment of the annual emissions from sources, removals by sinks, and other relevant metrics within the reporting company's inventory boundary. However, inventory accounting methods do not capture all GHG impacts due to a company's activities, since indirect impacts caused by a company's activities can occur outside of the company's inventory boundary. Examples of impacts not captured in the inventory can include:

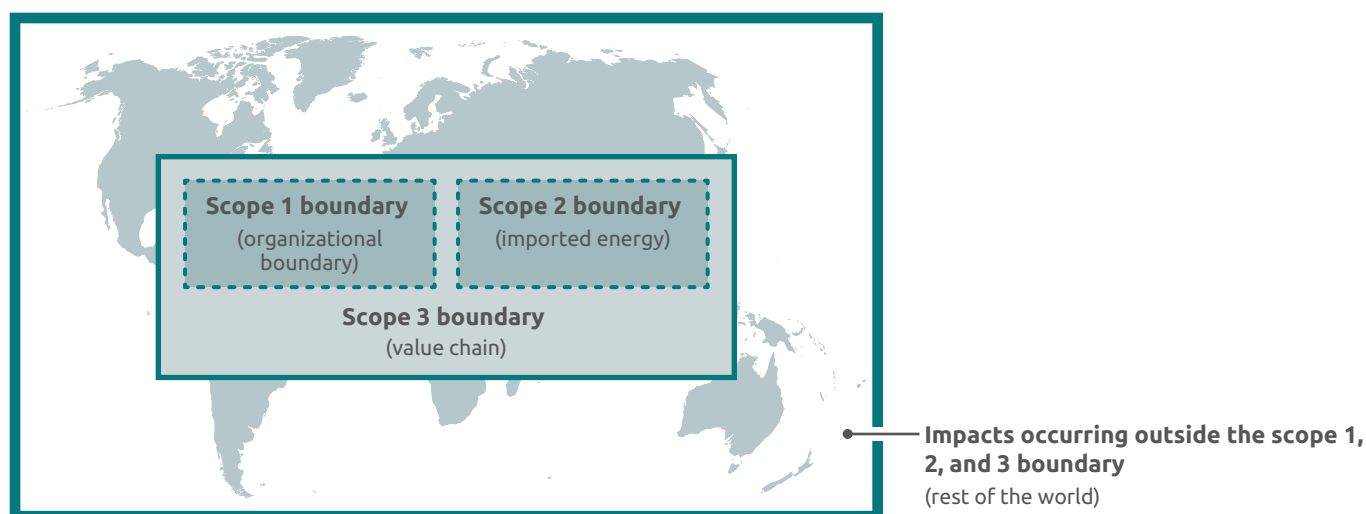
- Leakage effects (negative impacts on emissions and removals outside the company's physical GHG inventory boundary)
- Avoided emissions (emissions that would have otherwise happened, but that, as a result of a company's activities, did not happen)
- Avoided removals (removals that would have otherwise happened, but that, as a result of a company's activities, did not happen)
- Avoided land use (land use that would have otherwise happened, but that, as a result of a company's activities, did not happen)



- Market-mediated effects (substitution or displacement effects resulting from supply and demand dynamics)
- Other system-wide effects

To understand and evaluate these impacts, companies should use intervention accounting methods (also known as project accounting methods), which assess the GHG impacts of an action compared to the conditions most likely to occur in the absence of that action. Companies understand the system-wide impacts of their actions by looking beyond the inventory boundary and beyond a typical product life cycle assessment. Intervention accounting methods define an assessment boundary by identifying which sources and sinks are expected to be affected by an action, either positively or negatively, both inside and outside of the company’s inventory boundary. Figure 16.2 illustrates an inventory boundary that includes scope 1, scope 2, and scope 3, as well as impacts that can fall outside the inventory boundary.

**Figure 16.2 Assessing impacts within and beyond the inventory boundary**



After a company compiles its scope 1, 2, and 3 GHG inventory, companies use intervention accounting methods to assess net GHG impacts and use the results to inform decision making (Table 16.1). Companies should use the results of such assessments to ensure that company actions lead to global net GHG benefits (see Sections 16.4.3–16.4.5). Analyzing system-wide impacts can reveal important information about the net benefits and/or tradeoffs of corporate activities in the land sector that would otherwise be obscured or discounted.

