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Improving climate emissions accounting to accelerate the circular economy transition

Insights Paper

Contents

4 **Glossary**

5 **About this paper**

6 **Executive summary**

8 **The importance of climate accounting in the circular economy transition**

13 **Ensuring emissions inventories more accurately reflect circular business activity**

14 Opportunity 1
Recognise the circular economy across the GHG Protocol framework

17 Opportunity 2
Revise guidance for circular material inflows

20 Opportunity 3
Revise guidance for product durability

23 Opportunity 4
Revise guidance for circular material outflows

27 Opportunity 5
Revise guidance for circular economy financing

30 **Additional insights: reporting of avoided emissions**

Project Team

Ellen MacArthur Foundation — core project team

João Murilo Silva Merico
Senior Analyst, Author

Cindy Venho
Programme Manager, Author

Alasdair Hedger
Senior Expert, Author

Nicole Dando
Performance Measurement Lead, Project Lead

Miranda Schnitger
Climate Lead, Project Lead

Ellen MacArthur Foundation — wider team

Lenaïc Gravis
Editorial Development Manager

Ian Banks
Independent Editorial Consultant

Emily Pearce
Communications Manager

Louis Smith
Graphic Designer

James Wrightson
Creative Lead

Contributors

The Ellen MacArthur Foundation would like to thank the organisations and individuals who contributed to this paper with insights and constructive input.

Please note that contribution to the paper, or any part of it, or any reference to a third-party organisation within the study, does not indicate any kind of partnership or agency between the contributors and the Foundation, nor an endorsement by that contributor or third party of the study's conclusions or recommendations.

Bancolombia
David Penagos Echeverri
Emily Rivas Ochoa
Nicolas Atehortua Velásquez

Brambles
Marianne Richeux
David McLachlan

Danone
Lucie Rodriguez
Christopher Adamo

H&M Group
Henrik Sundberg
Sara Eriksson

Holcim
Antonio Carrillo
Remo Diethelm
Danila Gaudino
Eugenia Ceballos

Inter IKEA Group
Simon Skoogh
Christoph Leibing
Erika Alm

JLR
Peter Chigada
Fabian Watelet

Philips
Sophie Thornander
Harald Tepper
Simon Braaksma
Justin Strüber
Sachin Nande
Alexandros Theodoropoulos

Syensqo
Hubert Sizaret
Bruno Van Pary

Glossary

Circular activity

Economic activities that create value while eliminating waste and pollution, circulating products and materials, and regenerating nature. These activities help tackle global challenges and create a thriving economy within planetary boundaries, and include (but are not limited to): regenerative production, maintenance, sharing, resale, repair, rental, refurbishing, remanufacturing, recycling, upcycling, and composting.

Circular material inflows

Circular material inflows are safe secondary (i.e. non-virgin) materials, by-products, and/or regeneratively grown materials which are sourced by an organisation as inputs for production or further processing, and subsequently leave the organisation as products, packaging or services.

Circular material outflows

Products, packaging, and by-products that, at their end of use, are reused, redistributed, maintained, prolonged, refurbished, remanufactured, or recycled. Circular material outflows also include products and materials that, after use, are safely returned to the biosphere (e.g. through composting, or anaerobic digestion).

Inner/outer loop solutions

Refers to the economic flows of renewable and finite materials depicted in the ***Ellen MacArthur Foundation Circular Economy Systems Diagram***.[1] Inner loops are where most embedded value can be retained by keeping the product whole. Therefore, inner loops like sharing, maintaining, and reusing should be prioritised above the outer loops that see the product broken down and remade.

Recycling

Transforming a product or component into its basic materials and reprocessing them into new materials. The outermost loop, recycling, is the stage of last resort in a circular economy, because the greatest proportion of the embodied value and energy of the product are lost in the process.

Regenerative production

Regenerative production provides food and materials using methods that support positive outcomes for nature. These methods include, but are not limited to agroecology, agroforestry, and conservation agriculture. The positive outcomes include, but are not limited to, healthy and stable soils, improved local biodiversity, and improved air and water quality.

Virgin materials

Materials that have not yet been used in the economy. These include both finite materials (such as iron ore mined from the ground) and renewable materials (for example, newly produced cotton).

About this paper

This paper is intended for businesses, investors, policymakers, industry associations, and sustainability professionals concerned with accurate greenhouse gas (GHG) emissions accounting. It proposes revisions to the GHG Protocol's methodology so it better reflects business activity aligned with the transition to a circular economy.

At present, companies find it difficult to fairly and accurately attribute emissions within innovative business models as they shift from linear to circular approaches to value creation. As a result, there is poor visibility of the key role of circular solutions in progressing climate targets. As it stands, the GHG Protocol does not adequately account for the complex emission profiles of businesses adopting circular activities.

The Ellen MacArthur Foundation, working with businesses across a variety of industries in its Network, has highlighted five main areas of the GHG Protocol's guidance that conflict with, or hinder, the adoption of circular practices that reduce emissions.

These areas are outlined along with their impact, and corresponding revisions to the methodology are proposed. This paper aims to contribute towards enabling a fair and accurate reflection of circular activities in companies' emissions inventories.

To help accelerate action on the climate crisis, the Ellen MacArthur Foundation encourages all users of emissions data to support these revisions as part of the updates to the GHG Protocol's guidance and standards.

Executive summary

Measuring and attributing GHG emissions is central to driving the change needed globally to reach net zero and tackle climate change. As organisations make the critical shift from linear to circular value creation, they need to be able to accurately measure, track, and report the impact this has on their climate-related targets.

Despite the circular economy being crucial in addressing approximately half of global GHG emissions, businesses are unable to capture its full potential as current guidance for emissions reporting unintentionally discourages many circular activities. Adapting accounting methodologies to ensure that circular solutions are neither inadvertently penalised nor underreported will be crucial for supporting businesses, policymakers, and financial institutions to identify actions that will help them achieve their net zero targets.

This paper proposes five key opportunities for improvements to the GHG Protocol, the world's most widely used framework for measuring and managing GHG emissions.

1. **Recognise the concept of circular economy across the GHG Protocol framework**
   Relating to revision opportunities across the GHG Protocol's standards and guidelines

   - The guidance is not sufficiently clear on the reporting of emissions associated with circular activities beyond recycling (such as rental models), nor the allocation of emissions between actors in shared value chains linked by collaborative circular activities. It also leaves Scope 3 reporting as optional, which undermines visibility and accountability for emissions associated with circular activities
   - Addressing these gaps is vital to remove inconsistencies and prevent misunderstandings in how companies should account for circular economy activities that extend beyond recycling

2. **Revise guidance for circular material inflows**
   Relating to the products and materials purchased by a reporting company under categories 1 (Purchased Goods and Services), and 2 (Capital Goods) of the GHG Protocol

   - The guidance fails to appropriately account for emissions of purchased products and capital goods (i.e. inflows) designed for multiple lifecycles
   - Introducing methods that spread emissions associated with initial manufacturing over multiple life cycles and users would mean that circular solutions that extend product lifespan (for example, through reuse, repair, and remanufacturing) would be reflected more accurately and fairly in inventories

3. Revise guidance for product durability
Relating to the emissions of products while in use under Category 11 (Use of Sold Products) of the GHG Protocol

- Circular activities that extend product life and/or offer upgradability are inadvertently disincentivised by the current guidance as companies are required to report future use phase emissions in the year of sale. This inflates reported emissions of durable goods in comparison with short-lived products, and also impedes the reporting of upgradability (e.g. where the upgrade decreases use-phase emissions due to energy efficiency improvements)
- Including methods to depreciate or amortise use-phase emissions over a product's lifetime, or adopting annualised emissions reporting, are potential approaches to ensuring that the use-phase emissions of durable products can be fairly compared with those of short-lived goods

