Baillie Gifford™

Avoided emissions methodology

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Foreword

Much of the world is committed to limiting global warming to well below 2C and pursuing efforts to limit it to 1.5C, with many countries establishing targets for net zero emissions by mid-century. This entails increasing demand for innovations, technologies, products, and infrastructure that either avoid or remove greenhouse gas (GHG) emissions. Companies developing and supplying such climate solutions are likely to see rapid growth in demand for their products and services.

In order to inform investments in climate solution growth markets, information is needed on the technologies and products that are expected to avoid emissions at scale, as these will likely be the largest growth opportunities. However, although standard corporate-level GHG inventories are useful for identifying the carbon intensity of a company's own value-chain, they only provide backwards-looking information. They do not reflect the potential emissions reductions caused by a company's products or services. Similarly, there are limitations to the amount of information provided by taxonomies, such as the EU taxonomy for sustainable activities, which provide binary information but do not reflect the scale of opportunity from different technologies.

The methodological approach developed by Baillie Gifford's Climate Team seeks to address many of these issues. The estimation of avoided emissions is forward-looking, covering the investment time horizon and beyond, rather than providing a backwards-looking statement of avoided emissions occurring in a previous year. Growth opportunities are inherently about the future, and forward-looking estimation is essential for this purpose.

Another key feature of the analysis is the depth of understanding and scrutiny of each company that is assessed. Deep dives into specific technologies and markets reveal new questions and challenges for how to quantify and allocate avoided emissions, and this learning is used to refine further and develop the methodological approach. This analysis is highly useful for estimating avoided emissions, and contributing to the development of good practice in this important and emerging area.

Matthew Brander

Matthew Brander is a senior lecturer in Carbon Accounting at the University of Edinburgh. Since 2006, he has worked in consultancy and academia, specialising in greenhouse gas accounting and climate change policy. Baillie Gifford pays him for consultancy work. This foreword has been provided as part of this consultancy agreement.

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Introduction

Growth opportunities are inherently about the future, and forward-looking information is essential for this purpose.

This document provides an overview of the avoided emissions methodology our Climate Team has been developing. On the face of it, accounting for the contributions that companies can make through the avoidance of emissions should be relatively simple, as we have a consistent quantitative measure, carbon emissions, that we can apply universally, yet there are many complexities to take into account. Working with Dr Matthew Brander from the University of Edinburgh, our methodology incorporates the most up-to-date academic thinking on carbon accounting, meets international standards such as the GHG Protocol Policy and Action Standard, and offers a robust framework for supporting investment decision-making. This methodology will evolve over time as we work with Dr Brander and other academic experts to push best practices forward, and with companies to unearth more accurate and insightful data to inform our estimates.

This Methodology was developed by Michelle O'Keeffe, Paulina McPadden, Michael Pye and Matt Jones.

For any queries regarding the Methodology, please email **matt.jones@bailliegifford.com**.

The basics

What are avoided emissions?

Avoided emissions are not a new concept. Put simply, they are the reduction in emissions generated from a product or activity that differs from the status quo. Complexity arises when we estimate avoided emissions at different scales, over different time periods and for different activities. Our methodology is about estimating avoided emissions for companies and their products and services. We do this on a forward-looking basis. We ask how a company's activities might change emissions in the future and what impact this will have on a global scale. The line graph below provides a basic model for understanding avoided emissions. Here we compare the baseline scenario where the solution doesn't exist, to the scenario where we think a solution will reduce society's emissions.