For more information on intervention and project accounting methods and for additional guidance on applying intervention accounting methods, refer to the following materials:

- *GHG Protocol for Project Accounting* (WRI and WBCSD 2005) and supplementary *Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting* (WRI and WBCSD 2006),<sup>2</sup> for project-scale actions
- *GHG Protocol Policy and Action Standard* (WRI and WBCSD 2014a),<sup>3</sup> for actions of any scale
- Other chapters in this *Guidance* for calculating land sector emissions and removals (Chapters 3–10 and 17–20, as relevant) and Chapter 8 in this *Guidance* for calculating land use and land carbon leakage

**Table 16.1 Steps for applying intervention accounting methods to evaluate the impacts of actions**

Step	Description	Reference
<b>Step 1: Define the action to evaluate</b>	Identify and define the action(s) to evaluate.	Section 16.4.2
<b>Step 2: Define the scope of the assessment</b>	Define the assessment boundary, what types of impacts to assess, the assessment period, and whether the evaluation is ex post (backward-looking) or ex ante (forward-looking).	Section 16.4.3
<b>Step 3: Define the baseline (“without action”) scenario</b>	Define a counterfactual (“without action”) baseline scenario, representing the conditions most likely to occur in the absence of the action that is being assessed. The baseline scenario depends on assumptions related to key emissions drivers over the GHG assessment period. Baseline scenarios can be determined ex post or ex ante.	Section 16.4.4 <i>GHG Protocol for Project Accounting and GHG Protocol Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting</i>
<b>Step 4: Define the intervention (“with action”) scenario</b>	Define the intervention (“with action”) scenario, representing the events or conditions most likely to occur in the presence of the action being assessed. In ex post assessments, intervention scenarios are based on observed data collected during the time the action was implemented.	Section 16.4.5 <i>GHG Protocol for Policy and Action Standard</i>
<b>Step 5: Quantify the impacts of both scenarios to determine the net impacts of the action</b>	Estimate emissions, removals, and other metrics in the baseline scenario and intervention scenarios, and then calculate the difference between the scenarios to estimate the net impact of the action. Assess the uncertainty of the results of the evaluation, quantitatively or qualitatively.	Section 16.4.6 <i>GHG Protocol for Policy and Action Standard</i>
<b>Step 6: Use results to inform decision making</b>	Use results to inform company decisions regarding mitigation actions and strategies.	Section 16.4.7

### 16.4.2 Define the action to evaluate

When evaluating the impacts of actions, the first step companies take is to identify and define significant actions to evaluate. Actions can include projects, strategies, investments, purchases and sales, and other activities that have significant effects on GHG emissions, removals, land carbon stocks, land use, land carbon leakage, the production of land-based products, or other activities and metrics required or recommended by this *Standard*.

Actions can have positive impacts (by reducing emissions, increasing removals, reducing land use, or reducing land carbon leakage) or negative impacts (by increasing emissions, decreasing removals, increasing land use, or increasing land carbon leakage). Actions with positive impacts are mitigation actions. Table 16.2 provides some examples of mitigation actions.

Companies do not need to evaluate all actions. Instead, companies should identify and assess the actions expected to have the most significant potential impacts (either positive or negative) on emissions, removals, land use, and other metrics. To further prioritize, companies should adopt a risk-based approach and identify actions that might have significant negative impacts outside the scope 1, scope 2, and scope 3 boundaries. This approach helps ensure that actions taken to improve the GHG inventory have net positive effects overall.

To ensure that the net costs or benefits of certain corporate activities on global land use dynamics are accounted for in a company’s inventory, this *Standard* requires accounting for and reporting additional accounting categories separately from the physical GHG inventory, including land use and land carbon leakage (see Chapter 8).

**Table 16.2** Examples of mitigation actions to reduce GHG emissions, increase GHG removals, reduce land use, and/or reduce land carbon leakage