4. Revise guidance for circular material outflows
Relating to the emissions of products at their end of use and under categories 5 (Waste Generated in Operations), 10 (Processing of Sold Products), and 12 (End-of-life Treatment of Sold Products) of the GHG Protocol

- The current guidance fails to make visible the quantitative differences in emissions arising from waste-to-energy incineration, and circular solutions at the end of life. Companies also face a lack of clarity in accounting and allocating end-of-life emissions when products and materials previously considered waste are reintroduced to value streams as inputs
- Clarifying end-of-life emissions allocation for products with multiple life cycles, and requiring waste-to-energy incineration to be reported, are needed to ensure the guidance does not conflict with circular emission reduction strategies

5. Revise guidance for circular economy financing
Relating to the reporting of emissions by financial institutions under Category 15: (Investments) of the GHG Protocol

- The voluntary accounting of the Scope 3 emissions of investee companies by financial institutions means that circular activities in a value chain that are impacting emissions can be hidden from investment decisions. It can also cause a distortion in emissions reporting, as the implementation of some circular activities, such as rental models, may shift emissions from Scope 3 to Scope 1 in the inventory, causing a false perception in the eyes of investors of an increase in emissions
- Mandatory reporting of the Scope 3 emissions of financial portfolios is recommended to give financial institutions greater visibility of those emissions

Making the proposed revisions would allow businesses and investors to better assess the climate impacts of circular activities. Removing disincentives to the adoption of these activities will enable the socio-economic benefits of the circular economy to be reaped, while helping to meet global environmental challenges.

The importance of climate accounting in the circular economy transition

Five key revisions to the GHG Protocol standards and guidance can support the transition to the circular economy by enabling a fair and accurate emissions inventory for organisations engaging in circular economy activities. In this paper, 'fair and accurate' aligns with the GHG Protocol's objective to create a 'fair and true' account of emissions.

The GHG Protocol is the world's most widely used framework for measuring and managing greenhouse gas emissions (Box 2). Currently, its standards and guidance reflect the dominant linear economic system — assuming one life cycle per product, with one clear beginning and one clear end — from cradle to grave; i.e. extracting resources, manufacturing products and materials out of them, and selling these goods to a customer, after which they are disposed of as waste.

As part of an accelerating system shift towards a circular economy, an increasing number of businesses are engaging in activities that break away from the linear operational system — which is highly extractive, polluting, and wasteful, and results in GHG emissions. These activities offer multiple alternative beginnings and end-of-life solutions for materials and products that are not reflected in the current accounting methodologies and guidance, leading to inaccurate emissions accounting and attribution.

In the circular economy, materials never become waste, and nature is regenerated. Based on three principles — eliminate waste and pollution, circulate products and materials, and regenerate nature — the circular economy gradually decouples economic activity from the consumption of finite resources. Driven by design, products and materials are kept in use through circular activities like maintenance, reuse, refurbishment, remanufacture, recycling, and composting. **When applied to the ways businesses operate and create value, circular solutions can help tackle climate change, along with other global challenges such as biodiversity loss, waste and pollution** (Box 1).

To reach net zero and tackle the approximately half of global emissions associated with material extraction and processing, which the renewable energy transition cannot fully address,[2] we need to rethink the way we make, use, and dispose of products and materials.[3] This is where the transition to a circular economy has a critical role to play.

It follows that to enable investors and companies to harness the opportunities provided by the circular economy, climate emissions accounting standards must, as a minimum, ensure a fair and accurate account and attribution of the emissions associated with circular business models and activities. Through accurate inventories, companies and investors will be better able to assess the impact of circular activities on net-zero targets, whether they result in an increase, decrease, or no change in emissions, and make more informed decisions on which products and services to invest in to meet their climate goals. Importantly, the transition to the circular economy should not be inadvertently penalised in emissions accounting frameworks.

As the GHG Protocol forms the basis upon which most organisations account for their emissions, adaptations to its methodology would have far-reaching impacts in better-equipping businesses, policymakers and the finance sector to tackle climate change.

It is also important to note that not all activities that reduce emissions are equivalent when evaluated through a systems perspective. One tonne of CO2e may result either from an activity which pollutes, degrades nature, and depletes natural resources, or from a similar activity carried out in a way that has wider associated benefits, such as keeping materials in circulation for longer and regenerating natural ecosystems. While the standards for measurement will be agnostic to these two scenarios, policy agendas and business commitments are simultaneously seeking to address key challenges, such as biodiversity loss and pollution, while creating economic opportunities. The circular economy is a solutions framework that can help tackle multiple global challenges at once, and the insights below are relevant to those often competing priorities.

Challenges

To enable the fair and accurate accounting of emissions associated with circular economy activities, two types of challenges need addressing:

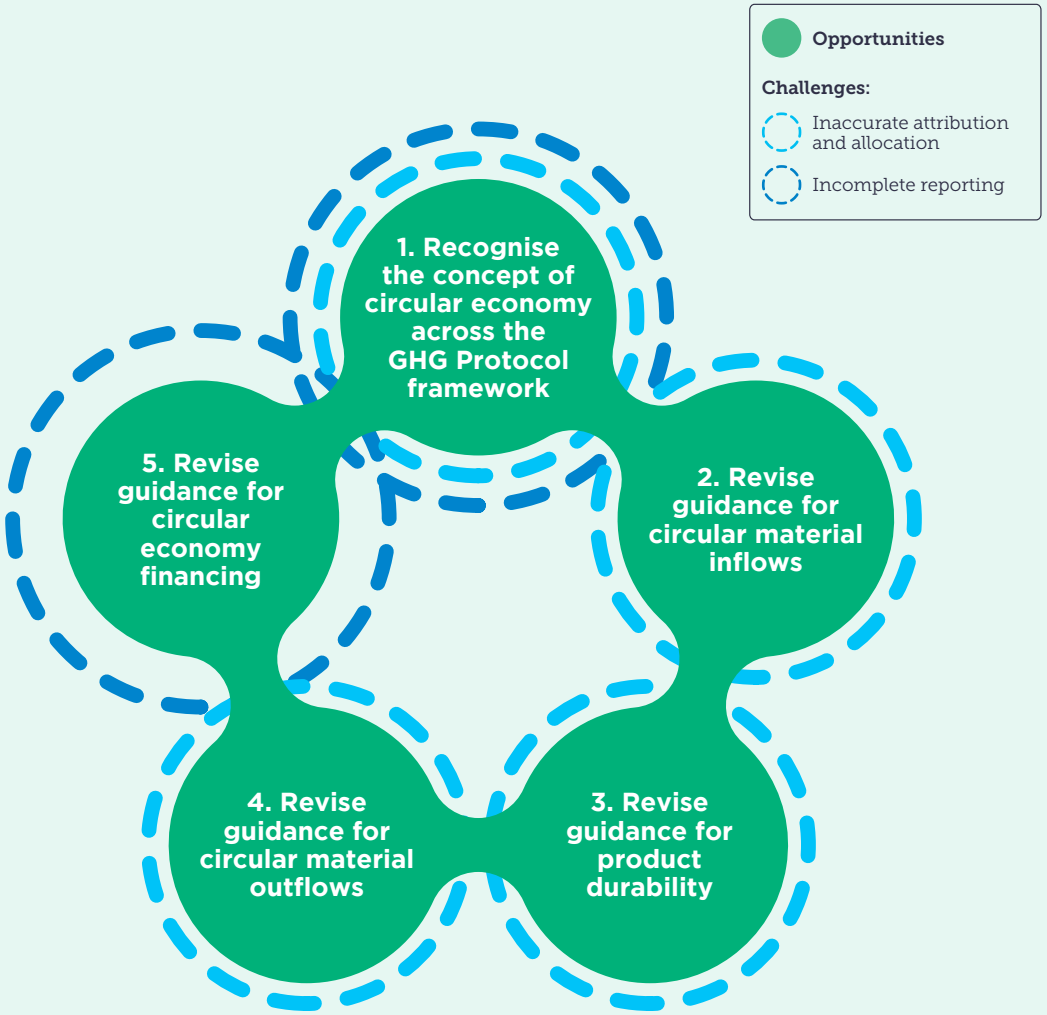
1. **Inaccurate attribution and allocation:** emissions are incorrectly or not optimally attributed to activities, and also not allocated optimally between multiple entities or across the whole lifecycle of a product (refer to Opportunities 1, 2, 3, and 4)
2. **Incomplete reporting:** emissions are not being fully disclosed due to optional reporting (refer to Opportunities 1 and 5)

