Barclays PLC

BlueTrack™
Methodology and Reporting Criteria

BARCLAYS

Contents

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Barclays' Climate Strategy

Addressing climate change is an urgent and complex challenge. It requires a fundamental transformation of the global economy, so that society stops adding to the total amount of greenhouse gases in the atmosphere, achieving what is known as net-zero emissions.

At Barclays, we are determined to play our part.

In March 2020, we announced our ambition to be a net zero bank by 2050, becoming one of the first banks to do so and in 2022 we gave shareholders an opportunity to vote to endorse our climate strategy, targets and progress.

We have a strategy to turn that ambition into action:

1 Achieving net zero operations

Barclays is working to achieve net zero operations and reducing supply chain emissions, investing in the continued decarbonisation of our operations, and in the development of a net zero pathway for the emissions from our supply chain.

2 Reducing our financed emissions

Barclays is committed to aligning its financing with the goals and timelines of the Paris Agreement.

3 Financing the transition

Barclays is providing the green and sustainable finance required to transform the economies we serve.

Our strategy is underpinned by the way we assess and manage our exposure to climate-related risk.

In addition, we believe that industry co- operation, particularly in setting common standards and transparent reporting, is important for all our stakeholders. We continue to engage with peers, industry experts and academics to assess the transition to a low-carbon economy and consider emerging methodologies.

Barclays was a founding member of the Financial Stability Board's (FSB) Task Force on Climate-Related Financial Disclosures (TCFD) and has aligned its disclosures to this since 2017. In 2021, we were a founding member of the Net Zero Banking Alliance (NZBA), part of the Glasgow Financial Alliance for Net Zero (GFANZ). The NZBA is an industry led, UN convened alliance that brings together banks across the world and represents about 40% of global banking assets. As part of this group, we are committed to aligning our lending and investment portfolios with net-zero emissions by 2050.

Barclays BlueTrack™ methodology

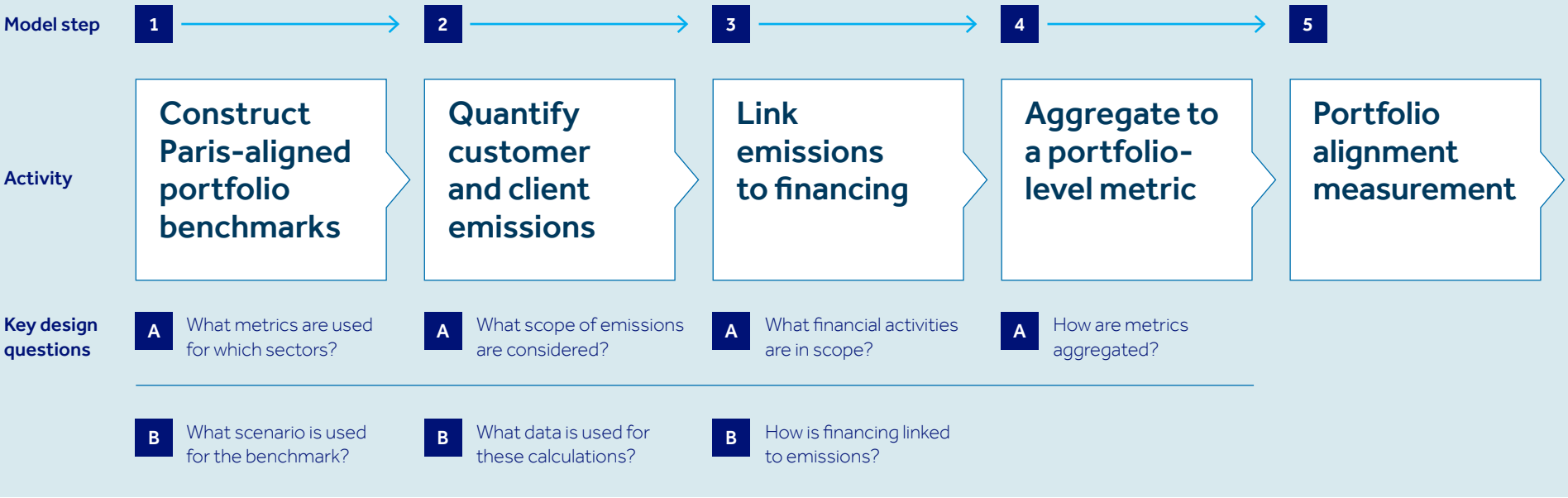
In November 2020, we published details of our strategy to measure and manage the alignment of our portfolios to the goals and timelines of the Paris Agreement. Our approach is underpinned by BlueTrack™, a methodology we have developed to measure and track our financed emissions at a portfolio level against the goals of the Paris Agreement.

BlueTrack™ built on existing industry approaches to cover not only lending but also capital markets financing. This methodology better reflects the breadth of our support for our corporate clients through our Investment Bank.

Most of our emissions result from the activities of the customers and clients that we finance and those generated in their respective value chains. These financed emissions fall within the general definition of Scope 3 emissions for us as a bank (see page 5). Our climate dashboard[a] shows our financed emissions targets over time and our progress towards them by comparing the BlueTrack™ metrics for individual sectors against a benchmark emissions level.

We will continue to evolve our approach over the coming years. This includes striving to align our ambition with any major changes made to international agreements or national goals. We will also consider recalculating and/or revising our targets as needed in order to reflect significant changes (e.g. material portfolio changes or methodological developments) that may compromise the relevance and consistency of the existing targets.

Key steps in BlueTrack™ sector assessment



a. https://home.barclays/sustainability/addressing-climate-change/reducing-our-financed-emissions/our-climate-dashboard/

Barclays BlueTrack™ methodology (continued)

What are the key updates in this paper?

This paper is an update to the 'Introducing BlueTrack™' Whitepaper that we first published in November 2020 and the updated version published in March 2022. In addition to our existing methodology, this updated version details the methodology that we will use to measure our financed emissions for the Automotive and UK Residential Real Estate sectors and an enhancement we have made to our Energy sector methodology.

Lastly, Asset Impact, our primary data vendor for Power and Energy production, have updated their own data providers. This has resulted in year-on-year movements which are explained in our accompanying Annual Report.

Addition of Automotive and Residential Real Estate sectors

This year we have published a 2030 target for the Automotive sector and set a convergence point for our UK Residential Real Estate (RRE) portfolio. This document sets out the methodologies we have adopted for these sectors including how we have aligned our approach to the Partnership for Carbon Accounting Financials[a] (PCAF) for UK RRE.

Updated NGL methodology for Energy

We have updated our Energy methodology to include Natural Gas Liquids (NGLs). These hydrocarbons comprise various liquids used for a variety of different purposes, including those not linked directly to Energy use e.g. petrochemicals.