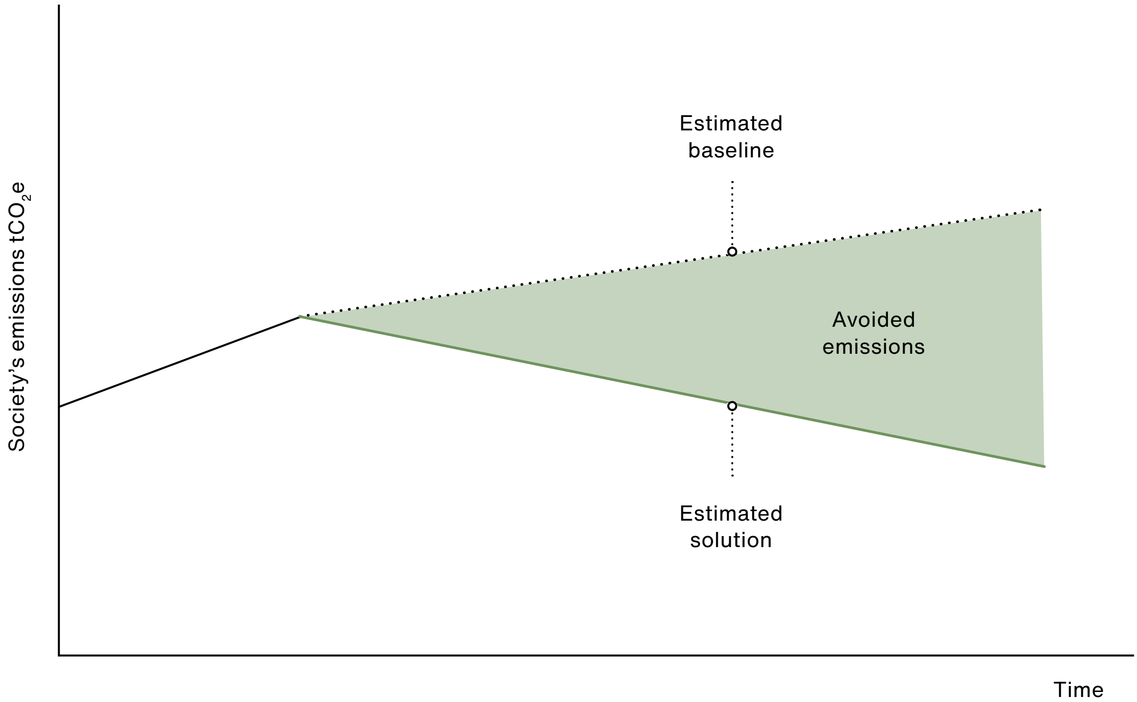
Estimated baseline

The baseline is the scenario where nothing has changed: the status quo remains the same. In Figure 1, the baseline sees emissions increasing. Using research and common sense to estimate what the most realistic baseline could be is a key feature of this methodology, ensuring we do not overstate the potential impact of the companies analysed.

Estimated solution

Companies that reduce emissions through the function of products and services provide climate solutions. Figure 1 shows a linear forecast in the declining emissions from such a solution, resulting in greater year-on-year avoided emissions over time.

Figure 1



Why is estimating avoided emissions useful?

Many companies contribute to reducing GHG emissions. The focus of our analysis is on finding those that have the potential to deliver significant reductions over a 5-10-year time horizon. Understanding this potential is challenging without a clear metric that can be used as a reference across companies and within the context of 50 billion metric tonnes of carbon dioxide emitted globally per year.

We use financial data to build the investment case for a company. We can use emissions data to improve our insight. Effective climate solutions should have significant emissions reduction potential. Aligning our investment case with our avoided emissions estimate helps us understand the scale of the opportunity and the potential impact a company could have. It also raises unlocking questions about the company we are looking to invest in:

- How closely are emission reductions tied to this company's success?
- How much control does the company have over its avoided emissions?
- How unique or differentiated is the solution provided by this company?

The before and after scenarios are based on a range of assumptions with varying levels of information. Exploring these assumptions helps us better understand what might affect the company's chances of success and the likelihood that they can deliver on our expectations.

Avoided emissions are also helpful for prioritisation. Do we want to be investing in companies that have the potential to reduce significant emissions now, or should we be looking for those that will benefit from tailwinds later in the transition? We can estimate avoided emission over different time periods, and explore the trajectories of both volume and value.

Finally, they are helpful for communication. Plenty of work has been done on avoided emissions within the private equity environment, focusing on emergent solutions in early-stage companies. We believe there is also significant opportunity for climate impact within publicly-listed companies that already have the expertise and capital to scale solutions now. Communicating this potential is challenging and avoided emissions analysis provides a helpful lens for thinking about potential company upside.