Type of actions	Examples of sectors	Examples of actions
<b>Actions to reduce scope 1 emissions (land sector)</b>	Agriculture	<ul style="list-style-type: none"> <li>• Reduce enteric fermentation emissions</li> <li>• Improve manure management practices</li> <li>• Reduce emissions from manure left on pasture</li> <li>• Reduce fertilizer emissions and increase nitrogen use efficiency</li> <li>• Reduce methane emissions from rice production</li> <li>• Reduce energy emissions</li> <li>• Reduce emissions from land use change by halting forest and other natural ecosystem conversion and degradation</li> </ul>
<b>Actions to increase scope 1 removals</b>	Agriculture	<ul style="list-style-type: none"> <li>• Integrate trees and perennial crops on agricultural lands (e.g., agroforestry, silvopasture)</li> <li>• Improve agricultural soil carbon management to increase soil carbon stocks</li> <li>• Establish conservation set-asides</li> </ul>
	Direct air capture	<ul style="list-style-type: none"> <li>• Use direct air capture technology or other technologies to remove CO<sub>2</sub> from the atmosphere and store it in geological reservoirs</li> </ul>
<b>Actions to reduce scope 3 emissions within the value chain</b>	Food and beverage	<ul style="list-style-type: none"> <li>• Work with agricultural producers in the value chain to implement actions listed above under “actions to reduce scope 1 emissions”</li> <li>• Reduce consumption, including through efficiency measures and reducing losses and wastes across the value chain</li> <li>• Shift sourcing to products with lower GHG emissions</li> </ul>
<b>Actions to increase scope 3 removals within the value chain (land sector)</b>	Food and beverage	<ul style="list-style-type: none"> <li>• Work with agricultural producers in the value chain to implement actions listed above under “actions to increase scope 1 removals”<sup>a</sup></li> </ul>
	Industrial, transport, and energy	<ul style="list-style-type: none"> <li>• Use bioenergy with carbon capture and storage (BECCS) in place of conventional bioenergy for industrial, transport, and energy sectors (e.g., use biogenic wastes to produce electricity and capture and store the emissions in geologic reservoirs instead of releasing them to the atmosphere)</li> </ul>
<b>Actions to reduce scope 1 land use and/or land carbon leakage</b>	Agriculture	<ul style="list-style-type: none"> <li>• Increase productivity (i.e., output per hectare) of crop or livestock production</li> <li>• Reduce post-harvest losses of crops and livestock products</li> </ul>
<b>Actions to reduce scope 3 land use and/or land carbon leakage</b>	Food and beverage Transport	<ul style="list-style-type: none"> <li>• Reduce consumption of land-based products, especially land-intensive products, including through efficiency measures and reducing losses and wastes across the value chain</li> <li>• Shift sourcing to products with lower land-use requirements and/or higher land-use efficiency</li> <li>• Shift sourcing to products, fuels, and feedstocks that do not displace or reduce food or feed production</li> </ul>

Note: a. Scope 3 accounting for proximate and adjacent non-productive lands, such as for conservation set-asides, is subject to Requirement 7 and cannot currently be implemented in version 1.0 of this Standard.

### 16.4.3 Define the scope of the assessment

#### Assessment boundary, assessment period, and type of assessment

The assessment boundary defines the scope of the assessment in terms of the range of GHG effects, and non-GHG effects if relevant, that are included in the assessment. Intervention accounting methods define an assessment boundary by identifying which sources, sinks, and other relevant metrics are expected to be affected by an action, either positively or negatively, both inside and outside of the company's inventory boundary. Such effects are identified by mapping a causal chain that involves tracing the process by which the action leads to impacts through a series of interlinked logical and sequential stages of cause-and-effect relationships. Companies should also decide if they want to evaluate other types of impacts in addition to emissions, removals, land use, and land carbon leakage, such as other environmental, social, and economic impact categories relevant to decision making.<sup>4</sup> Further guidance on identifying effects and mapping the causal chain can be found in Chapter 6 of the *Policy and Action Standard* (WRI and WBCSD 2014a).

The assessment period is the time period over which impacts resulting from the action are assessed. The assessment period may differ from the action implementation period—the time period during which the action is in effect—and should be as comprehensive as possible to capture the full range of effects based on when effects are expected to occur.

Intervention accounting methods can be used to estimate the impacts of actions in the future (prospective) or to evaluate impacts in the past (retrospective). Companies should decide if they want to evaluate the impacts of actions that have already been implemented and/or potential actions that are being considered or planned. Companies can evaluate actions either through:

- A forward-looking (ex ante) assessment, to inform decision making by estimating future impacts of implemented or potential actions; or
- A backward-looking (ex post) assessment, to evaluate the effectiveness of actions after implementation by estimating impacts to date.

For further guidance on defining the GHG assessment boundary, assessment period, and assessment perspective, see the *Policy and Action Standard* (WRI and WBCSD 2014a).



### 16.4.4 Define the baseline (“without action”) scenario

Estimating the effect of an action requires a reference case, or baseline scenario, against which GHG effects and other impacts included in the assessment boundary are estimated. The baseline scenario represents what would have happened in the absence of the policy or action being assessed.

Baseline scenarios can be determined *ex ante* or *ex post*. An *ex ante* baseline scenario is a forward-looking baseline scenario, typically established prior to the implementation of the action, which is based on forecasts of emissions drivers (such as projected changes in population, economic activity, or other drivers that affect emissions), in addition to historical data. An *ex post* baseline scenario is a backward-looking baseline scenario established during or after implementation of the action. Companies may first estimate baseline emissions, removals, and other metrics before estimating intervention scenario emissions, either *ex ante* or *ex post*, or may implement both in parallel.