Overview of the BlueTrack™ methodology

The BlueTrack™ methodology comprises five main steps:

1. Constructing Paris-aligned portfolio benchmarks

The first step of our methodology is to use an external climate scenario to construct a Paris-aligned portfolio benchmark that defines how a given financing portfolio will need to reduce emissions over time.

When we released the first edition of this Whitepaper in 2020, the best available scenario to develop Paris-aligned benchmarks for our financing portfolios was the International Energy Agency's Sustainable Development Scenario[b] (SDS). SDS is aligned to a 1.7°C world and is a roadmap for realising net-zero CO_2 emissions in the Energy sector by 2070. The 2025 targets previously set for the Energy and Power sectors were informed by the SDS scenario. In the first update of BlueTrack™ in 2022, we included 2030 targets for Energy, Power, Cement and Steel based on the IEA's Net Zero by 2050[c] (NZE2050) scenario and these targets remain unchanged. The NZE2050 scenario is aligned with a goal to limit global temperature rises by 1.5°C with a 50% probability.

For the Automotive sector, we have set an emissions intensity target range based on new car sales with the upper end of the range aligned to the reduction required in the IEA's NZE2050 scenario. The use of a range reflects the reality that there are additional dependencies and variables outside our control that will determine the pace of the transition and therefore how quickly we are able to reduce our financed emissions intensity in these sectors. We also describe how we adjust the scenario as it is expressed in existing cars, rather than new sold cars in a given year.

For UK RRE, we measure emissions intensity, but this is instead based on the UK Climate Change Committee's (CCC) Balanced Net Zero (BNZ) scenario[d]. This scenario was published by the Climate Change Committee as an independent body of the UK Government and sets out a roadmap for decarbonising the UK economy by 2050. This scenario is more relevant for our UK mortgage base rather than the regional and global pathways from the IEA which aggregates different countries with different property stocks.

These scenarios have been selected because they have been developed by reputable external providers, are aligned with the Paris Agreement goals, and because they are sufficiently granular for our needs.

2. Quantifying customer and client emissions

The second step of the methodology is to quantify the emissions produced by our customers and clients to which we provide financing. The emissions from a particular sector will vary depending on the nature of its activity, as well as the definition of the value chain boundary deemed in scope for emissions calculation.

Emission boundaries

GHG protocol defines emissions into three categories (Scopes):

- Scope 1 emissions are direct emissions, e.g. arising from fuel burned by a company
- Scope 2 emissions are indirect emissions, e.g. arising from the power or energy consumed by a company
- Scope 3 emissions are all other indirect emissions, e.g. those arising from goods and services provided by the company.

For our corporate clients, given many typically operate across different parts of the value chain, a regimented definition of emissions according to scope may not always be appropriate.

Barclays aims to capture emissions across a defined set of business processes that capture the most material parts of the value chain and which are also consistent with the benchmark scenario.

For each sector, this involves setting boundaries to define the emissions that our customers and clients are responsible for, and then sourcing and processing data from a variety of internal and external sources to quantify those emissions.

a. https://carbonaccountingfinancials.com/
b. https://www.iea.org/reports/world-energy-outlook-2019
c. https://www.iea.org/reports/world-energy-outlook-2022
d. https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf

Barclays BlueTrack™ methodology (continued)

When measuring Scope 2 emissions, we seek to measure these using a market-based approach where available. However, data is often scarce and as a result, these are often measured using location-based methods.

Key data sources

Company-level disclosure has started to improve significantly in recent years, particularly driven by the TCFD. Nonetheless, we continue to find that the data is still not sufficiently robust to be used as the primary source for BlueTrack™ in many cases.

We utilise a mixture of company-reported data and model emissions depending on the sector. For sectors where we have a large number of customers and clients and/or where business operations typically span across a varying part of the overall value chain, we estimate emissions directly using production level data. We use Asset Impact, a specialist data provider of asset-level data, for our Energy, Power and Automotive sectors. For corporate sectors where we have a lower number of clients, we use company-reported data and validate that it meets boundaries specified in the methodology. However, in both cases we rely on external sources for emissions data, for which the quality is currently evolving.

For our UK RRE sector, we use the data held within Energy Performance Certificates (EPC) as our primary data source.

Fall back methodologies

Our methodology seeks to assess emissions at the most granular approach possible. For corporate sectors, this means that we model emissions metrics at a subsidiary level.

In cases where we do not have the necessary production data to compute an emissions metric to the entity we lend to, we assume the financing is provided directly to the ultimate parent of the group.

In cases, where we do not have the required production data even at the parent entity level, we apply an industry average. This is only applicable for sectors where we set an absolute target, currently on the Energy metric, and more detail is provided in the Energy section below.

Where other data is missing, we apply a fall back that is detailed in the below sector methodologies.

Overrides

In certain cases, the data, fall back inputs (as detailed above) or the modelled outputs are overridden using expert judgement.

To facilitate this, we run a series of filtering exercises to identify which data, including both emissions and financial data, may be stale or important to the portfolio metric. We then review this data by comparison to other published sources (including news articles and company reports) and dialogue with our data vendors.

Where there is a significant divergence identified with a supporting rationale (for example, where a company has divested a material asset but which is not yet reflected in the underlying data) we apply an override to the data.

We may also apply overlays to remediate other known model limitations.

Treatment of emission offsets

BlueTrack™ does not allow company-purchased offsets (e.g. carbon credits) to reduce emissions as we feel it is most important to focus a metric on operational activities under a company's control rather than rely on unrelated offsets (the availability of which may be limited). The methodology does allow company-operated removals, i.e. on-site carbon capture at a plant, however, given this is currently marginal in the context of emissions, there is no impact on the metrics (<0.01% of electricity generated from fossil fuels operates with carbon capture technology today according to the IEA).

Data quality

We are currently developing data quality scores for our metrics, with an aim to disclose these over time.

3. Attributing emissions to our financing

The third step of the methodology is to attribute customer and client emissions to the financing provided. This involves defining the financing activities considered in scope, determining how provided financing should be spread across the various business activities for diversified corporates, and then appropriately linking each financing portion to the respective absolute emissions or emissions intensity metric.

Products in scope

We include both lending as at the reporting date and capital markets financing we have facilitated in the prior 12 months to the reporting date, although the latter is not relevant to UK RRE.

All of our global lending activities, including off-balance sheet credit lines, trade financing, asset finance and any direct equity holdings for our corporate clients, are considered in scope.

Our measurement of financing

The majority of Barclays lending to corporate sectors is in the form of Revolving Credit Facilities (RCF) which are typically undrawn, particularly in the Investment Bank. As a result, we use the total limit (i.e. maximum amount we are committed to finance under the facility) outstanding as of the reporting date. The use of limits is less applicable for UK RRE lending, so we instead use the drawn balance in line with the PCAF framework.