Opportunities

To address these challenges, this paper identifies five opportunities for revisions to the GHG Protocol's Scope 3 standard and guidance:[I]

1. **Recognise the concept of circular economy across the GHG Protocol framework**
2. **Revise guidance for circular material inflows**
3. **Revise guidance for product durability**
4. **Revise guidance for circular material outflows**
5. **Revise guidance for circular economy financing**

To correctly capture the impact of circular economy activities on emissions, it is essential to address these challenges in a way that avoids undermining the integrity of the current disclosure ecosystem, promotes interoperability between disclosure initiatives, and protects existing targets that align climate commitments with business success.



I These five areas also align well with feedback and proposals provided by GHG Protocol stakeholders in the recent public consultation (March 2023) and published in ***Scope 3 Survey Final Summary Report and Scope 3 Final Proposals Summary*** (2024)

BOX 1

How circular solutions can help reduce GHG emissions

Eliminate waste and pollution

The first principle of the circular economy focuses on stopping waste from being generated in the first place, with an emphasis on the upstream design of products, operations, and business models.

Example(s) in practice:

- In the automotive sector, designing cars with fewer and lighter materials to avoid structural waste could reduce the emissions of the sector by 89 million tonnes CO_2e per year[4]
- In the food sector, measures such as redistributing surplus edible food for human consumption and discounting soon-to-expire products, combined with behavioural changes, could reduce edible food waste by 50% by 2030 with a potential annual emissions reduction from across the food value chain totalling 1.4 billion tonnes CO_2e[5]

Circulate products and materials

The second principle is about keeping materials in use, either as a product or, when this is no longer possible, as components or raw materials. Keeping products in use with minimal reprocessing (such as reuse and repair) contributes to retaining the product's embodied energy, and can reduce emissions associated with new production and end-of-life treatment while maintaining product utility.

Example(s) in practice:

- If refillable and returnable designs and models were to be applied to all plastic packaging in the personal care, beverage, and food industries, emissions savings would represent a 35–70% reduction compared to today's single-use packaging[6]
- Where products and materials can no longer be kept in use in their original form, material recycling can generate energy savings that is preferable to extracting virgin materials. Steel recycling, for example, uses 10-15% of the energy required to produce primary steel[7]
- In the food system, recirculating materials, such as food by-products, and transforming them into new food products, materials (like textiles), or soil fertility products, can prevent emissions from landfill and contribute to the regeneration of natural systems by returning nutrients to the soil

Regenerate nature

The third principle focuses on supporting natural processes. Instead of continuously degrading nature, natural capital is rebuilt by employing land use practices that allow nature to replenish soils, increase biodiversity, and return biological materials to the earth.

Example(s) in practice:

- Growing food and biomaterials using agricultural practices that build soil health exemplifies this principle. By applying regenerative cropland techniques on arable land (e.g. using cover crops and organic fertilisers), the emissions associated with growing certain crops can be reduced and the carbon sequestration ability of soil can be increased, enabling an annual carbon benefit of 2.5 billion tonnes CO_2e in 2050[8]
- Similarly, by adopting practices supporting regenerative outcomes to the production of wheat, dairy, and potatoes in the EU and UK, the emissions of production could be reduced by 50% and biodiversity loss by 20%, while total food output could be increased by 5% and farmers provided with an additional USD 200 per hectare per year[9]

BOX 2

The GHG Protocol

The GHG Protocol is a widely used framework for measuring and managing GHG emissions. It provides standards for organisations to measure and report their emissions, forming the basis for climate disclosure worldwide, and organises emissions into three 'Scopes' based on where they occur in the value chain:

Scope 1: Direct emissions

GHG emissions from sources that a company owns or controls.

These emissions are the result of activities such as fuel combustion from company-owned vehicles, industrial processes (e.g. chemical production), and fugitive emissions (e.g. leaks from air conditioning units or equipment).

Scope 2: Indirect emissions from purchased electricity

Emissions that are generated from the production of electricity, heat, or steam that the company purchases for its own operations.

While the company does not produce these emissions itself, it is responsible for the emissions created by the utility supplying its energy.

Scope 3: Other indirect emissions from the company's value chain

All other indirect emissions that occur throughout a company's value chain, both upstream (suppliers) and downstream (customers) divided into 15 categories (listed on the right).

These emissions are more difficult to measure, as they rely on data from complex supply chains, but can represent the largest portion of a company's carbon footprint.

Circular economy activities can have a notable impact on the seven highlighted categories, making it crucial that guidance is revised in these areas to enable a fair and accurate emissions inventory for organisations engaging in circular economy activities.

Upstream:

- **Purchased goods and services**
- **Capital goods**
- Fuel- and energy-related activities not included in Scope 1 or Scope 2
- Upstream transportation and distribution
- **Waste generated in operations**
- Business travel
- Employee commuting
- Upstream leased assets

Downstream:

- Downstream transportation and distribution
- **Processing of sold products**
- **Use of sold products**
- **End-of-life treatment of sold products**
- Downstream leased assets
- Franchises
- **Investments**

Ensuring emissions inventories more accurately reflect circular business activity

1

Recognise the circular economy across the GHG Protocol framework

Relevant to [GHG Protocol] Scope(s) 1-3: Multiple categories

The guidance needs to address the following:

- Lack of guidance and definitions for circular economy activities beyond recycling
- Lack of clarity on emissions allocations between different actors in a circular value chain
- Optionality of Scope 3 reporting

Lack of guidance and definitions for circular economy activities beyond recycling

The GHG Protocol includes a definition of recycling and a methodology for accounting for its associated emissions (see the glossary for the role of recycling in a circular economy, and how it differs from the GHG Protocol's definition).[II] However, the guidance does not define the circular economy, nor does it offer definitions of circular approaches beyond recycling that keep products and materials in use and regenerate nature.[III]

The present guidelines are insufficient to account for emissions associated with other circular activities (such as rental) or the introduction of multiple lifecycles, which drive systemic changes, and challenge traditional resource flows as well as the concept of material ownership. As a result, there are inconsistencies and misunderstandings in how companies should account for circular economy activities that extend beyond recycling.

> ***Example:***
> **A car manufacturer that shifts its business towards rental.** As the manufacturer now retains ownership of the car while it is used by customers, the guidance on how emissions ought to be allocated and reported becomes unclear. Some emissions previously reported under Scope 3 (e.g. Category 11: use of sold products) may become part of the manufacturer's Scope 1 inventory.

Without clarity on what kind of changes need to be made to emissions accounting as circular activities are more widely adopted, and when these changes should be applied, there are risks of inconsistencies and inaccuracies in reporting. This lack of clarity also hampers businesses' visibility of the climate impact of their circular activities, posing barriers to the adoption and scaling-up of these strategies that have significant emissions reduction potential.