For further guidance on choosing the type of baseline comparison, defining the most likely baseline scenario, and defining the methods and data to estimate baseline emissions, removals, and other metrics, see Chapter 8 in the *Policy and Action Standard* (WRI and WBCSD 2014a). For guidance on project-specific and performance standard baseline approaches, see the *GHG Protocol for Project Accounting* (WRI and WBCSD 2005) and *GHG Protocol Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting* (WRI and WBCSD 2006).

### 16.4.5 Define the intervention (“with action”) scenario

The intervention (“with action”) scenario represents the events or conditions most likely to occur in the presence of the action (or group of actions) being assessed. The “with action” scenario applies the same assessment boundary as the baseline scenario except that it includes the action (or group of actions) being assessed. In contrast to *ex ante* assessments, which forecast intervention scenarios based on assumptions, intervention scenarios in *ex post* assessments are based on observed data collected during the time the action was implemented. The same method(s) used to estimate baseline emissions, removals, and other metrics should also be used to estimate intervention scenario emissions, removals, or other metrics.

For further guidance on identifying parameters affected by the action, defining the most likely intervention scenario, and defining parameters and selecting methods to estimate intervention emissions, removals, and other metrics, whether for *ex ante* or *ex post* assessments, see Chapters 9 and 11 in the *Policy and Action Standard* (WRI and WBCSD 2014a).

### 16.4.6 Quantify the impacts of both scenarios to determine the net impacts of the action

The GHG effect of an action is estimated by subtracting baseline (“without action”) emissions, removals, and other impacts from intervention (“with action”) scenario impacts. Actions can have a combination of both positive and negative impacts, and the net impact of an action can be positive or negative. Table 16.3 provides some examples of the positive and negative GHG impacts of interventions, which depend on the difference between the intervention scenario and the baseline scenario.

Actions may have multiple positive or negative impacts or may present tradeoffs. For example, an action taken to reduce emissions or increase removals within a reporting company’s operations or value chain may have unintended negative impacts outside the company’s inventory boundary (e.g., leakage) that negate, or even reverse, its positive impacts. In the specific case of land carbon leakage—a negative GHG impact caused by corporate actions that reduce or divert food or feed production on agricultural land—companies are required to account for and report land carbon leakage (see Chapter 8).

**Table 16.3** Examples of impacts quantified using intervention methods

Action	Intervention scenario ("with action")	Baseline scenario ("without action")	GHG impacts of intervention (difference)
Reducing emissions in the agricultural supply chain	Scenario A: Work with existing suppliers to improve practices to reduce GHG emissions while maintaining yields	Existing suppliers use high-GHG agricultural practices	<ul style="list-style-type: none"> <li>• <b>Positive GHG impact:</b> Existing suppliers reduce their GHG emissions by changing practices</li> </ul>
	Scenario B: Shift to new suppliers that use low-GHG practices with similar yields		<ul style="list-style-type: none"> <li>• <b>No immediate direct GHG impact:</b> Existing suppliers continue high-GHG practices, while new suppliers continue low-GHG practices</li> <li>• <b>Possible GHG impact:</b> May lead to indirect GHG benefits over time if market demand for improved supplier performance leads to broader adoption of improved practices</li> </ul>
Reducing food loss and waste	Changing practices to reduce food loss and waste at any stage of the food supply chain (production, handling/storage, processing/packaging, distribution/market)	Current level of food loss and waste	<ul style="list-style-type: none"> <li>• <b>Positive GHG impact:</b> Reduced need for food production, avoiding land management production emissions, and decreasing pressure to clear additional land</li> </ul>
Increasing agricultural yields	Doubling yield through the use of new fertilizer and land management practices	Current yield	<ul style="list-style-type: none"> <li>• <b>Negative GHG impact:</b> Increased land management production emissions from fertilizer use</li> <li>• <b>Positive GHG impact:</b> Decreased land use change emissions from decreased pressure for land clearing elsewhere</li> </ul>
Capturing methane from landfills	Capturing landfill methane and using it for energy to displace fossil fuel use	Scenario A: Landfill methane would have been released to the atmosphere (no flaring); fossil natural gas would have been used for energy	<ul style="list-style-type: none"> <li>• <b>Positive GHG impact:</b> Avoided methane emissions from landfills</li> <li>• GHG impact of displacement of fossil fuels depends on the difference between life cycle emission factors for the fossil fuel displaced versus the landfill gas combusted</li> </ul>
		Scenario B: Landfill methane would already have been captured, e.g., because local/national laws require landfill gas to be captured and flared	<ul style="list-style-type: none"> <li>• GHG impact of intervention depends on the difference between life cycle emission factors for the fossil fuel displaced versus the landfill gas combusted</li> </ul>
Using agricultural wastes for bioenergy	Using agricultural wastes (e.g., crop residues) for bioenergy generation, which is used to displace fossil fuels	Agricultural wastes would have decomposed within a few years; fossil fuels would have been combusted	<ul style="list-style-type: none"> <li>• <b>Negative GHG impact:</b> Carbon losses on the land where agricultural wastes are collected (i.e., loss of dead organic matter or inputs to the soil carbon pool)</li> <li>• <b>Positive GHG impact:</b> Lower GHG impact in cases where the life cycle emission factor of the bioenergy from agricultural wastes is lower than that of the displaced fossil fuel</li> </ul>