For our corporate financing activities, we also considered using the drawn amount, exposure at default (EAD) or risk weighted assets (RWAs). There are arguments for using drawn amounts: they better reflect spot exposure and would form part of the company's liabilities. However, drawn amounts are typically much lower than the limit and using them would lead to carbon metrics that are overly dominated by the capital market financing we arrange for our corporate clients. It would also expose carbon metrics to volatility at times of an increase in drawn amounts which cannot be controlled, it would not be informative for the management of our activity, and it may be related to the near-term liquidity needs of a company rather than investment in carbon-generative activities.

Barclays BlueTrack™ methodology (continued)

In addition to lending, our model considers debt and equity financing arranged in the capital markets as in scope. This is a key element of our approach, and ensures that we are properly accounting for the breadth of support we provide our corporate clients through our capital markets franchise. We use the amount arranged over the past 12 months prior to the reporting date which is pro-rated by league table credit if there were several banks in the syndicate. Barclays is allocated 33% of the pro-rated financing amount, with the remaining proportion allocated to investors. We continue to monitor developments in the industry here including the PCAF consultation on Capital Market Instruments which we co-chaired in 2021 and 2022. PCAF published a final methodology for consultation in November 2022, for which we await the final outcome.

Emissions attribution

Once company-level emissions metrics are calculated, those metrics need to be linked to the financing that we provide. For example, if we provide £100 in financing to a fossil fuel company, we need to determine what percent of their total financing £100 represents.

If a company straddles multiple sectors, e.g. has a subsidiary that extracts fossil fuels and another subsidiary that generates power, the power generation subsidiary will be counted as part of the Power portfolio, and the fossil fuel extraction subsidiary as part of the Energy portfolio. This also means that we do not allocate corporate companies into sectors based on arbitrary industry codes, e.g. NACE[a], which do not tell the complete picture of a company's operations, but include companies on the basis of whether they meet our required scope.

a. Statistical classification of economic activities in the European Community.

We utilise the PCAF framework for our UK RRE customers, whereby the property emissions are allocated on the basis of loan-to-valuation (LTV) with the valuation assessed at the point of origination.

4. Aggregating company-level measurements to a portfolio-level metric

The final step of the methodology is to aggregate company-level emission measurements and financing information into portfolio-level metrics. Barclays calculates two financed emissions metrics:

1. Physical Intensity: how much CO_2e (Carbon Dioxide Equivalent) is released on average for a certain amount of economic activity or material produced;
2. Absolute Emissions: a measure of the absolute emissions generated, or fair share, of the company's emissions over time.

For our UK RRE metric, we also provide a measure of data quality using the PCAF data quality framework. Furthermore, the Energy Mix metric set out in our previous Whitepaper has now been withdrawn from this methodology following internal review.

When we set a target based on an emissions intensity metric, we recognise that it would in theory allow 'greening' a portfolio by keeping fossil fuel companies financing and adding green company financing to the portfolio, which would keep absolute emissions high. However, this logic would only apply in the short term, as the amount of green financing to be added in order to keep a portfolio in line with a 1.5°C scenario would soon become boundless (as the benchmark intensity gets closer to zero) and outside of what a bank can realistically capture as a fair share.

When we set a target based on an absolute emissions metric, we measure the share of emissions of our financing relative to the company's value. As such, an absolute measurement is subject to significant volatility. For example, any event that changes the company valuation of a corporate client could increase or decrease the absolute emissions they contribute to our portfolio, despite no change in real-world emissions, because the financing increases or decreases relative to their total value.

5. Portfolio alignment measurement

We have set targets for five of the six sectors listed in this paper which are articulated as percentage reductions compared to a baseline reporting year. Our financed emissions in our target year therefore must be calculated on a consistent basis to this baseline year. However, as we continue to make improvements to our methodology and as data standards improve over time, it will become increasingly difficult to recalculate our financed emissions for the baseline year. To manage the impact of these changes, we have adopted a principles-based approach to guide whether prior metrics and baselines should be restated or re-baselined:

- A restatement will involve updating the historical starting point for a period and recalculating the historical performance;
- A re-baseline will involve keeping the historical performance constant and re-calculating the current period baseline to ensure consistency when reviewing performance. The indicative historical baseline will also be disclosed;
- Due to this, direct like for like comparisons of financed emissions information disclosed may not always be possible from one reporting period to another. Where information is restated or re-baselined, this will be identified or explained.

We calculate our annual progress against our target by calculating a theoretical baseline based on the recalibrated metric and the cumulative progress made up to the previous year. This is to ensure a fair representation of cumulative progress we have made to date. Additional information, including a worked example for Energy, is provided in the Appendix.

Our approach by sector – Energy

The Energy sector covers the production, processing and distribution of hydrocarbon fuels and its derivatives. Hydrocarbons are mostly used as an energy source, but they are also used in the petrochemical industry to produce plastics, solvents and other intermediate products. This sector generates emissions mainly through the combustion of fuels by end users, e.g. automotives and power generation, but also through production processes including flaring, venting and unexpected leaks that could occur across the supply chain. A number of options are available to reduce the emissions per Joule via efficiency upgrades, early detection of leaks and carbon capture, but decarbonisation will largely rely on an expansion of renewable energy capacity to replace fossil fuels.

1.A. What metrics are used as benchmarks for the Energy sector and why?

1.A.1 Our model uses an absolute emissions metric to measure the performance of our Energy portfolio.

1.A.2 An absolute emissions metric is a measurement of the total quantity of greenhouse gases emitted by an entity over time. For example, if a company emits 10 tonnes of carbon dioxide this year, its absolute emissions measurement would be 10 tonnes.

1.A.3 We have chosen to use an absolute emissions metric because the energy sector cannot reduce its emissions intensity beyond a certain point (for example, burning a barrel of oil will always produce a similar quantity of emissions) and an emissions intensity metric will not capture the absolute reduction in production necessary for fossil fuel producers to be aligned with the Paris Agreement.

1.A.4 We recognise that many Energy companies are diversifying into alternative businesses, including renewable power generation. However, we capture the growth in renewable power through the Power metric so to align as closely as possible with the scenario benchmark.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 When we released the first edition of this Whitepaper, the best available scenario to develop Paris-aligned benchmarks for our financing portfolios was the SDS.

1.B.2 As a result, Energy was benchmarked against the SDS Fossil Fuel Production projection for the OECD with the absolute emission projection taken from the SDS scenario using fossil fuel production forecasts.

1.B.3 Since then, the IEA has released the NZE2050 scenario which is more ambitious and realises net-zero CO_2 emissions in the Energy sector by 2050. This scenario is aligned with a goal to limit global temperature rises by 1.5°C with a 50% probability.

1.B.4 As a result, we now benchmark Energy against the NZE2050 World scenario which requires a c.38% reduction in CO_2 from all energy-related sources by 2030.

1.B.5 Detailed production forecasts are not provided by the IEA so we have used the total emissions from energy as a suitable proxy. The scenario is not available at an OECD level, however, in the SDS scenario there was limited difference between the two benchmarks.