Key principles

Dynamic baselines

The world we live in is changing; the transition is happening. As such, company production in year one will displace a different set of products 10 years in the future as our energy supply, behaviours and opportunities evolve in a low-carbon way. It is not appropriate to simply multiply the avoided emissions in year one by the number of years of operation – each individual year should be calculated against the appropriate baseline in that year. Figure 2 shows the difference between a static and a dynamic baseline.

For example, renewable energy is increasingly becoming part of the global energy mix. The average emissions intensity of different electricity grids is changing. In 2021, the global average for each kilowatt hour (kWh) of electricity produced emitted around 460 grams of CO_2e*. Under the International Energy Agency (IEA) net zero scenario, this reaches 138 grams by 2030. However, different countries are starting from different bases, such as China, with an intensity of around 600gCO_2e/kWh, versus Sweden, where it is closer to 50gCO_2e/kWh. A dynamic baseline considers such factors as these emissions reduce over our 10-year time horizon.

* According to the IEA's Net Zero Energy scenario

Forward-looking

The combination of annual avoided emissions, product lifetime, dynamic baselines and potential sales growth enables us to build a forward looking picture.

For example, if we invest in a company that produces an electric vehicle in 2025, and we expect that car to last for 12 years, then we can calculate a lifetime avoided emissions estimate. Figure 3 below illustrates how these forward-looking estimates are unlikely to be linear, as we may assume different growth rates over different periods. If our growth forecasts are correct, however, the actual and estimated avoided emissions will eventually converge.

Figure 2

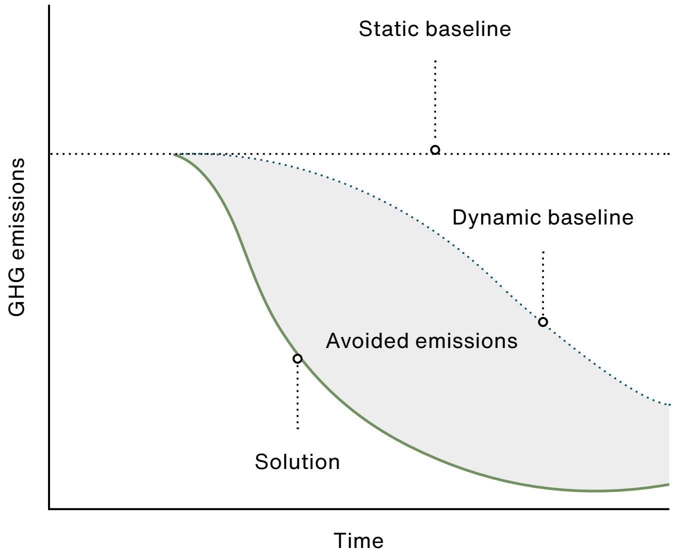
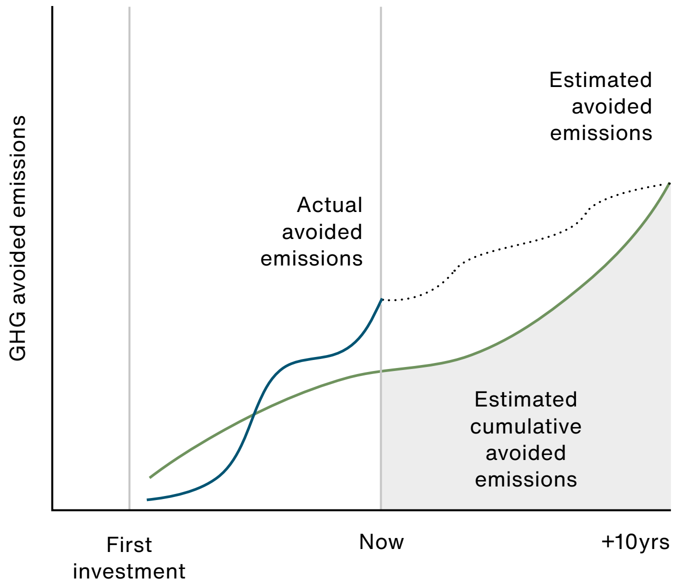