Lack of clarity on emissions allocations between different actors in a circular value chain

Circular economy activities often require collaborative and symbiotic relationships between companies and across industries to enable the continued circulation of products and materials at their highest value. There is insufficient guidance on how — and under what forms of collaboration — companies may allocate emissions across multiple parties. Such ambiguity can discourage circular economy initiatives and collaborations.

> ***Example:***
> **A pallet manufacturer sets up a pallet repair station on the premises of its customer.** This set-up is economically and operationally beneficial to both parties — compared to setting up a pallet repair station offsite.[IV] With the lack of clarity in the current guidance, the emissions from repairing the pallets (e.g. energy consumption) might be accounted for by the customer as they occur on its premises and from its use of energy, rather than shared between the parties.

II The GHG Protocol's current definition of recycling is: "Processes that occur as a result of a product or material being reused or recycled as a material input into another product's life cycle". Greenhouse Gas Protocol, ***Product Life Cycle Accounting and Reporting Standard*** (2011), p.136

III By contrast, the circular economy is recognised as a system solution in EU Reporting requirements — European Sustainability Reporting Standard (ESRS) E5: "A circular economy is a system that tends towards sustainable use of resources in extraction, processing, production, consumption, and management of waste. Such a system brings multiple environmental benefits, in particular, the reduction of material and energy consumption and emissions into the air (greenhouse gas emissions or other pollution), the limitation of water withdrawals and discharges, and the regeneration of nature limiting the impact on biodiversity". European Commission, ***Consolidated text: Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards*** (2023), p155/284

IV An offsite repair station would also potentially increase emissions for both parties due to the need for a separate site and fuel burning for additional transportation.

Although the Protocol allows collaborating entities to establish allocation agreements, there is a lack of guidance to clarify under which types of collaboration organisations within a value chain are allowed to allocate emissions across their respective inventories when practices are established to facilitate circular solutions.

Optionality of Scope 3 reporting

Due to Scope 3 reporting being optional for compliance with the GHG Protocol, circular economy activities are disincentivised in two ways.

First, Scope 3, which often represents the bulk of total emissions associated with a company's value chain, is where circular economy solutions have the highest GHG mitigation potential. By keeping scope 3 optional, companies lack visibility of the emissions benefits of adopting circular activities — through material procurement, product use, rental models and end of use — and are therefore not incentivised to adopt them (see examples of addressing emissions with the circular transition in Box 1 and in Figure 4).

Second, the optionality of Scope 3 allows the reporting of category 15 investment emissions to be limited to Scopes 1 and 2. In effect, financial institutions do not need to report on their portfolios' Scope 3 emissions. The reporting of portfolio Scope 3 emissions by financial institutions is crucial to unlocking capital for circular economy solutions that go beyond the low-carbon energy transition in reducing emissions. However, it should be noted that financial institutions would only be able to report on their portfolio Scope 3 emissions under category 15 if their investees themselves report on their Scope 3 emissions (see more in Opportunity 5. 'Revise guidance for circular economy financing').

Revisions for the Scope 3 Technical Working Group to explore further:

Lack of guidance and definitions for circular economy activities beyond recycling

- Define the term 'circular economy', include definitions of other terms relevant to the circular transition (such as reuse, refurbish, virgin, non-virgin, regenerative production, recycling etc.), and preferably align them with the Foundation's ***circular economy glossary***
- Establish accounting guidelines, methodologies, and examples of how the emissions associated with circular activities beyond recycling — such as rental models, increased product durability, and the introduction of multiple life cycles — should be reported in all Scopes and Categories. A proposed way to differentiate between circular economy activities includes the Ellen MacArthur Foundation's '***butterfly diagram: visualising the circular economy***'
- Increase clarity by stating that companies can use the 'recycled content method'[V] for other circular activities such as reuse, refurbishing, and repair

Lack of clarity on emissions allocations between different actors in a circular value chain

- Clarify under which types of collaboration companies are allowed to split emissions accounting and reporting between them

Optionality of Scope 3 reporting

- Explore the feasibility of making Scope 3 reporting mandatory for all organisations, including a requirement for financial institutions to report the Scope 3 emissions of their investee companies under category 15

V A methodology to allocate the emissions stemming from recycling. The GHG Protocol guidance states that: "The recycled content method allocates the recycling process emissions and removals to the life cycle that uses the recycled material." Greenhouse Gas Protocol, ***Product Life Cycle Accounting and Reporting Standard*** (2011), p.73

2

Revise guidance for circular material inflows

Relevant to [GHG Protocol] Scope 3: Category 1 – Purchased Goods and Services; and Category 2 – Capital Goods

The guidance needs to address the following:

- Lack of guidance for the upstream emissions associated with purchased products and capital goods designed to have multiple lifecycles

Lack of guidance for upstream emissions associated with multiple lifecycles

The GHG Protocol Scope 3 guidance for category 1 (purchased goods and services) and category 2 (capital goods) requires companies to report the emissions associated with all upstream activities (i.e. cradle-to-gate) for the production of goods or capital assets purchased or acquired during the reporting year. While the Protocol includes methods for accounting for recycled content, its guidelines are insufficient for other circular business models where products and capital goods are designed for durability and multiple lifecycles.

As the durability of products increases and the number of lifecycles and actors involved expands, there is a need for methodologies that support a distributed allocation of responsibility across the various stakeholders that take these longer emissions histories into account. The current guidelines do not adequately account for this complexity, which is essential for accurately capturing and attributing emissions in circular systems.

Example:
A piece of capital equipment that is refurbished and reused multiple times across different organisations (see Figure 1). While this practice reduces the overall emissions footprint of these organisations — compared to each of them acquiring their own new equipment — current accounting methods often fail to adequately represent this improvement. The initial emissions from manufacturing are difficult to allocate among the actors engaged in subsequent use cycles, leading to an incomplete picture of the emissions benefits.

Thus, the Protocol should incorporate new methodologies that account for non-virgin goods with complex emissions histories. This would ensure that circular solutions that can generate multiple benefits, such as extending product lifespan through reuse, repair, and remanufacturing, are adequately reflected. Without such updates, the Protocol's standards and guidance risk inadvertently favouring one-time recycling approaches over circular strategies that retain more of the embodied value of products and components over multiple lifecycles.

Revisions for the Scope 3 Technical Working Group to explore further:

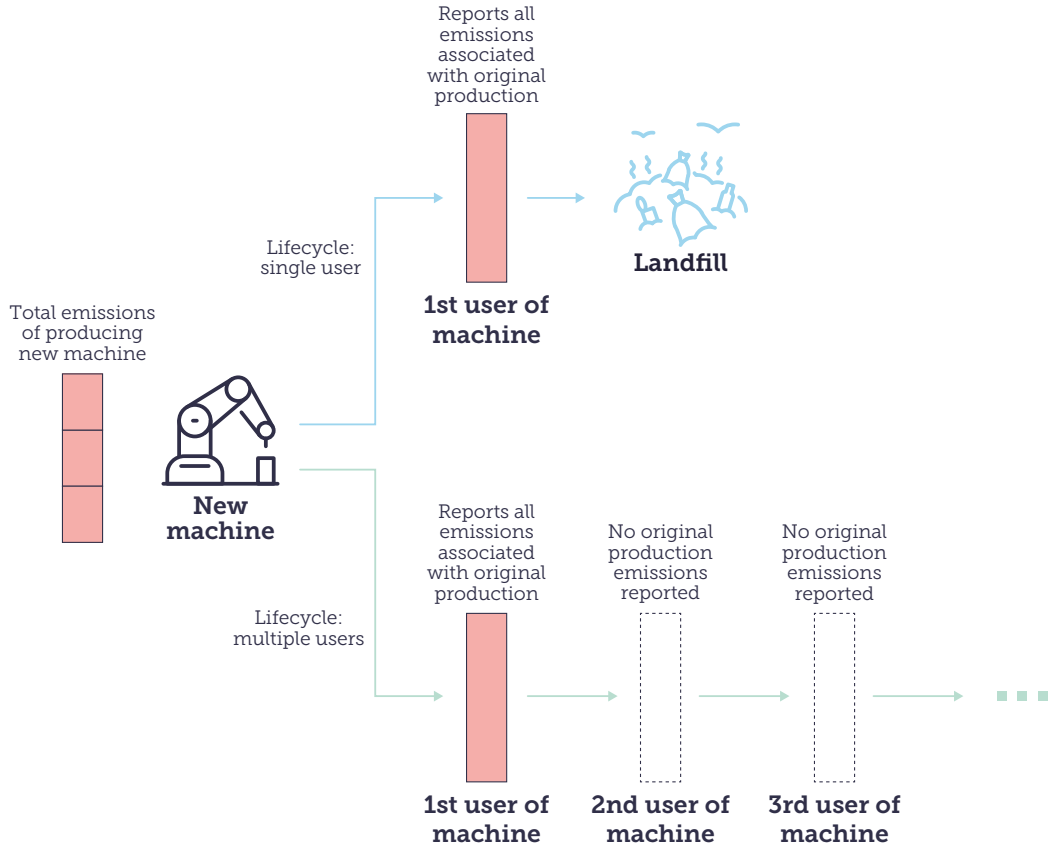
Companies' purchase of capital goods and products:

- Develop methodologies where the initial manufacturing emissions could be depreciated/amortised over the product's or asset's expected lifetime. This approach would facilitate a more distributed allocation of emissions among the various organisations benefiting from the product throughout its multiple lifecycles
- Consider introducing an explicit option for companies to adopt a 50:50 allocation method for products known to have only two life cycles or distinct users. This method could simplify the accounting process for specific cases where products are designed for one-time reuse or refurbishment

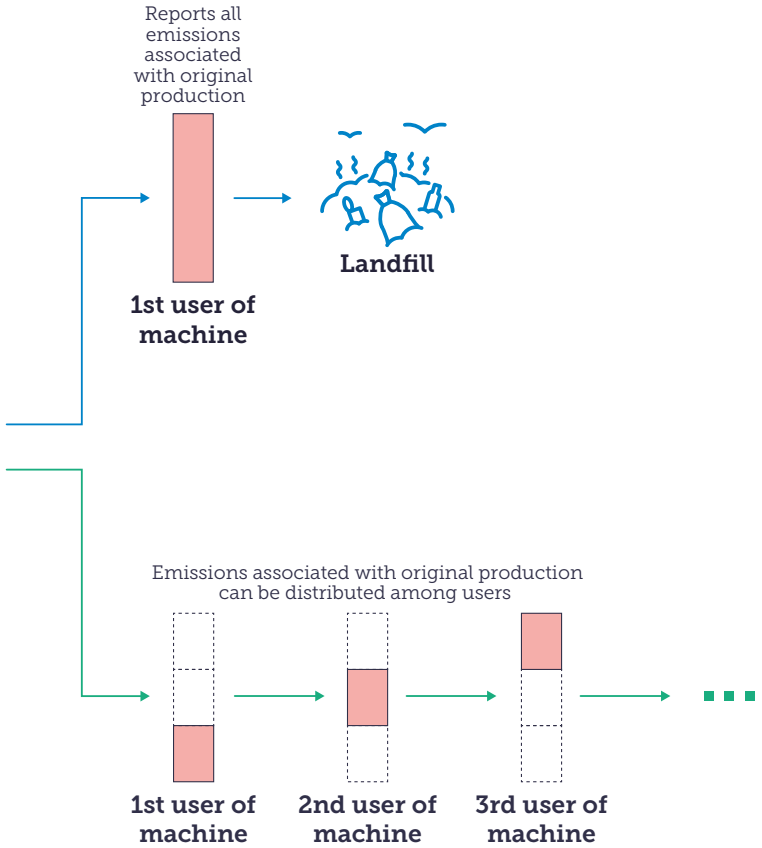
FIGURE 1

Production emissions: Category 1 and 2 emissions are allocated to the first user only

Current guidance – attributing upstream emissions to first user only does not incentivise reuse



Proposed revisions – upstream emissions distributed among users incentivises reuse



3

Revise guidance for product durability

Relevant to [GHG Protocol] Scope 3: Category 11 – Use of Sold Products

The guidance needs to address the following:

- The inadvertent disincentivising of improved product durability and upgradability in the accounting of use-phase emissions

Disincentivising of improved product durability and upgradability

In the Scope 3 Guidance for category 11 (use of sold products), companies are asked to report the total expected lifetime emissions of each product sold during that reporting year. For companies applying circular economy principles aimed at extending product and material lifetimes (e.g. through designing for durability or product upgradability), this presents a particular challenge, as prolonging the use-phase of goods increases the emissions reported to category 11 in the year of sale (i.e. due to higher expected Scope 1 and 2 emissions from increased product lifetime). As such, these initiatives are inadvertently disadvantaged.

Example:
Company A's washing machines are designed for durability and are expected to last four times as long as those of company B (see Figure 2). In the year of sale, company A would have to report four times as many emissions in category 11 for each washing machine, compared to company B. Company A's machines would thus appear much more emissions-intensive, although their emissions per use would be at least the same. This can disincentivise organisations from developing longer-lasting goods and the business models to support their continued use (e.g. repair and refurbishment).

Example (continued):
When also taking into account upstream emissions, the impact associated with a switch to more durable machines is even more significant because the manufacturing process only occurs once.

Similarly, the impact of circular strategies enabling product upgradability (such as design for modularity or disassembly) is not well captured in the category 11 guidance. As companies are expected to report the total expected lifetime emissions of their products in the year they are initially sold, any improvements that could apply to those products at later stages of their lifecycle are difficult to capture in the guidance.

Example:
A company manufactures mobile phones with batteries that can be easily removed and replaced. If the company were to develop a more energy-efficient battery, it could offer upgrades on previously purchased phones, enabling a reduction in the use-phase emissions of existing products compared to initial forecasts, while extending the lifespan of the product.

Currently, the potential emissions benefits of designing upgradable and therefore longer-lived products are not reflected in inventories. At the same time, other benefits of product upgradability may also be lost, such as reduced virgin material demand.

Revisions for the Scope 3 Technical Working Group to explore further:

Adapt the time horizons to be used for determining how emissions from the use of sold products are reported. For example:

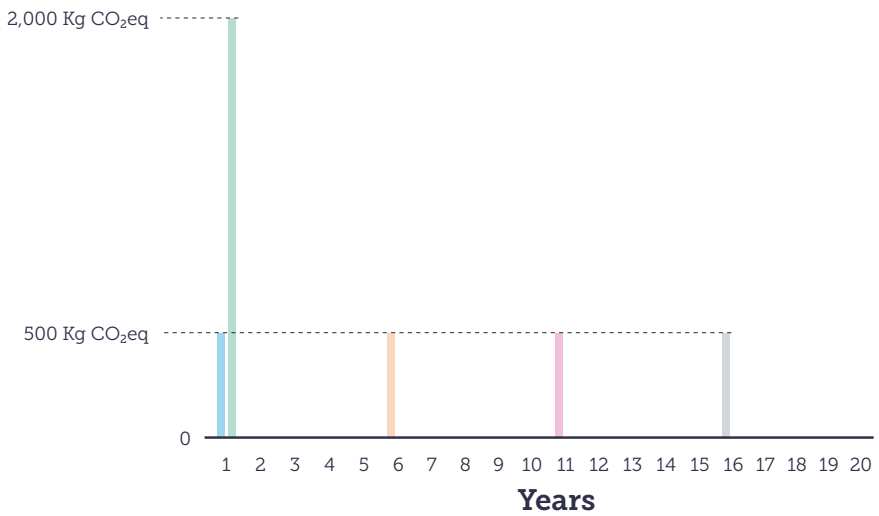
- Category 11 emissions could be depreciated/amortised over the product's lifespan, similar to how the value of assets is calculated in financial accounting. This would spread the total expected lifetime emissions of products during use over their expected lifetime, and, crucially, would allow for a reassessment each year of the expected lifetime emissions to take product upgradability into account
- An alternative approach is that companies could calculate and report use-phase emissions annually[VI]

VI Any emissions pathways that inform targets would need to be revised for both approaches.