1.B.6 The IEA also separately publish a methane tracker[a] which suggests that methane emissions can reasonably be reduced by c.75% by 2030. When combined with CO_2, this represents a c.40% reduction in emissions on a CO_2e basis.

2.A. What scope of emissions are included, and why?

2.A.1 For the Energy sector, we include all companies that extract fossil fuels, including companies whose primary business is from another part of the value chain.

2.A.2 Any emissions associated with fossil fuels extracted by another company are excluded (unless we have a financial relationship with them). As a result, a company that is solely involved in refining or trading oil is excluded.

2.A.3 The emissions from production (Scope 1 and 2) are included in the metric as well as refinery and combustion emissions from the produced fuel. This is a key design choice as in reality most of the emissions related to a given unit of fossil fuels are released into the atmosphere during combustion, i.e. by the end user as part of Scope 3. This decision was made to recognise that both producers and consumers of fossil fuels are responsible for reducing the emissions that result.

2.A.4 We exclude any downstream emissions associated with non-energy purposes, e.g. petrochemical manufacturing.

2.A.5 As part of this update, we have now included the emissions associated with Natural Gas Liquids (NGLs) in addition to coal, oil and gas.

2.A.6 NGLs form part of the natural gas production stream which becomes liquid in surface conditions. There are various types of NGLs and chemically, they belong to the part of the spectrum between dry gas (simple methane) and crude oil with combustion factors falling between them.

2.A.7 The IEA does not publish detailed information (volume or emissions) on NGLs and Asset Impact does not provide data on production volumes of each NGL type (only at an aggregated country/technology level). As a result, we model the emissions associated with combustion using expected combustion rates and emissions factors with details provided in Figure 1.

a. https://www.iea.org/reports/global-methane-tracker-2022

Our approach by sector – Energy (continued)

Figure 1: Approach to estimating intensity factors by fossil fuel

Oil

Oil forms a significant part of our portfolio and extraction technologies are very diverse. We use the OPGEE[a] (Oil Production Greenhouse Gas Emissions Estimator) and the PRELIM[b] (Petroleum Refinery Lifecycle Inventory Model) lifecycle assessment models to calculate Scope 1 and 2 emissions, which provides increased granularity of energy intensity, e.g. oil extracted from tar sands can be three times more intensive than the global midpoint on a CO_2e basis.

This is consistent with our sensitive sector policy requirements for oil sand producers.

OPGEE is a peer reviewed independent academic study and the model can provide estimates for CO_2 and methane both separately and on a combined (CO_2e) basis.

Scope 3 CO_2 emissions factors are estimated using the annual emissions and annual production levels as reported from the IEA.

Gas

Extraction technologies for gas are less diverse and detailed studies of production intensity are less common. We use the National Energy Technology Laboratory (NETL)[c] lifecycle assessment analysis to estimate CO_2 emissions factors which allows us to differentiate by extraction technology (conventional, unconventional, deepwater, CBM). While NETL is a study of North American gas fields, we feel this methodology is suitable because the CO_2 component of gas extraction is reasonably consistent across geographies.

We use the IEA Methane Tracker to estimate methane at a country and extraction technology level. There can be a significant divergence in methane intensity at a country level and those with stronger regulations in place often observing far lower intensities than average, e.g. the intensity of Norwegian gas is on average around one hundred times less intensive than the median and around one thousand times less intensive than the most intensive country.

Scope 3 CO_2 emissions factors are estimated using the annual emissions and annual production levels as reported from the IEA.

NGLs

Scope 1 and 2 emissions factors are assumed to be the same as gas given they are extracted as part of the same process.

We source Scope 3 emissions intensity factors for oil and gas from the IEA. However, the IEA does not publish detailed information on NGLs, nor does Asset Impact provide data on production volumes of each NGL type. As a result, we estimate emissions factors using a weighted average of all NGLs. This is calculated using NGL production volumes in the US (per 2021) and combustion rates and emissions intensities from the Energy Information Administration (EIA)[d].

The derived intensity factor is 0.5x of gas despite the emissions intensity being higher. This is because propane and ethane are the two most commonly produced NGLs (>50%) and the latter is rarely used for Energy purposes.

Coal

Detailed studies of coal intensity factors are less common again but generally form a much smaller part of the overall chain compared to oil and gas.

There is, however, significant divergence in the energy (and carbon) content of different types of coal. As coal production from Asset Impact is measured in tonnes rather than Mega Joules (MJ), we first estimate the energy content and this can vary significantly according to the type of coal being extracted: lignite, subbituminous, bituminous, anthracite. We estimate using the mid-point of a range provided by the US Environmental Protection Agency (EPA)[e].

We then estimate emissions from the energy content. CO_2 emissions do not vary strongly with extraction technology and are assumed to be 1% of lifecycle emissions as estimated by the EPA. Methane emissions, however, can be variable depending on the extraction method, for example, the average methane intensity of underground mines is around eight times more intensive than surface mines. We assess methane from the Global Energy Monitor[f] which follows the methodology developed by the Pacific Northwest National Laboratory and the EPA.

Scope 3 CO_2 emissions factors are estimated from the EPA.

a. https://eao.stanford.edu/research-project/opgee-oil-production-greenhouse-gas-emissions-estimator
b. https://www.ucalgary.ca/energy-technology-assessment/open-source-models/prelim
c. https://netl.doe.gov/
d. https://eia-international.org/
e. https://www.epa.gov/
f. https://globalenergymonitor.org/

Our approach by sector – Energy (continued)

Figure 2: **Key criteria for assessing the GWP (Global Warming Potential) of methane**

No	Criteria	Description	Preferred measure
1	**Comparability**	• The standard convention set out by the United Nations is to measure greenhouse gases using a GWP100 basis. • Typically, companies disclose emissions on a GWP100 basis which also aligns to the approach adopted by our peers so would aid comparability across the industry. • Some clients have started to disclose methane on a standalone basis although coverage is currently low.	GWP100
2	**Credibility**	• Methane is much more potent that CO_2 but is also much more short-lived (average life of 12 years) which makes it challenging to compare. • The Intergovernmental Panel on Climate Change (IPCC) are currently debating the usefulness of a GWP20 given a GWP100 measure may underestimate the short-term impact of methane (and other short-lived gases).	GWP20
3	**Data quality**	• Data quality of methane is typically weaker than CO_2 given a significant proportion comes from fugitive sources. • While a modelled estimate at a portfolio level will be reasonably accurate, it will be less so at a counterparty level where operating practices differ. • A GWP100 measure will reduce the overall impact of methane in the portfolio, thus reducing the reliance on poor data.	GWP100

2.B. What data is used for these calculations?

2.B.1 We model company emissions by combining external fossil fuel production databases with assumptions about emissions factors. This is similar to the approach used in the PACTA methodology.