Figure 3

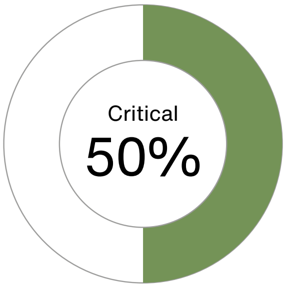


Attribution

The attribution factor aims to reflect the importance of each company's contribution, relative to the overall system required to deliver a full climate solution. It is an arbitrary factor: its worth is in acknowledging the role of a company within its value chain, rather than providing a definitive measure of impact.

It also aims to address some of the challenges of double counting from a value chain perspective. However, it doesn't eliminate this completely – to do so would require identifying every single component along a value chain, which, although possible, would introduce a large degree of uncertainty today and risk false precision.

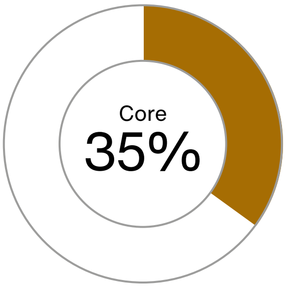
Our approach involves three attribution categories:



01. Critical

Attribution factor 50 per cent. Companies that are close to delivering the end solution, are central to its delivery, and have products that are hard to replicate. They are also the ones driving the innovation in the value chain that makes system change more viable at speed, potentially addressing significant bottlenecks. A company may also be identified as 'critical' if it delivers on a significant part of the value chain through vertical integration.

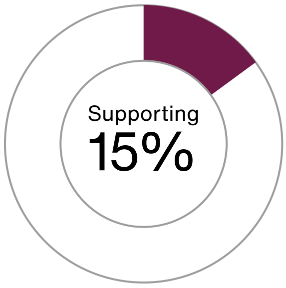
For example, Tesla is critical to the adoption of electric vehicles (EVs) through its role in delivering attractive, cost-effective EVs and the innovation it brings with its high degree of vertical integration and commitment to engineering solutions.



02. Core

Attribution factor 35 per cent. These are companies that provide highly specialised inputs to the system, albeit potentially further down the supply chain, or whose production is not the key area of innovation driving the system change, albeit still essential to its delivery.

For example, SolarEdge produces solar inverters, a core and specific component of solar panels, which allows them to capture the maximum available sunlight for conversion into electricity.



03. Supporting

Attribution factor 15 per cent. These are products which are less specialised to carbon mitigation, but are still needed to deliver the change required.

For example, Allkem's lithium production is essential to the batteries that power energy storage and EV solutions, occupying a position at the beginning of the supply chain with many stages between its product and the end solution.

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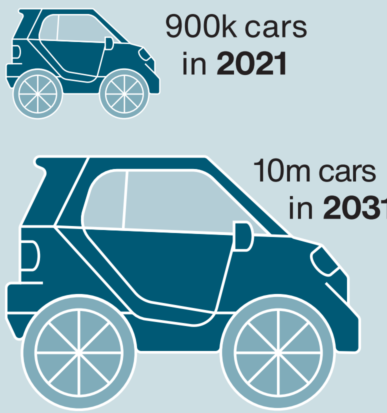
An example

To better explain our process, we've laid out an example from an electric vehicle manufacturing company, where increasing EVs on the road directly replaces their fossil fuel incumbents.



900k cars in **2021**

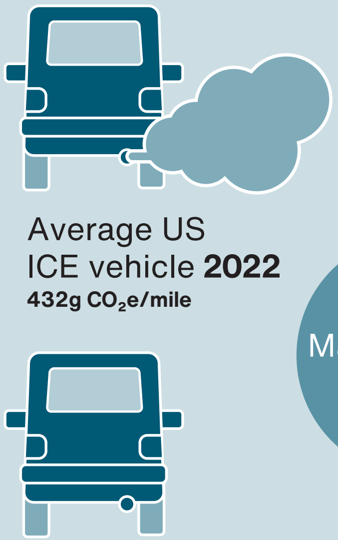
10m cars in **2031**

01 Company output

How many vehicles do we expect the company to produce over the next 10 years? Ideally, we take this data from the company, either engaging with them directly or through disclosures. We also need to assume an annual mileage and expected lifetime of the vehicle.

