

The most important GHG accounting concept you may not have heard of: the attributional-consequential distinction

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Introduction

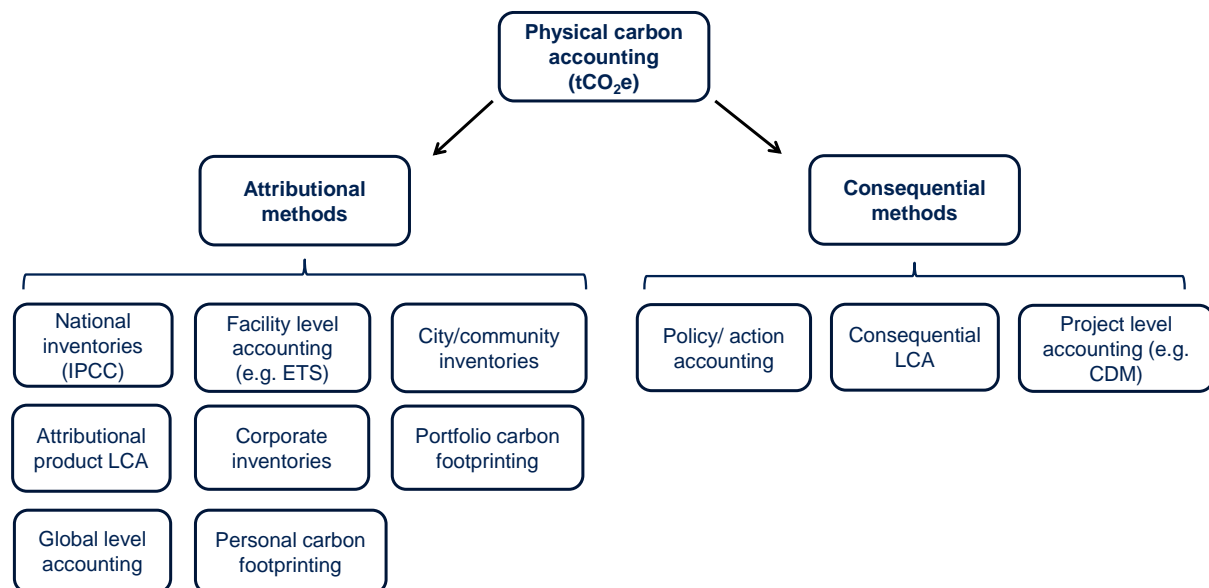
Too often environmental professionals, policy-makers, and standard-setters fail to distinguish between two major types of GHG accounting methods¹ – which are appropriate for fundamentally different purposes. Using the wrong type of method can lead to bad decision-making – and unfortunately, this happens all too often.

Many GHG accounting practitioners will be familiar with ‘attributional’ type methods, which create inventories of emissions—for example, corporate GHG inventories, national GHG inventories, and traditional product life cycle assessments. Often practitioners mistakenly assume that attributional is the *only* type of method, and try to use such methods to answer questions that they cannot and should not be used to answer – like how much a mitigation action *reduces* emissions.

A fundamentally different type of GHG accounting method is ‘consequential’, which aims to quantify the *change* in emissions caused by decisions or interventions. Examples include project-level accounting and consequential life cycle assessment. This type of method is also sometimes called ‘intervention’ accounting.

Figure 1 provides an overview of most GHG accounting methods and indicates whether they are attributional or consequential.

Figure 1. Categorisation of physical GHG accounting methods as ‘attributional’ or ‘consequential’



To give a real-world example for why the distinction matters: The Scottish whisky industry has started using the grain residues from its distilling processes as a fuel because it substitutes for their use of fossil fuels. With this change in fuels, the GHG emissions reported in their corporate GHG inventories decrease. However, livestock farmers who previously used the grain residues as animal feed now have to buy more soy meal, which increases the cultivation of soy and contributes to deforestation in

¹ This paper focuses on GHG accounting, but the attributional-consequential distinction can be applied to all forms of social and environmental accounting.

countries expanding their agricultural output. The decision to switch fuels might look good within an attributional inventory of a single company, but such an attributional accounting method will not inform you of any changes in emissions caused by the decision that occur outside the corporate inventory boundary.