**Table 16.3** Examples of impacts quantified using intervention methods (cont.)

Action	Intervention scenario ("with action")	Baseline scenario ("without action")	GHG impacts of intervention (difference)
Dedicating land to producing bioenergy crops	Using dedicated cropland to grow bioenergy crops, which are used to displace fossil fuels	Cropland would have produced food, given the growing global demand for food; fossil fuels would have been consumed	<ul style="list-style-type: none"> <li>• <b>Negative GHG impact:</b> Land conversion and land use change emissions elsewhere (leakage) due to displaced food production</li> <li>• GHG impact of displacement of fossil fuels depends on the difference between life cycle emission factors (fuel combustion, extraction, refining, transportation, etc.) for the fossil fuel displaced versus the bioenergy feedstock</li> </ul>

GHG reduction or removal opportunities may lie beyond a company’s scope 1, scope 2, and scope 3 inventories. For example, some companies may track not only the emissions, removals, or other metrics that arise from the use of their products (scope 3, category 11), but also the avoided emissions, removals, or other metrics system-wide (i.e., beyond the inventory boundary) that result from the use of their products and solutions compared to alternative products and solutions. Avoided emissions, removals, and other metrics may also arise when accounting for emissions from recycling (scope 3, category 5 or 13) or from other activities.

Reporting information about impacts within and beyond the inventory boundary enables companies and their stakeholders to better understand the full, system-wide consequences of corporate actions. Boxes 16.1 and 16.2 provide examples that demonstrate how including land emissions and land use metrics together in the assessment boundary can be used to evaluate tradeoffs and net impacts to inform corporate mitigation actions and strategies. In cases where the net emissions impacts of an action appear to be positive but land use increases, companies can use intervention accounting and assess changes in the carbon opportunity cost (COC) of land use (see Chapter 8), alongside changes in emissions and removals, to evaluate if that action has a positive net, system-wide GHG impact.

### Evaluating how actions and other factors lead to changes in GHG inventories

In addition to evaluating the impact of individual actions, companies may want to understand why values reported in the GHG inventory change over time and how individual actions, whether by the reporting company or companies in its value chain, contribute to those changes. GHG inventories change over time in part due to companies’ actions and in part because of changes in companies’ value chains or other external factors that are not related to, or caused by, the planned actions of the reporting company.

For example, scope 3 land emissions quantified using national average emission factors may increase or decrease in the company’s scope 3 inventory as the national average emission factor changes over time, independent of any actions that the reporting company may be taking to reduce land emissions in its value chain. In GHG inventory accounting (as opposed to intervention accounting), all changes to emissions, removals, and other metrics within the company’s inventory boundary over time matter, independent of whether that change results from the planned actions of the reporting company or actions taken by other actors.

Nevertheless, companies may find it useful to understand how their own actions have affected their inventories and to attribute changes in their GHG inventories to specific actions. This can help companies evaluate whether their actions and mitigation strategies are on track to achieve a certain level of emission reductions, removal

enhancement, land use reductions, and so on, in their inventory for a given timeline, while taking into account changes in the inventory that are unrelated to their own operations or actions in their value chain.

To evaluate how activities affect GHG inventories, companies can use factor analysis or decomposition analysis.<sup>5</sup> These tools are helpful when multiple parameters counteract each other. For example, a food service company implements a plan to work with suppliers and producers to use feed additives to reduce methane emissions from beef production, but this intervention does not progress as fast as expected. Through decomposition analysis, the company learns that this delay has been compensated for, however, by a faster-than-expected shift in purchases from beef toward lower-emission foods. This type of information can be useful to inform the design of new actions or to make changes to current actions to maximize positive GHG impacts.