02 Baseline and alternative

What is the most likely baseline technology that an EV will replace? A similar-sized internal combustion engine (ICE) vehicle is the most realistic. The emissions intensity of these vehicles will likely reduce over time.



Average US ICE vehicle **2022**

432g CO_2e/mile

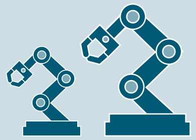
Average US EV emissions **2022**

103g CO_2e/mile

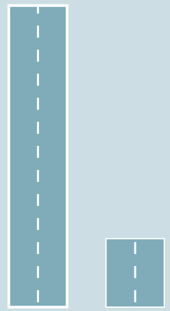
We consider the full lifetime of the products we're making avoided emissions claims about. Manufacturing emissions of an EV are currently higher than an ICE vehicle, but the use-phase emissions balance this out over the lifetime of the vehicle. We separate use and manufacturing emissions, so we adapt our assumptions for how each will change in isolation.

03 Manufacturing emissions

Emissions during manufacturing

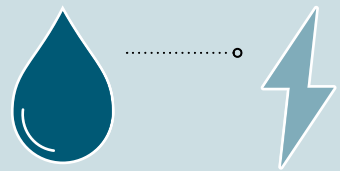


Emmissions during use



04 Substitution

Not every new electric vehicle will replace an ICE one. It is very hard for us to estimate this accurately. We can assume that as the penetration of EVs in the total stock of cars on the road increases, the chance of displacing an ICE vehicle becomes lower, and therefore potential avoided emissions are reduced.

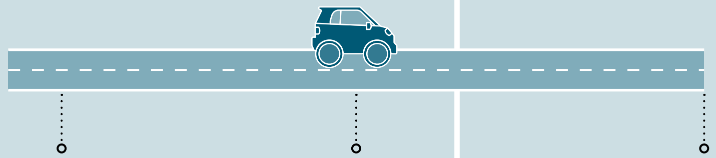


EV = <1%† in **2021**

EV = 16%† in **2031**

We combine all this data to estimate avoided emissions over different time frames. The annual figure below is emissions avoided from cars in the first year of production and their first year of use only. The lifetime annual figure is the same cars over their full lifetime of use. The investment lifetime figure includes all cars produced over our investment period and their subsequent lifetimes. So a vehicle built in 2031 will still be included in 2040.

05 Estimate



Annual

3 (Mt) of CO_2e

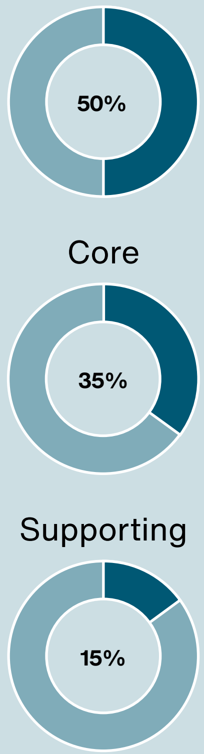
Lifetime annual

49Mt of CO_2e

Lifetime during investment

3,000Mt of CO_2e

† Of global passenger car fleet



06 Attribution

We weigh up where we think the company sits within the three categories detailed on **page 7**. For this EV company, it is relatively vertically integrated and is also delivering the end solution, therefore we have given it a 50% attribution.

50%

Critical

Delivering the end solution, vertically integrated.

This is a basic example that, for simplicity, doesn't include all the data we use. We try to tailor our approach from company to company, but we're often limited by the data we have available to us. We're constantly improving this process as we put more companies through the methodology.

What is next?

As we analyse more companies, learn from progress, and continue to engage with our peers, we intend to develop this methodology further. Avoided emissions are increasingly being recognised as a useful tool within public markets, having already demonstrated their utility for private investors. We're keen to use our expertise to help others better understand how they can use avoided emissions data, as we continue to use the data ourselves to better understand the companies in which we invest. There are many questions still to answer, and we know our approach will never be perfect. Estimating avoided emissions is inherently a subjective exercise, and the process by which estimates are built is often more insightful than the final number. As we continue to test our methodology we welcome feedback and insight.