FIGURE 2

Use-phase emissions: An increase in durability increases the emissions reported in year-of-sale

Current guidance – designing for product durability is not incentivised as the reporting of use-phase emissions in advance distorts a comparison with non-durable products



Non-durable machine designed to last 5 years: four new machines used over a 20 year period

New non-durable machine

New non-durable machine

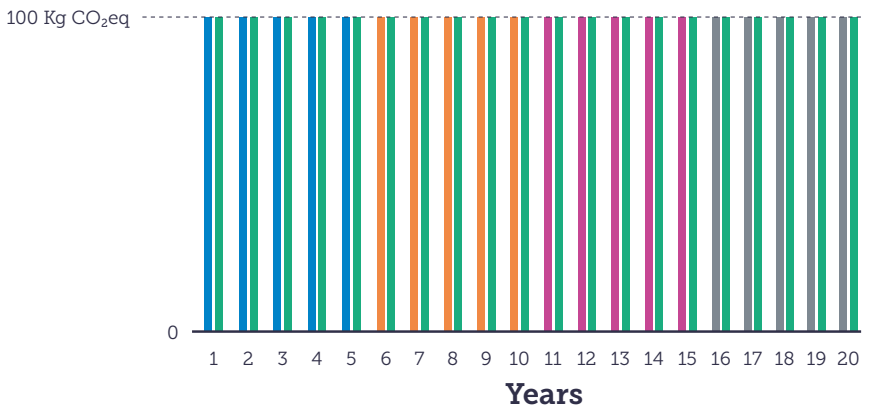
New non-durable machine

New non-durable machine

Durable machine designed to last 20 years

New durable machine

Proposed revisions – spreading the reporting of use-phase emissions over the anticipated product lifetime is more accurate and enables a fair comparison of emissions



Non-durable machine designed to last 5 years: four new machines used over a 20 year period

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New non-durable machine

New non-durable machine

Durable machine designed to last 20 years

New durable machine

4

Revise guidance for circular material outflows

Relevant to [GHG Protocol] Scope 3: Category 5 – Waste Genereted in Operations; Category 10 – Processing of Sold Products; and Category 12 – End-of-life Treatment of Sold Products

The guidance needs to address the following:

- Lack of guidance on the allocation of emissions from circular activities which reintroduce into the value stream materials and products otherwise considered to be waste
- Lack of guidance on the allocation of end-of-life emissions between organisations engaging in circular activities with multiple lifecycles
- Disregard for quantitative differences in i) emissions generated and ii) retention of embodied carbon between waste-to-energy incineration and circular practices
- Lack of visibility on the timeframe for reporting end-of-life emissions

Lack of guidance on the allocation of emissions associated with reintroduction and end-of-life

In a linear model, products reach a definitive end to their life cycle and become waste. This is reflected in categories 5 and 12 where, respectively, companies are asked to report the emissions incurred from the disposal and treatment of 'waste' from their operations, and from the 'end-of-life' disposal and treatment of their sold products. The accounting and allocation of emissions is unclear when products and materials considered waste are to be reintroduced to value streams as inputs.

By keeping products and materials in use for as long as possible through circular business models and activities — like resale, remanufacture, and upcycling food by-products — new use phases are introduced to product life cycles, blurring the lines of when products reach their 'end-of-life'. This blurring makes it unclear how the reporting of emissions from these circular activities should take place and leaves room for different interpretations of the Protocol.

Example:
A carpet manufacturer repurposes its products at their end of use (see Figure 3). If a carpet manufacturing company collects its products from customers when they are no longer wanted and, instead of sending them to incineration, sells them as material inputs for the manufacturing of furniture, it is unclear whether the carpet company ought to report the emissions of this repurposing under category 12 (end-of-life treatment of sold products) or move them to category 10 (processing of sold products). The challenge is exacerbated by the limited definitions and lack of emissions factors for circular activities that can retain more value (e.g. repair, resale) compared to recycling, which is well-defined. This in turn makes it difficult for companies to accurately reflect the impact of these solutions.

At the same time, there are questions on how end-of-life emissions should be allocated between organisations engaging in circular activities. The more use phases a product has, the more difficult it is for companies to have visibility of, and be able to assess, the emissions of all the applications. For example, if, at its end of use, the furniture manufactured using material from the carpet industry was to be repurposed to become insulation for the construction sector, at what point would the materials of the initial carpet company be considered to be undergoing end-of-life treatment? This becomes particularly pertinent when products are resold and circulated in other industries. The material's journey becomes more convoluted and having visibility of it becomes more challenging. When alternative solutions to linear end-of-life practices are implemented, there is no clear guidance on how to approach the allocation of responsibility among all actors involved in the process.

Emissions from incineration practices

In addition to these challenges, the guidance disincentivises the adoption of circular solutions by allowing inventories to exclude emissions from certain linear cradle-to-grave practices. For example, under the waste-to-energy guidance, companies can discount emissions generated through the incineration of their products if this process generates energy. This is the case whether the energy is used by the company directly or fed into the electricity grid, and means that emissions from incineration with energy recovery are omitted from companies' inventories. This accounting methodology fails to make visible any quantitative

difference in emissions generated between incineration with energy recovery, which is not part of a circular economy, and circular practices, such as repairing, reusing, and recycling, which retain the embodied value and carbon of existing products. This would be resolved by revising the methodology to require the reporting of emissions from waste-to-energy incineration.

Lack of visibility on the timeframe for reporting end-of-life emissions

Finally, as with the accounting challenges associated with increasing product durability, forecasted data can create hurdles for circular economy solutions at the end-of-life. Companies have to forecast the emissions of their products' end-of-life treatment in the year these products are sold, without visibility or knowledge of when or how their products are actually disposed of. This is particularly difficult for companies engaged in circular economy activities when multiple use cycles are introduced, or products have very long life cycles. Without revisions to how and when these end-of-life emissions are accounted for (i.e. in the year of production or the actual end of life), the accuracy of reported emissions will remain uncertain. Companies may be tempted to choose end-of-life treatments that are easier to account for, such as incineration, rather than circular options, such as repair and remanufacture, which lack clear guidance but are less carbon-intensive, address challenges such as biodiversity loss and pollution, and create economic value (e.g. by reducing costs of raw material extraction).