Appropriate purposes of attributional and consequential methods

Attributional methods are appropriate for allocating ‘carbon budgets’ to entities as, in theory, they can be ‘summed’ to equal total global emissions (e.g., the sum of all national inventories should approximate to total global emissions and the sum of all sub-national scope 1 emissions should approximate total direct national emissions) without double counting or omissions. Attributional methods generally provide clear rules for identifying a specific set of sources and sinks and allocating ‘ownership’ or ‘responsibility’ to different entities. For example, for national emission inventories, the boundary rule is all emissions/removals physically occurring within the country’s territorial borders. Such a rule can be applied with a high degree of certainty and is therefore appropriate for regulatory compliance or legally binding targets.

Consequential methods do not define a scope of responsibility concerning an entity in this way, as they are instead concerned with the impacts of specific decisions.

Problems arise when attributional methods are used to inform decisions aimed at reducing GHG emissions because attributional methods do not tell us about consequences that occur outside the entity’s defined inventory boundary. As a result, decisions can be blind to indirect impacts and actors can be misled into implementing actions that lower their entity’s attributed emissions while inadvertently increasing global emissions.

Instead, consequential methods should be used for informing decisions aimed at reducing emissions, as they provide information on the system-wide or global change in emissions caused by the decision or intervention (e.g., they set the accounting boundary as large as it needs to be to capture all material direct and indirect impacts). Returning to our Scottish whisky industry example, a proper application of consequential GHG accounting to estimate the impact of using grain residues for bioenergy would entail expanding the assessment boundary to include indirect effects, including those mediated through markets, and excluding from the assessment sources and sinks unaffected by the decision.

Table 1 provides a summary of the key features, limitations, and uses of each type of method.

Table 1. Summary of key features and appropriate uses of attributional and consequential methods

Feature	Attributional methods	Consequential methods
Accounting purpose	Allocating responsibility to entities for emissions/removals arising from specified sources/sinks; for establishing emissions quotas and/or tracking emissions over time.	Quantifying system-wide change in emissions/removals caused by a decision or intervention.
Boundary setting principles	Boundary determined by a normative ruleset, typically based on physical connections between each entity and emissions source or removals sink. For	Boundary determined by the intervention and output parameter (e.g., GHG emissions) that is studied (i.e., include all and <u>only</u> sources and sinks that change as

	example, for national inventories, the rule is all sources and sinks physically existing within the territorial jurisdiction of a country	a result of the decision or intervention studied).
Type of 'change' that can be accounted for	Change relative to a base year/period	Change relative to a predicted, counter-factual baseline (i.e., what would have happened in the absence of the decision or intervention studied).
Retrospective or prospective	Generally, attributional methods are applied retrospectively (<i>ex-post</i>), but this is not a necessary feature of attributional methods and they can be applied to future scenarios.	Generally, consequential methods are applied to inform future decisions (<i>ex-ante</i>), but this is not a necessary feature of consequential methods and they can be applied to evaluate the impact of decisions/interventions in the past (<i>ex-post</i>).
Output information	Physically measurable quantity of GHGs released to and/or removed from the atmosphere.	Estimated change in GHG emissions to and/or removals from the atmosphere caused by a specified decision or intervention, relative to a counter-factual baseline (not physically measurable).

Common Issues

What is striking is that the attributional-consequential distinction is still not recognised widely enough by GHG management practitioners. Too often governments or companies implement climate change mitigation actions because doing so reduces emissions within an attributional boundary, without proper consideration of the system-wide consequences.

Another mistake that sometimes occurs is mixing elements of attributional and consequential approaches within a single method or analysis, such as including values for avoided emissions within what should be an inventory of actual emissions and removals. For example, a mistake that used to be present in the United Kingdom (UK) government guidance for corporate GHG accounting was the use of a negative emissions factor for recycled waste due to the avoidance of emissions from landfills. The results are problematic as they are inappropriate for managing carbon budgets as they do not sum to total emissions, and neither do the inventory results show the total system-wide change caused by specific decisions or interventions.

Conclusion

Importantly, BOTH attributional and consequential methods are needed – with each used for their appropriate purposes. Attributional methods can be used for allocating responsibility, setting reduction targets, and tracking progress towards the achievement of those targets within specified boundaries. But any actions aimed at reducing emissions should be checked with a consequential method to ensure they do not unintentionally increase emissions outside the inventory boundary. Further, you should be sceptical of any claims regarding or implying that actions taken led to “emission reductions” that are

based solely on attributional GHG inventory reporting. Such claims should be supported with impact estimations using an appropriately chosen consequential method.