Please feel free to contact our Climate Analyst, Matt Jones if you wish to discuss further: **matt.jones@bailliegifford.com**.

FAQs

How do we use this data?

We use avoided emissions data within our decision-making process for climate solutions and for understanding which companies are, in general, actually providing solutions. We believe value will acrue to companies who are enabling the most carbon avoidance, and we can use avoided emissions data to understand where this value might sit within the total supply chain. For our impact strategies, we can use these estimates to understand the potential impact and establish if it aligns with our investment case. These strategies can also use the data in portfolio construction to help reflect any potential impact on our holding size. Importantly, we do not use this data in any comparisons to our own financed emissions footprint, or the actual scope 1, 2 and 3 emissions of our holdings, as this would be a misrepresentation of the accuracy of the avoided emissions data and falsely compare estimated figures to actual ones.

Where do we get our data from?

At each stage of our methodology, there is a range of different data inputs, from the output we think a company might have in one year, to the life-cycle emissions of their product. As standard, we try to use company-reported data where possible. Our holdings are increasingly estimating avoided emissions within their own reporting. We're careful not to be too trusting of these methodologies and often engage with companies where we want to learn more. For wider scenario data, we typically use the IEA Net Zero scenario, which is publicly available. In some cases, where we try to use regional or more sector-specific data, we use Bloomberg New Energy Finance scenario data.

Do you use Life Cycle Assessments (LCA)?

We do, but we're aware of the limits of these assessments and the importance of finding LCA's that are reflective of the product/service we're investing in. Constructing an LCA is often compared to building a Lego set of an actual product, such as as a wind turbine. You want as many of the bricks in your Lego set to match the product your modeling. Building a good LCA involves choosing the correct model bricks to represent your wind turbine. These bricks might include the power source at manufacturing, the location of that power source or the way in which the raw materials to build the turbine were transported. We try to use peer-reviewed studies in the absence of company- or product-specific LCAs. We're looking for LCAs that we know have the same boundaries as the product or service we're assessing. This isn't always easy, and we have to make assumptions about where we think certain products might have been produced, or the energy inputs in to their life-cycle.

Glossary

Avoided emissions: The difference in emissions produced from one thing versus another, over a range of time scales and across different system boundaries. Often used to estimate the potential emissions reduction from a company's products or services.

Attribution factor: A percentage used to reflect the importance of each company's contribution relative to the overall system required to deliver a full climate solution.

Carbon accounting: The process of measuring and reporting the greenhouse gas emissions associated with an organisation, product, or service.

Dynamic baseline: A baseline that factors in changes in emissions over a specific time horizon, accounting for the evolving nature of the energy supply, behaviours, and opportunities in a low-carbon world.

Greenhouse Gas (GHG) Protocol: An international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions.

Life Cycle Assessment (LCA): A method for evaluating the environmental impacts of a product or service throughout its entire life-cycle, from production to disposal.

Net zero emissions: A state in which the amount of greenhouse gas emissions produced by a country, company or individual is balanced by an equal amount of emissions removed from the atmosphere, resulting in no net increase in atmospheric greenhouse gas concentrations.

Static baseline: A baseline that assumes a constant level of emissions over time, without accounting for changes in energy supply, behaviours, or opportunities.

Scope 1 emissions: Measurement of direct GHG emissions from operations that are owned or controlled by a company. Typically relates to the combustion of fossil fuels on-site and in direct control of the company.

Scope 2 emissions: Measurement of indirect emissions of a company associated with the generation of purchased electricity, steam, heat and cooling. It indicates a company's energy usage and can be helpful in highlighting energy intensity and efficiency.

Scope 3 emissions: Measurement of indirect emissions from a company's upstream and downstream value chain. Scope 3 effectively represents the emissions from the network within which a company operates. It is, therefore, useful in understanding wider emissions exposure and determining spheres of influence.

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