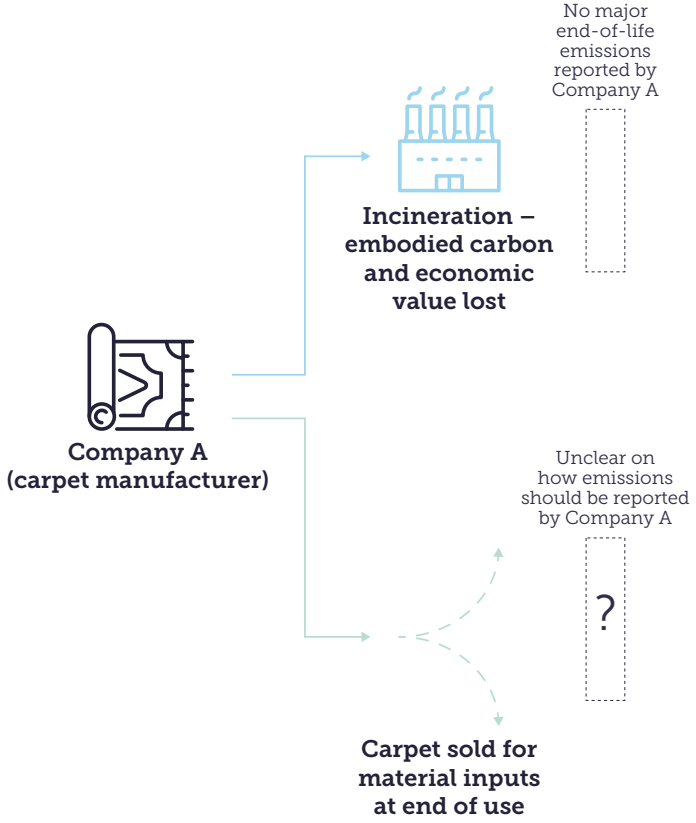
Revisions for the Scope 3 Technical Working Group to explore further:

- **Require companies to include the emissions from end-of-life incineration in full, without energy discounting methods.** To prevent double counting, this should be applicable unless the company can demonstrate that it directly consumes the same energy it generated at end of life, in which case these emissions would already be captured in the company's inventory for Scope 1 or 2
- **Evaluate the possibility of reporting end-of-life emissions in the year they occur,** rather than forecasting them in the year the product is originally sold
- **Explore reviewing the role of category 10 (processing of sold products) in a circular economy** when companies repurpose materials previously considered waste into new product streams, as in the carpet-furniture-insulation example above
- **Collaborate with relevant stakeholders to develop clear emissions factors** for circular activities that can retain more value (e.g. repair, resale, and remanufacture)

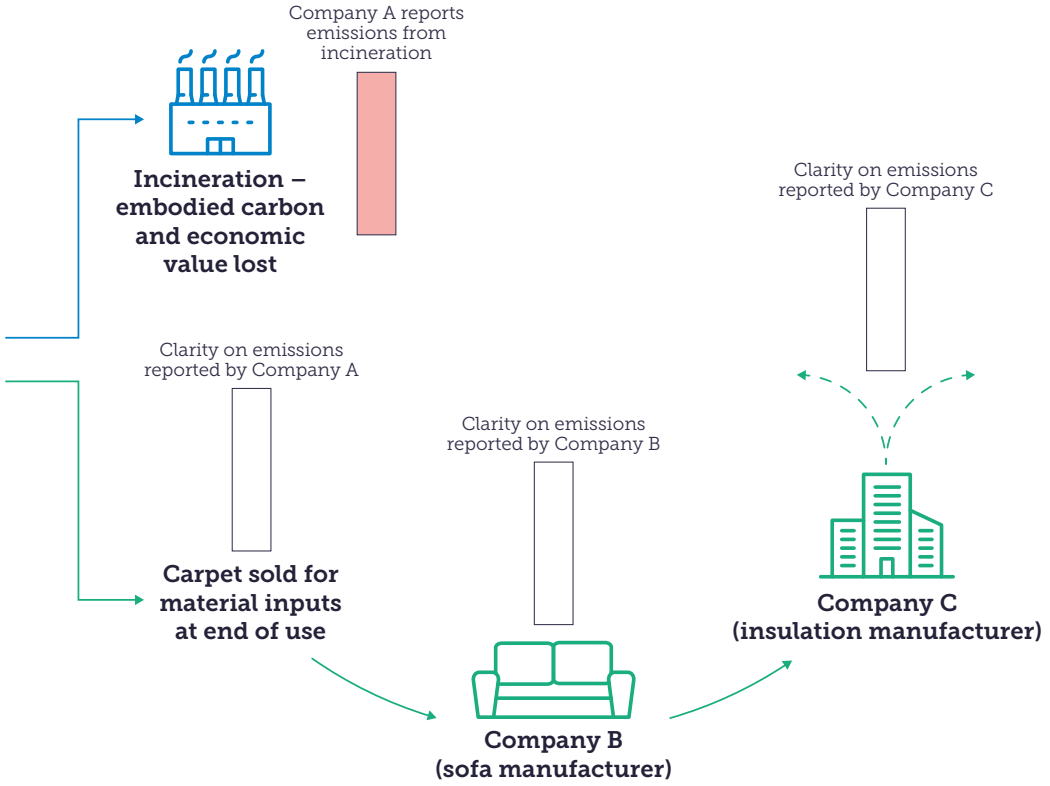
FIGURE 3

End of life emissions: Emissions from waste-to-energy incineration are excluded, and emissions allocation is unclear when 'waste' products and materials are reintroduced into value chains

Current guidance – emissions from waste-to-energy incineration are not accounted for and the allocation of emissions is unclear when products and materials are reintroduced into other value chains



Proposed revisions – account for emissions from waste-to-energy incineration, and provide clear guidance on the allocation of emissions from circular activities reintroducing into the value chain materials and products formerly considered waste



5

Revise guidance for circular economy financing

Relevant to [GHG Protocol] Scope 3: Category 15 – Investments

The guidance needs to address the following:

- Lack of visibility of Scope 3 portfolio emissions
- Lack of visibility of shifts from Scope 3 to Scope 1 in portfolio emissions

Lack of visibility of Scope 3 portfolio emissions

The current category 15 guidance requires financial organisations to report the Scope 1 and Scope 2 emissions of investees, and stipulates that Scope 3 categories must be included if they are significant to the investment. However, the Protocol allows organisations, covered by category 15, to determine their own significance threshold based on their business objectives. Reporting Scope 3 emissions is therefore optional for – and in practice often goes unreported by – financial institutions, investors, and organisations that provide financial services. This presents particular challenges to the circular economy transition as most of the emissions impact of circular activities and climate benefits are associated with organisations' Scope 3 activities.

Without mandatory reporting of Scope 3 emissions by investee companies, investment decisions can become skewed towards a low-carbon energy transition as only Scope 1 and 2 data are widely reported and therefore available for use by financial institutions when making their investment decisions. With improvements in energy efficiency and the transition to renewable energy only able to address half of global emissions, investments in this space alone will not be enough to reach net zero. To tackle the remaining emissions, circular economy investments, which provide new ways to make and use products, materials, and food, will be crucial. To encourage these investments, financial institutions will need more visibility of the Scope 3 profiles of their portfolios.

Lack of visibility of shifts from Scope 3 to Scope 1 in portfolio emissions

The current guidance on category 15 can mean companies engaging in certain circular business models (such as rental) have artificially inflated emission profiles in the eyes of investors. This is due to changes in product ownership that require shifting the reporting of emissions from Scope 3 to Scope 1. As financial institutions are not required to report on their investees' Scope 3, any shift in an investee's emissions from Scope 3 to Scope 1 will incorrectly make it seem like additional emissions are being generated (in fact, circular business models have the potential to reduce total emissions, compared to linear scenarios by reducing the need for production). This distorts the evaluation of the emissions impact of these investments, and can disincentivise capital from flowing towards companies engaged in such circular activities.