### Box 16.1 Evaluating net impacts of strategies to increase maize production using intervention accounting to inform decision-making

In this example, a hypothetical company based in West Africa seeks to increase maize production while reducing net GHG impacts. The company is currently growing 1,800 tonnes (t) of unfertilized maize per year across 1,000 hectares and wants to grow its business to produce 4,500 t of maize per year. It has defined two possible actions to increase its maize production: intensifying production on its existing land holdings by adding nitrogen fertilizer or acquiring additional existing farmland for maize production at current yields. After mapping the causal chain and identifying all potential GHG effects of the action, the company determines that the most significant potential impacts of these actions are land management production emissions and land use impacts, and includes these impacts in the assessment boundary. The company defines the following baseline (“without action”) and intervention (“with action”) scenarios:

- **Baseline scenario:** The unfertilized fields yield 1.8 t/ha/year of maize or 1,800 t/year of maize overall across 1,000 hectares of scope 1 land occupation. The company estimates scope 1 land management production emissions of 0.06 tCO<sub>2</sub>e per t of maize, or a total of 108 tCO<sub>2</sub>e/year. The company also estimates the COC of land use (i.e., annualized carbon losses relative to native vegetation) on its croplands at 20 tCO<sub>2</sub>e/ha/year, for a total scope 1 COC of land use of 20,000 tCO<sub>2</sub>e/year.
- **Intervention scenario 1 (intensification):** The company estimates that adding 100 kg N/ha/year of fertilizer would increase yields to 6 t/ha/year, meaning that production of the 4,500 t of maize would require only 750 hectares—reducing scope 1 land occupation by 250 hectares. Scope 1 land management production emissions (due to increased fertilizer use) would rise to 0.30 tCO<sub>2</sub>e per t of maize, or 1,350 tCO<sub>2</sub>e, an increase of 1,242 tCO<sub>2</sub>e from the baseline scenario. Scope 1 COC of land use would fall to 15,000 tCO<sub>2</sub>e, a decrease of 5,000 tCO<sub>2</sub>e. Therefore, while scope 1 land management production emissions would increase, scope 1 COC of land use would decrease by more than the land management production emissions increase, and the net GHG benefit would be 3,758 tCO<sub>2</sub>e relative to the baseline scenario.
- **Intervention scenario 2 (expansion):** The company estimates that it would need to acquire an additional 1,500 hectares of existing farmland to expand production to 4,500 t of maize at current unfertilized yields, bringing scope 1 land occupation to 2,500 hectares. In this case, scope 1 land management production emissions would slightly rise to 270 tCO<sub>2</sub>e/year, an increase of 162 tCO<sub>2</sub>e/year. However, the large increase in land occupation would increase the scope 1 COC of land use to 50,000 tCO<sub>2</sub>e/year, an increase of 30,000 tCO<sub>2</sub>e/year.

To understand the net impacts of each potential action, the company calculates the difference between the intervention and baseline scenarios (see Table B16.1-1 below). Although fertilizer-related emissions in the “intensification” scenario increase relative to the baseline, the reduction in land use and the COC of land use reveal that, overall, this is the best strategy to meet its production goals while also reducing overall net GHG impacts. The expansion scenario, by contrast, does not lead to increased fertilizer emissions but leads to large increases in land use and the COC of land use. By assessing both its scope 1 land management production emissions and scope 1 COC of land use, the company decides to pursue the intensification option (Scenario 1) to realize its maize production goal while also limiting net impacts (since Scenario 1 has net GHG benefits compared to both the baseline scenario and the “expansion” scenario, Scenario 2).

**Box 16.1 Evaluating net impacts of strategies to increase maize production using intervention accounting to inform decision-making (cont.)**

Had the company only included scope 1 land management production emissions, but not land use, in the assessment boundary, it might have concluded that the pursuit of the “expansion” action scenario would have the greatest net benefit. Furthermore, had the company only assessed changes to scope 1 land management production emissions and scope 1 land occupation, it would have observed Scenario 1 as a tradeoff between higher emissions and lower land occupation, but the net GHG impacts of that tradeoff would have remained unclear. Simultaneously assessing changes in land use (and the COC of that land use), alongside changes in emissions, can provide a more complete picture of the tradeoffs and net impact posed by the expansion scenario, and points the company instead toward the pursuit of the intensification scenario, which in this case delivers a larger overall net positive GHG benefit.