2.B.2 Fossil fuel energy content for oil, gas and NGLs (MJ) and production for coal (tonnes) is obtained from a specialist data provider: Asset Impact, and converted into emissions using a variety of techniques depending on the fuel as shown on Figure 1.

2.B.3 Emissions relating to fossil fuel extraction can vary significantly depending on the extraction method, region of production and operational processes.

2.B.4 Methane emissions vary significantly across regions, depending on the source. We source methane emissions through extraction technology and country data from the IEA Methane Tracker. These emissions are aggregated using Asset Impact's production data.

2.B.5 We have specifically chosen not to use company-reported data given the ongoing industry-wide challenges around methane measurement but instead model it ourselves. This approach calculates a level of methane inherent in our portfolio, which is then attributed to each company according to their production, technology and location mix of underlying assets.

2.B.6 We recognise this methodology is likely to show significant variances in respect of methane emissions at the underlying company level given it does not reflect the underlying operations of each company but instead applies an industry based estimate which can lead to very different outcomes.

2.B.7 Utilising company disclosures (instead of an estimate) would pose a number of challenges around data sourcing and coverage, comparability and time consistency that we are not in a position to address in the short term. As a result, we intend to improve the quality of methane measurement in BlueTrack™. Therefore, our approach to methane measurement will likely be updated in the future which may lead to recalculation of reported emissions.

2.B.8 We acknowledge that CO_2 and methane have different warming characteristics and aggregating them requires the use of assumptions. However, given the data quality issues we have decided to aggregate it into a CO_2e measure using a standard GWP100 approach which is widely used in company reporting. Figure 2 describes the key criteria that have guided our selection.

2.B.9 Scope 3 CO_2 emissions factors are estimated using the annual emissions and annual production levels as reported from the IEA. Figure 3 shows the derivation from the IEA.

Our approach by sector – Energy (continued)

Figure 3: **Derived emissions factors from the IEA for fossil fuels**[a]

Technology	Annual Emissions ($Mt\ CO_2$)	Annual Production (Mtoe)	Emissions Factor (gCO_2/MJ)
Coal	14,950	3,911	91
Oil	10,912	4,412	56
Natural Gas[b]	7,548	3,502	46
NGLs[b]	n/a	n/a	24

2.B.10 For the companies with substantial footprints that do disclose emissions (generally at parent company level, with limited breakdown per activity or per subsidiary), available disclosures are used to check and, where appropriate, override the value calculated from production data.

2.B.11 Data coverage for companies that are classified as Upstream O&G and miners is >90% by exposure as of December 2022. This is driven by better data coverage for the larger borrowers and across clients of the Investment Bank vs. lower coverage in smaller borrowers and in clients of the Corporate Bank. Over time, we will look to improve data coverage through our vendors, improved company disclosures and client outreach.

2.B.12 To minimise potential understatement of our emissions, values for Upstream companies without data are estimated. For the portion of the Energy portfolio for which the production data is not available at the parent level, but where we would expect there to be (i.e. the company is an Upstream company), the absolute emissions are estimated based on the portfolio average (of the sub-sector). This will also avoid a change in the metric due to an expansion in coverage that would not be reflective of a change in Barclays' portfolio emissions profile.

3.A. What financing activities are considered in scope, and why?

3.A.1 All financing activities as shown on page 6 are in scope. Notably, green financing for the Energy sector is not eligible for dedicated purpose green financing under Barclays Sustainable Financing Framework.

3.B. How is provided financing linked to company-level emissions metrics?

3.B.1 When calculating our proportion of a company's absolute emissions, we use financing provided as a proportion of book value of total debt and equity (taken directly from the company balance sheet). Where equity is negative, only the total debt is used, and where neither equity nor debt is known, total assets are used.

3.B.2 We do not use the traditional measurement of enterprise value, as it relies on market capitalisation, which can create volatility. Everything else being equal, Barclays' absolute emissions would increase if a company's stock price falls (and vice versa). In addition, Enterprise Value (EV) uses debt net of cash, which is why PCAF recommends using Enterprise Value Including Cash, which is increasingly becoming the norm. Using this would not be consistent with the definition of 'financing' and would lead to the equity and debt holders owning more than 100% of a company's emissions.

3.B.3 We are aware that an undrawn commitment does not form part of a company's balance sheet value. It is nonetheless included in exposure in our model as it is a better reflection of the balance sheet commitment we make. This leads to an over-allocation of emissions to Barclays vs. other funders of a company but is relatively immaterial when allocating an ownership share to Barclays given most companies multi-bank and have a large book value of debt and equity.

4.A. How are client-level measurements aggregated for the Energy portfolio?

4.A.1 Total absolute emissions are calculated as a simple sum of Barclays' 'fair share' of each company's absolute emissions. Figure 4 contains a full list of data sources used for each calculation component.

$$\sum_{\text{Company}} \left[\frac{\text{Barclays financing}}{\text{Company value}} \times \text{Company emissions} \right]$$

$$\text{Company emissions} = \sum_{\text{Fossil fuel}} \text{Emissions factor} \times \text{Production}$$

a. https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022-free-dataset
b. Not derived from the IEA (see Figure 1).

Our approach by sector – Energy (continued)

Figure 4: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Barclays financing	Lending	Internal	Dec 2022
	Capital Markets	Dealogic	Dec 2022
Company value	Total Debt	S&P CapIQ	Dec 2022
	Total Equity	S&P CapIQ	Dec 2022
	Total Assets	S&P CapIQ	Dec 2022
CO_2 emissions factors Scope 1 and 2	Oil	Estimates derived from OPGEE and PRELIM models	2020
	Gas	Estimates derived from NETL lifecycle assessment analysis	2014
	Coal	EPA	2018
	NGLs	Estimates derived from NETL lifecycle assessment analysis	2014
Methane emissions factors Scope 1 and 2	Oil	Estimates derived from OPGEE and PRELIM models	2020
	Gas	IEA Methane Tracker	2022
	Coal	Global Energy Monitor	2021
	NGLs	IEA Methane Tracker	2021
CO_2 emissions factors Scope 3	Oil	IEA	2022 estimate from 2022 WEO Report
	Gas	IEA	2022 estimate from 2022 WEO Report
	Coal	EPA	2018
	NGLs	EIA	2021
Production	Oil	Asset Impact	2022 full-year forecast as at Sep 2022
	Gas	Asset Impact	2022 full-year forecast as at Sep 2022
	Coal	Asset Impact	2022 full-year forecast as at Sep 2022
	NGLs	Asset Impact	2022 full-year forecast as at Sep 2022

Our approach by sector – Energy (continued)