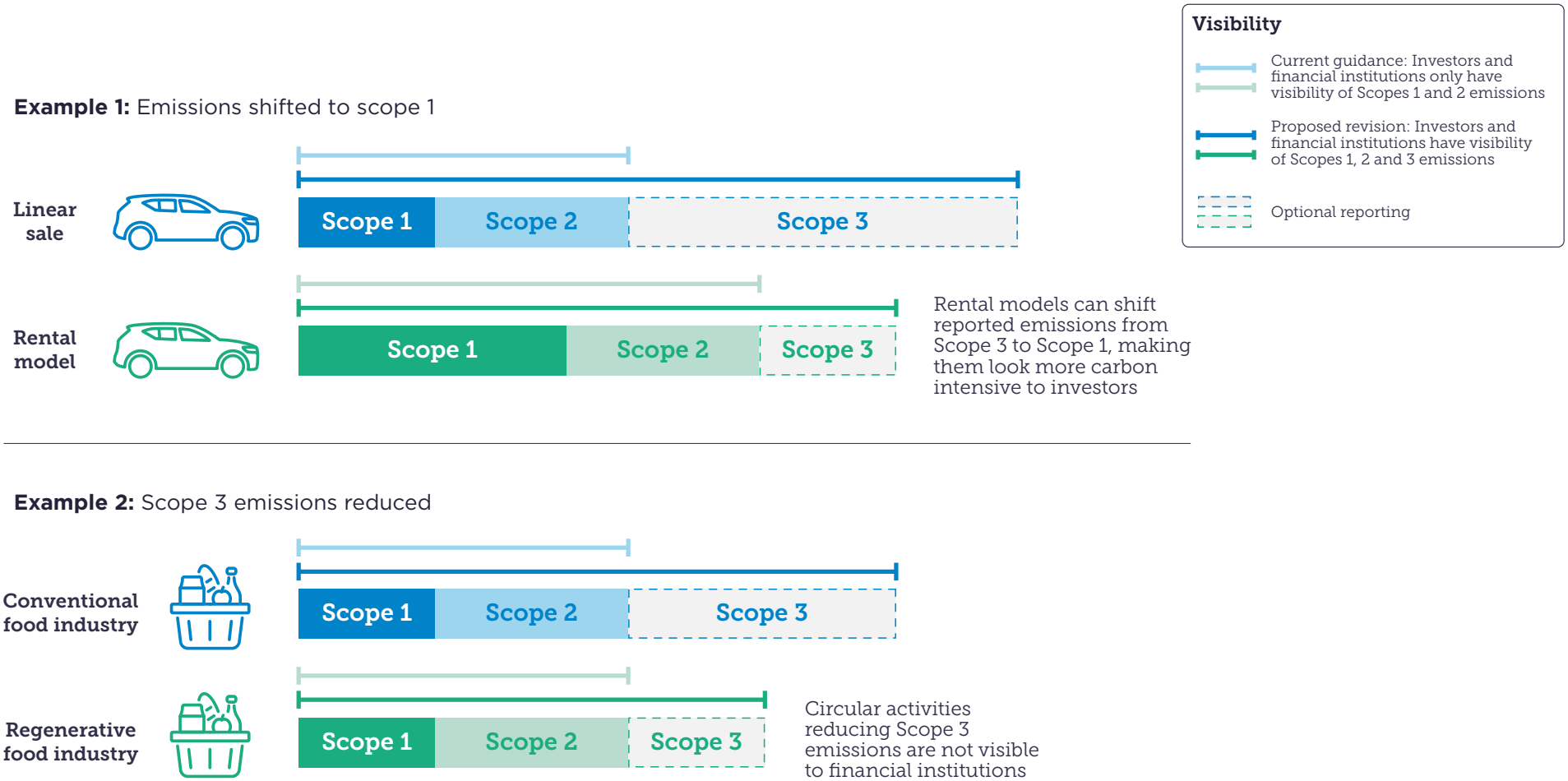
Therefore, financial institutions lack both visibility of the emissions impact of circular economy activities, and information on the differences in emission reductions realised from higher value 'inner loop' strategies (e.g. increased product durability and rental models that enable products to be reused and repaired) in comparison with recycling (see Figure 4). Visibility of these emission benefits would enable financial institutions to allocate capital to the most impactful circular economy decarbonisation solutions and, therefore, help decarbonise their financial portfolios.

Revisions for the Scope 3 Technical Working Group to explore further:

- **For organisations whose primary source of revenue is financial services, assess the implications of requiring category 15 (investments) to include Scope 3 emissions of investee companies.** Revisions to category 15 requirements should avoid any negative unintended consequences, such as potential double counting of emissions within a reporting entity
- **In parallel, explore the feasibility of making Scope 3 reporting mandatory for all companies wanting to comply with the GHG Protocol standard** so that those financial institutions reporting on category 15 have the appropriate data

FIGURE 4

Portfolio emissions: financial institutions lack visibility on the impact of circular solutions on their portfolio Scope 3 emissions



Additional insights: reporting of avoided emissions

Circular activities may result in both reduced and avoided emissions.

This paper focuses on the priority revisions needed to the GHG Protocol to enable a fair and accurate account of inventories: avoided emissions are not part of climate emissions inventories.

There are benefits to the calculation of avoided emissions. For example, it can serve as a decision-making tool to drive meaningful changes that scale circular solutions, guide product design and research, and influence portfolio planning. Such a calculation could be used to determine which products to develop and which to retire, or to evaluate the benefits of increased product utilisation, such as reductions in emissions per use, which can help users maximise the embodied value of existing products. It can also help evaluate the impact of enabling circular solutions down the value chain: for instance, a chemical company providing solutions that enable its customers to lower the emissions of their products during use.

According to the Protocol, businesses find it valuable to calculate avoided emissions because it can improve their brand image and highlight positive decisions within the company that are not shown on emissions inventories.

The Protocol's approach to differentiate between emissions inventories and avoided emissions is effective in reducing challenges of mixed data sets that could hinder the accuracy and interpretation of company reports, as well as lead to risks of greenwashing. As the calculation of avoided emissions relies on predictions and hypothetical scenarios, it offers a view into potential emissions impacts, rather than realised ones. Avoided emissions disclosures are not included in requirements developed by the International Sustainability Standards Board (ISSB) nor by the EU Corporate Sustainability Reporting Directive (CSRD).

Nonetheless, for further guidance that may be developed specifically for avoided emissions, the following insights on the topic might provide useful starting points:

- A number of large companies are developing their own avoided emissions methodologies, resulting in considerable uncertainty and variation, and harming the credibility of avoided emissions claims
- The lack of standardisation is also leading to issues in accelerating collaboration in value chains. For example, if the postive impacts are not part of their inventories, companies are unsure how to attribute them to different actors in the value chain
- The World Business Council for Sustainable Development's (WBCSD) avoided emissions guidelines have helped address some of these gaps, but further guidance is needed to accelerate harmonisation, accountability, and transparency on avoided emissions[10]

Endnotes

1 Ellen MacArthur Foundation, ***Circular Economy Systems Diagram*** (2019)

2 Ellen MacArthur Foundation, ***Completing the picture: How the circular economy tackles climate change*** (2019)

3 UNEP, International Resource Panel, ***Global Resources Outlook 2024: Bend the Trend – Pathways to a liveable planet as resource use spikes*** (2024)

4 Ellen MacArthur Foundation, ***Completing the picture: How the circular economy tackles climate change*** (2019)

5 Ellen MacArthur Foundation, ***Completing the picture: How the circular economy tackles climate change*** (2019)

6 Ellen MacArthur Foundation, ***Unlocking a reuse revolution: scaling returnable packaging*** (2023)

7 Material Economics, ***Industrial transformation 2050: pathways to net-zero emissions from EU heavy industry*** (2019)

8 Ellen MacArthur Foundation, ***Completing the picture: How the circular economy tackles climate change*** (2019)

9 Ellen MacArthur Foundation, ***The big food redesign: Regenerating nature with the circular economy*** (2021)

10 WBCSD, ***Guidance on Avoided Emissions. Helping business drive innovations and scale solutions towards Net Zero*** (2023)

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