**Table B16.1-1 Net GHG impacts of two strategies to increase maize production**

	Baseline scenario	Scenario 1 (intensification)	Scenario 2 (expansion)	Net effect: Scenario 1 vs. Baseline scenario	Net effect: Scenario 2 vs. Baseline scenario
<b>(a) Scope 1 land occupation (ha)</b>	1,000	750	2,500	Scope 1 land occupation reduced by 250 ha	Scope 1 land occupation increased by 1,500 ha
<b>(b) Crop yield (t/ha)</b>	1.8	6.0	1.8		
<b>(c) Total maize produced (t) (c = a x b)</b>	1,800	4,500	4,500		
<b>(d) Scope 1 land management production emission factor (tCO<sub>2</sub>e/t maize)</b>	0.06	0.30	0.06		
<b>(e) Scope 1 land management production emissions (tCO<sub>2</sub>e) (e = c x d)</b>	108	1,350	270	Scope 1 land management production emissions increased by 1,242 tCO <sub>2</sub> e	Scope 1 land management production emissions increased by 162 tCO <sub>2</sub> e
<b>(f) Carbon opportunity cost (COC) factor per hectare (tCO<sub>2</sub>e/ha)</b>	20	20	20		
<b>(g) COC factor per unit product (tCO<sub>2</sub>e/t maize) (g = f / b)</b>	11.1	3.3	11.1		
<b>(h) Scope 1 COC of land use (tCO<sub>2</sub>e) (h = c x g)</b>	20,000	15,000	50,000	Scope 1 carbon opportunity cost reduced by 5,000 tCO <sub>2</sub> e	Scope 1 carbon opportunity cost increase of 30,000 tCO <sub>2</sub> e
<b>(i) Scope 1 land management emissions + carbon opportunity cost of land use (tCO<sub>2</sub>e) (i = e x h)</b>	20,108	16,350	50,270	Positive impact of 3,758 tCO <sub>2</sub> e <b>(Implement action)</b>	Negative impact of 30,162 tCO <sub>2</sub> e <b>(Do not implement action)</b>

*Note:* Example adapted from Searchinger et al. (2018), using yield response assumptions from Fischer et al. (2014), scope 1 land management emission factors from Bryngelsson et al. (2016), and carbon opportunity cost factor per hectare from Waite et al. (2026). All units are per year.

### 16.4.7 Use results to inform decision making

Companies should use both inventory and intervention accounting approaches to inform decisions and mitigation strategies. Companies should implement actions that have the greatest net positive GHG impacts (i.e., the largest reductions in GHG emissions and increases in GHG removals) globally and, if assessed, the least negative other environmental, social, and economic impacts.<sup>6</sup> Table 16.4 provides high-level guidance on using the results of inventory and intervention accounting methods together to inform decision making.

**Table 16.4** Using results of inventory and intervention accounting methods to inform decision making

Inventory accounting results within scopes 1, 2, and 3	Intervention accounting results across scopes 1, 2, 3, and beyond <sup>a</sup>	Guidance
Action <b>improves</b> the scope 1, 2, and 3 GHG inventory	Action leads to net <b>positive</b> GHG impacts	<b>Implement action</b> Companies may estimate and report the impacts on GHG emissions, removals, land use, and land carbon leakage resulting from the action (using intervention accounting methods) separately from the scopes.
	Action leads to net <b>negative</b> GHG impacts For example, due to leakage	<b>Do not implement action</b> Consider alternative actions with net positive impacts. If implemented, companies should redesign the action or implement complementary measures to minimize possible negative impacts (e.g., leakage) outside the inventory boundary.
Action <b>does not improve</b> the scope 1, 2, and 3 GHG inventory	Action leads to net <b>positive</b> GHG impacts For example, due to avoided impacts or substitution/displacement effects	<b>Implement action</b> Companies may estimate and report GHG impacts resulting from the action (using intervention accounting methods that also include land use and land carbon leakage) separately from the scopes.
	Action leads to net <b>negative</b> GHG impacts	<b>Do not implement action</b>

*Note:* a. In intervention accounting, the GHG assessment boundary is not limited to emissions, removals, land use, and land carbon leakage that occur within the inventory boundary.

If actions have a positive impact (i.e., reduce GHG emissions, increase removals, reduce land use, and/or reduce land carbon leakage) outside the company’s inventory boundary, companies may estimate and report the impacts of actions using intervention accounting methods and report these impacts separately from the physical GHG inventory. Box 16.2 provides a simple example of how a company can use an ex ante assessment to inform decision making regarding a food waste reduction program. Complete and transparent information helps to maximize positive impacts on the climate and minimize any negative impacts not already captured in the physical GHG inventory. Any estimates of avoided emissions must not be included in or deducted from the company’s scope 1, 2, or 3 inventory. For guidance on quantifying avoided emissions from the use of sold products, refer to the *Scope 3 Standard* (see Box 9.4) and Russell (2018).<sup>7</sup>

In addition to estimating the GHG effect of the action, users may take additional steps to help inform decision making, such as by harmonizing top-down and bottom-up assessments, normalizing results, applying decomposition analysis, and combining ex ante and ex post assessments (see Section 11.6 in the *Policy and Action Standard*).