Figure 5: **Key choices to calculate the absolute metric**

Key choice	Description
Sector boundary	Upstream Energy (producers of coal, oil and, gas and NGLs)
Emissions scope	Emissions generated from the extraction, refining and combustion of fossil fuels extracted by a producing company Relate to CO_2e Scope 1, 2 and 3 emissions for fossil fuel producers
Greenhouse gases measured	CO_2 and methane
Scope 1 and 2 estimation	Derived from OPGEE and PRELIM lifecycle assessment models for oil; NETL lifecycle assessment analysis and IEA Methane Tracker for gas and NGLs; and EPA for energy content and CO_2 estimates; Global Energy Monitor for methane as described in Figure 1. Checked against company disclosure, for material cases, if available
Scope 3 estimation	Derived from asset level fossil fuel extraction (tonne of fuel), energy content of each fuel type (MJ per tonne) and global carbon emission factors for oil and gas (CO_2 per MJ). Derived as a weighted average of NGL mix using combustion and intensity factors from the EIA. Derived from EPA for coal as described in Figure 1. Checked against company disclosure, for material cases, if available
Barclays financing and attribution	Financing provided or arranged The share of the Barclays financing as a percentage of a company's total debt and equity is attributed to Barclays
Treatment of missing production data	For the portion of the portfolio for which the production data is not available, the absolute emissions are estimated based on the average of our portfolio
Benchmark scenario	IEA SDS (for 2025 target) IEA NZE2050 (for 2030 target)
Target baseline year	2020

Our approach by sector – Power

The power sector comprises the generation, distribution and sale of electric power to the general public and industry. This sector generates emissions through the combustion of fossil fuels for power generation, but also through the construction of its associated infrastructure. In order to decarbonise, the sector needs to phase out the use of fossil fuel power in favour of renewable energy sources, or fit fossil fuel plants with carbon capture technologies.

1.A. What metrics are used as benchmarks for the Power sector and why?

1.A.1 For power generation, we consider emission intensity to be the primary emission metric given that a reduction in the carbon intensity of electricity (via a switch to renewable or nuclear sources) is the key driver of decarbonisation pathways for the sector.

1.A.2 Emissions intensity metrics provide a view of the decarbonisation progress made by a company or sector over time. When transitioning, companies will need to invest in greener activities, which would be captured using an intensity metric but not necessarily an absolute metric.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 When we released the first edition of this Whitepaper, the best available scenario to develop Paris-aligned benchmarks for our financing portfolios was the SDS.

1.B.2 As a result, power generation was benchmarked against the SDS electricity generation pathway for the OECD as the most appropriate benchmark, given that it is mostly a regionalised activity.

1.B.3 We also benchmarked Power against the NZE2050 World scenario which requires a c.69% reduction in CO_2 intensity at a World level by 2030 which represents the higher reduction in emissions in our target range. The IEA do not publish further geographic granularity in order to set a benchmark at an OECD level however, we would expect that the OECD would require a faster rate of decarbonisation than the global average.

1.B.4 The intensity in both cases is derived by dividing the electricity total emissions by the electricity generation.

2.A. What scope of emissions are included, and why?

2.A.1 For the Power sector, we attribute to each company the emissions that result from combusting fossil fuels to produce electricity (Scope 1). In the case of renewable and nuclear power, as no combustion is required, the emissions are zero.

2.A.2 The methodology does not consider the Scope 2 emissions of the sector given their marginality in the context of electricity generation.

2.A.3 Scope 3 emissions for the Power and Utilities sector generally comprise the upstream emissions from fossil fuel extraction, the purchase of power from upstream generation companies and the downstream combustion of natural gas transported to final consumers, e.g. for residential or commercial heating.

2.A.4 We have now taken the opportunity to analyse all gases that are involved in the lifecycle of power generation, from construction to end-power generation, however, at this stage we have not made any amendments to the methodology.

2.A.5 We continue to measure only the emissions associated from combustion. However, there is one exception to this, where we assign zero emissions to biomass.

2.A.6 Biomass can take many forms, including waste products but also wood pellets. The burning of wood in particular is a carbon-intensive process which emits around one and a half times the emissions for every unit of electricity generated when compared to coal. However, the United Nations Framework Convention on Climate Change (UNFCCC) currently recognises this process as zero-emitting if the biomass is from a sustainable source and we continue to align our approach with the UNFCCC. This approach will be subject to review in the future.

2.A.7 For fossil fuel plants, the majority of lifetime emissions come from the use (combustion) phase. Our internal analysis suggests that CO_2 comprises >99% of greenhouse gas emissions from the combustion of oil, gas and coal. Other greenhouse gases are more prevalent in the wider process of hydroelectricity and the use of biomass but as we describe below, these are currently not measured. As a result of this analysis, we will now report the Power metric as a CO_2e metric.

2.A.8 For renewable power, the majority of emissions arise from the construction of the plants and the associated material production, notably concrete and steel. Emissions from solar photovoltaics mainly come from material extraction and the manufacturing process. At this stage, we do not have appropriate data or benchmark to capture manufacturing-related emissions.

2.A.9 As we only measure emissions from combustion processes, we ignore any biogenic emissions from hydroelectric facilities caused by the flooding of land during the dam construction and the degradation of biomass in the newly created reservoirs. There are various studies which provide approximations which vary significantly depending on the geospatial features of the dam, however, the estimates are significantly lower than the intensity factors of fossil fuels.

Our approach by sector – Power (continued)

Benchmarking study

BlueTrack™ calculates emissions from asset-level data, rather than relying solely on reported data, in order to get a comparable and consistent view across companies. For some inputs we use fall backs and averages, e.g. capacity factors, which can lead to uncertainty in the outputs.

We have begun to assess the performance of BlueTrack™ calculated physical intensities against those estimated by companies. This has helped us to identify the extent of variations and potential reasons which could contribute to these differences, but it has also given us an insight into whether we can directly use company-reported emissions or continue using the current bottom-up approach.

For our analysis, we have begun to develop an uncertainty metric which measures a range of uncertainty around the counterparty and portfolio level results calculated by BlueTrack™. We ran a Monte Carlo simulation for a variety of the model inputs and set the uncertainty measure at a 95% confidence level.

We then back-tested the uncertainty metrics by sampling companies in the Power sector and observing whether the reported intensities lie within or outside the confidence intervals, and then investigated companies which were outside our expected range.

The portfolio intensity calculated using reported data was within the range of uncertainty due to the averaging effect of the calculation, however, at a company level only c.55% were within the range of uncertainty calculated at the company level.

The key reason for variances being high at a company level is the lack of standardisation in the way companies report emissions. We identified a number of areas where disclosure differences can vary from one power company to another – while it is difficult to estimate the impact of each difference, we have determined that the most material factors are likely to be:

- The reporting basis used by companies: BlueTrack™ uses data from Asset Impact which apportions production on an equity basis. However c.40% of companies in our sample used a control basis to calculate emissions.
- The scope of emissions: BlueTrack™ calculates Scope 1 emissions from power generation. However, at least 25% of companies in our sample calculate intensity based on Scope 1 and 2 emissions, including cases where Scope 2 emissions represent a higher proportion of the total as a result of other activities not related to power generation.
- Purchased vs. own-generation: BlueTrack™ calculates emissions based on own-generated power. However, we observed a number of companies that report intensity on a final supply basis, which can also be on a gross or net (of own-company use) basis.

We also observed that approximately a third of companies restated their 2019 emissions in 2020 due to a change in emission calculation methodology, the inclusion of new emissions or other reasons.

At a portfolio level, we have concluded that the physical intensity calculated by BlueTrack™ appears in line with that calculated by companies' reported intensities. However, variances exist at a company level which is where we remain cautious. While it is evident that multiple factors contribute to variances at individual company level in varying proportions, no factor could be singled out that causes a large variation.

We continue to use bottom-up emissions estimates for Power companies given issues around coverage (although this will likely continue to improve in the near term), the consistency issues described above and a lack of granularity of company disclosures, i.e. emissions are typically not available at a legal entity level.

2.A.10 Emissions from the upstream production of fossil fuels, notably coal and gas, can have an impact on lifecycle emissions of power generation, given the dispersion of methane emissions from different sources in particular. However, there is limited data on power supply chains in order to provide a detailed assessment at this stage. As a result, these continue to be excluded from the methodology.

2.A.11 Other upstream emissions, notably from the purchase of electricity by transmission and distribution companies, continues to be included where we lend directly to the power generator itself (as a Scope 1 emission).

2.A.12 Downstream Scope 3 emissions from the supply of natural gas, continue to be accounted for in the Scope 1 emissions of end users.

2.B. What data is used for these calculations?

2.B.1 We model emissions using emissions factors and asset utilisation rates.

2.B.2 The electricity capacity data used is obtained from a specialist data provider: Asset Impact.

Our approach by sector – Power (continued)

2.B.3 For Power companies, electricity production capacity is typically not fully utilised; we estimate the actual production by applying a utilisation factor derived from IEA data for each fuel type and region. The estimated production is converted into Scope 1 emissions using the IEA estimates of the carbon content of each fuel type. Figures 6 and 7 show the capacity and intensity factors that are derived from the 2022 IEA World Energy Outlook at a World and OECD level respectively, as of 2022.

2.B.4 We recognise that this approach makes use of simplifying assumptions, and that both emissions factors and utilisation rates will vary from the IEA averages used on a company-by-company basis. For example, certain countries in which Barclays' clients operate have regulations in place to limit the use of coal-fired power generation where lower carbon assets (renewable, gas) are installed, which impacts its utilisation. Renewable power asset utilisation is naturally limited by weather trends, i.e. requirements for wind/sun, which will vary by geography. Emissions factors may vary due to asset efficiency as two different coal-fired power plants may generate different amounts of electricity per tonne of fuel combusted.

2.B.5 Furthermore, at each historic reporting date, these emissions factors and utilisation rates were only available with a one-year lag. For example, the rates used for the 2020 reporting period were taken from the 2019 IEA WEO report and those used for the latest reporting period reflect the latest (2022) WEO Report.

3.A. What financing activities are considered in scope, and why?

3.A.1 All financing activities as explained on page 6 are in scope. In addition, certain financing activities in the Power sector (loan facilities or capital market transactions) are specifically flagged as 'Green' and assumed to have a zero intensity if the proceeds are used for renewable electricity generation.

3.A.2 We use Barclays Sustainable Finance Framework[a] to identify activities as Green, where the dedicated purpose of financing is Electricity Generation.

3.A.3 All the relevant proceeds as per the terms of the arrangement are assumed to be for power generation. For example, if we provide £100 of dedicated financing for a company to generate renewable power, the entire £100 of financing would be assigned a zero intensity and included in the emissions intensity metric regardless of how much revenue the company generates from power generation. We acknowledge that this approach could lead to a small double-count in the benefit from renewable production which may become more material over time.

Figure 6: **Derived capacity factors from the IEA for power generation[b]**

Technology	Annual Electricity Generation (TWh)	Generation Capacity (GW)	Capacity Factor
Coal	10,074	2,178	53%
Oil	655	412	18%
Natural Gas	6,585	1,875	40%
Nuclear	2,840	419	77%
Hydro	4,411	1,381	36%
Bioenergy	790	181	50%
Other Renewables	4,428	2,278	28%

Figure 7: **Derived emissions factors from the IEA for Power[c]**

Technology	Annual Emissions (Mt CO_2)	Annual Electricity Generation (TWh)	Emissions Factor (kg CO_2/MWh)
Coal	2,060	2,127	969
Oil	142	184	773
Natural Gas	1,362	3,339	408

a. https://home.barclays/content/dam/home-barclays/documents/citizenship/ESG/2022/Barclays-Sustainable-Finance-Framework.pdf#:~:text=The%20Barclays%20Sustainable%20Finance%20Framework%20%28%E2%80%9Cthe%20Framework%E2%80%9D%29%20sets,our%20performance%20agains%20t%20our%20sustainable%20finance%20targets
b. https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022-free-dataset
c. https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022-free-dataset

Our approach by sector – Power (continued)

Figure 8: **Standard Revenue Adjustment Matrix**

Sector	Sub-Sector	Production Primary	Production Other	Revenue Share Primary	Revenue Share Other
Power	Generation	Power	–	100%	0%
		Power	N types	75%	25% / N
		–	N types	0%	25% / N
	Distribution	Power	–	25%	0%
		Power	N types	25%	25% / N
		–	N types	0%	25% / N

3.B. How is provided financing linked to company-level emission metrics?

3.B.1 If financing is provided to a Power company, our model splits financing across its businesses according to the division of that company's revenue (as per S&P TruCost, subject to fall back provisions). This means that if Barclays has arranged a £100m bond and provided a £50m RCF to a company that derives only 10% of its revenue from power generation, only £15m in financing will be included in the Power portfolio intensity calculations (before applying a 33% weighting). This is particularly important to ensure accurate accounting where we have exposure to large companies with relatively small Power businesses, although it could make it difficult for third parties to reconcile our emission disclosure with our financial disclosure.

3.B.2 Where granular revenue data is not available, a standard matrix based on the sector classification of the producer (Barclays Industry Classification or 'BIC' code) will be used as shown in Figure 8.

4.A. How are client-level measurements aggregated for the Energy portfolio?