**Box 16.2 Using an ex ante assessment to inform a food waste reduction program**

A hospitality company that supplies large buffets to conferences decides to reduce food waste by using smaller serving pans and portion sizes, eliminating trays, and preparing food on demand instead of in advance. It decides to perform an ex ante assessment of this food waste reduction scenario. The company determines that the most significant impacts of the program are scope 3 (upstream) emissions and land use, and defines the assessment boundary to include these potential impacts.

The company currently sources 5,200 tonnes of food for its buffets annually (see table below) and projects that, in the absence of any intervention, this purchasing volume will be maintained in the following year (baseline “without action” scenario). To quantify the impacts of the food waste reduction scenario, the company uses emission factors from a standard database, multiplied by the various types of food they source, to estimate that the projected scope 3 emissions associated with those food purchases will be 9,886 tCO<sub>2</sub>e in the following year. Similarly, they use standard data on yields to estimate that the food will be sourced from 2,025 hectares of agricultural land that year (land occupation).

To define the intervention (“with action”) scenario, the company assumes that the planned food waste reduction measures would reduce the purchase of beef and milk by 10 percent and of maize and vegetables by 5 percent. Using the same methods above, the company estimates that these food purchase reductions would reduce both scope 3 emissions and land occupation by about 9 percent each, and also save costs.

To calculate the overall net impact of the action, the company calculates the difference between the baseline and intervention scenarios. The results indicate that scope 3 emissions and land occupation both decline in the intervention scenario, so the company decides to pursue the food waste reduction measures.

**Table B16.2-1 Quantifying the effects of a food waste reduction program**

Food type	Amount purchased (t)	Production-related GHG emission factor (kg CO <sub>2</sub> e/kg) <sup>a</sup>	Total production-related GHG emissions (tCO <sub>2</sub> e)	Land occupation (yield) factor (m <sup>2</sup> /kg)	Total land occupation (ha)
<b>Baseline scenario</b>					
Beef	100	41.35	4,135	126.45	1,265
Milk	1,300	2.17	2,821	2.05	267
Maize	2,000	0.97	1,940	1.74	349
Vegetables	1,800	0.55	990	0.81	146
<b>Total</b>	<b>5,200</b>		<b>9,886</b>		<b>2,025</b>
<b>Food waste reduction scenario (intervention scenario)</b>					
Beef	90	41.35	3,722	126.45	1,138
Milk	1,170	2.17	2,539	2.05	240
Maize	1,900	0.97	1,843	1.74	331
Vegetables	1,710	0.55	941	0.81	139
<b>Total</b>	<b>4,870</b>		<b>9,044</b>		<b>1,847</b>
<i>Net impact of the action</i>			<b>Emissions reduced by 842 tCO<sub>2</sub>e</b>		<b>Land occupation reduced by 178 ha</b>

Note: a. Land use and emission factors from Poore and Nemecek (2018) for North America. Emission factors include emissions from farm, feed, processing, transport, packaging, and upstream losses to the point of purchase by a food service operator.

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## Endnotes

- 1 The GHG Protocol's workstream on actions and market instruments will define where to report the impacts of actions in a GHG report and if additional information needs to be disclosed.
- 2 Available at <https://ghgprotocol.org/standards/project-protocol>.
- 3 Available at <https://ghgprotocol.org/policy-and-action-standard>.
- 4 Other potential impact categories related to corporate actions include ecosystem protection, climate adaptation and resilience, biodiversity, reduction of air and water pollution, job creation and poverty reduction, agricultural productivity, food security, human health, energy access, waste, soil quality, and others. For guidance on how to incorporate these other impact categories, see the Initiative for Climate Action Transparency (ICAT) Sustainable Development Methodology (ICAT 2020), available at <https://climateactiontransparency.org/icat-toolbox/sustainable-development/>.
- 5 For an example of decomposition analysis, see the GHG Protocol *Policy and Action Standard* (WRI and WBCSD 2014, 132), available at <https://ghgprotocol.org/policy-and-action-standard>.
- 6 For guidance on using multicriteria analysis for decision making across multiple environmental, social, and economic impacts, see the Initiative for Climate Action Transparency (ICAT) Sustainable Development Methodology (ICAT 2020), available at <https://climateactiontransparency.org/icat-toolbox/sustainable-development/>.
- 7 Russell 2018. Available at <https://ghgprotocol.org/estimating-and-reporting-avoided-emissions>.

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