4.A.1 For the Power portfolio, emission intensity is calculated as a function of each company's emissions and energy produced. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 9 contains a full list of data sources used for each calculation component.

$$\sum_{\text{Company}} \left[\frac{\text{Company emissions}}{\text{Production}} \times \text{Barclays financing} \right] \Big/ \sum_{\text{Company}} \text{Barclays financing}$$

$$\text{Company emissions} = \sum_{\text{Technology}} \text{Emissions factor} \times \text{Production} \times \text{Capacity factor}$$

Our approach by sector – Power (continued)

Figure 9: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Barclays financing	Lending	Internal	Dec 2022
	Capital Markets	Dealogic	Dec 2022
	Green Financing	Internal	Dec 2022
	Revenue Share	S&P TruCost	Aug 2022
CO_2 emissions factors Scope 1	All Generation	IEA	2022 estimate from 2022 WEO Report
Capacity factors	All Generation	IEA	2022 estimate from 2022 WEO Report
Production	All Generation	Asset Impact	2022 full-year forecast as at Sep 2022

Figure 10: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Power generators
Intensity type	Physical intensity (CO_2e emissions per unit of electricity generated), expressed in $kgCO_2e$ / MWh
Emissions scope	Emissions generated from the combustion of fossil fuels for heat and electricity by a generating company Relate to CO_2e Scope 1 emissions for fossil fuel producers
Greenhouse gases measured	CO_2
Scope 1 emissions estimation	Derived from Asset Level Capacity, Capacity Utilisation per fuel type and Emission Factors Checked against company disclosure, for material cases, if available
Production estimation	Total electricity generated derived from asset level capacity and Utilisation per fuel type
Barclays financing and attribution	Financing provided or arranged The share of a company's financing that relates to electricity generation is used (the rest is excluded). This is estimated by using the share of revenue that the client derives from those activities
Treatment of missing production data	Not applicable
Benchmark scenario	IEA SDS (for 2025 target) IEA NZE2050 (for 2030 target)
Target baseline year	2020

Our approach by sector – Cement

Cement is used to build housing as well as industrial and transport infrastructure and is the core component in concrete. The manufacturing process is carbon-intensive and requires a chemical process (calcination) that occurs at high temperatures. Among the options proposed to abate its emissions are reducing the use of clinker, implementing carbon capture technology, using renewable forms of electricity, fuel switching to use biomass wastes or green hydrogen.

1.A. What metrics are used as benchmarks for the Cement sector and why?

1.A.1 Our model uses an emissions intensity metric to measure the performance of our Cement portfolio.

1.A.2 We have selected an emissions intensity metric because a reduction in the carbon intensity from manufacturing processes, through an increase in efficiency and investment in technology, are the key drivers of decarbonisation for this pathway, rather than a reduction in the products' use.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 The emissions benchmark for our Cement portfolio is taken from the IEA's World NZE2050 scenario, which is combined with forecast production volumes. The higher end of the 2030 target range is taken from the NZE2050 World scenario. Regional granularity is not available in this scenario. In addition, cement is an essential building block of economic/infrastructure development and the IEA pathways do not predict a rapid reduction in its usage.

1.B.2 Cement is a hard-to-abate sector because most of the emissions generated are a result of process emissions which cannot be avoided if cement production is to continue, i.e. direct emissions occur through a chemical process of calcination. The manufacturing process also generates emissions from burning fossil fuels to produce clinker with production highly energy intensive and tending to rely heavily on coal.

To achieve a net zero pathway by 2050 reduction levers can be split into two-time periods.

- From present day until 2030, there are near-term levers for reducing sector emissions from cement, but these result in small reductions, e.g. clinker substitution by reducing the clinker-to-cement ratio.
- From 2030 to 2050, the levers are driven by investment and implementation of technology that is currently under development, and likely to lead to substantial emissions reduction. For example, carbon capture, utilisation and storage (CCUS) technology will play an important role in reducing emissions from various industries, especially in the Cement sector, but scalability is a currently a key challenge.

1.B.3 The IEA only produce granular forecasts for the direct emissions associated with the manufacturing of cement and do not provide forecasts for the electricity generated for this purpose, either on-site on through the grid. The NZE2050 scenario also does not provide production forecasts and, as a result, we have had to make some assumptions to infer an intensity metric such that it aligns to the reporting boundary.

2.A. What scope of emissions are included, and why?

2.A.1 For the Cement sector, a fixed boundary system for the manufacturing sector is used where we measure all emissions from an integrated cement plant, which are typically Scope 1 and 2 emissions. This includes thermal combustion for the production of clinker, electricity generation for the kiln, and the grinding and blending of materials.

2.A.2 We chose this boundary because a significant proportion of the emissions for these sectors are produced during the manufacturing process.

2.A.3 The methodology does not include emissions from the extraction and crushing of limestone and other raw materials used in the production or transportation of cement products, which are typically Scope 3 due to low materiality and to align with the scenario benchmark.

2.A.4 As we use company-reported data, all greenhouse gases are typically included in company estimates. However, CO_2 is the most material gas by far for the sector.

2.A.5 For the avoidance of doubt, we measure the gross emissions of cement production. This includes the emissions from the burning of waste products used as part of the calcination process.

2.B. What data is used for these calculations?

2.B.1 Given the small number of clients we have in the sector and that most of them disclose emissions and production data, we utilise company-reported data to calculate emissions intensity.

2.B.2 In certain situations, where company emissions data does not align to the reporting boundary, we apply adjustments using expert judgement. No adjustments have been made on this basis to date.

3.A. What financing activities are considered in scope, and why?

3.A.1 All financing activities as explained on page 6 are in scope.

3.A.2 Green financing for the Cement sector is not eligible for dedicated purpose green financing under Barclays Sustainable Finance Framework.

3.B. How is provided financing linked to company-level emission metrics?

3.B.1 Once company-level emissions metrics are calculated, those metrics need to be linked to the financing that we provide. We approach this in the same way as the Power metric as described on page 17.

3.B.2 A fall back table is used where revenue share data is not available as shown in Figure 11.

Our approach by sector – Cement (continued)

Figure 11: **Standard Revenue Adjustment Matrix**

Sector	Sub-Sector	Production Primary	Production Other	Revenue Share Primary	Revenue Share Other
Cement	Cement	Cement	–	100%	0%
		Cement	N types	75%	25% / N
		–	N types	0%	25% / N

4.A. How are client-level measurements aggregated for the Cement portfolio?

4.A.1 For the Cement portfolio, emission intensity is calculated as a function of each company's emissions and tonnes of cement produced. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 12 contains a full list of data sources used for each calculation component.

$$\sum_{\text{Company}} \left[\frac{\text{Company emissions}}{\text{Production}} \times \text{Barclays financing} \right]$$

$$\sum_{\text{Company}} \text{Barclays financing}$$

Our approach by sector – Cement (continued)

Figure 12: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Barclays financing	Lending	Internal	Dec 2022
	Capital Markets	Dealogic	Dec 2022
	Revenue Share	S&P TruCost	Aug 2022
CO_2e emissions factors Scope 1 and 2	N/A	Company reports	Latest available
Production	N/A	Company reports	Latest available

Figure 13: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Cement manufacturers
Intensity type	Physical intensity (gross CO_2e emissions per tonne of cement produced), expressed in tCO_2e/t cementitious material
Emissions scope	Emissions generated from the thermal combustion required for the production of clinker, electricity generation for the kiln, and the grinding and blending of materials Relate to the CO_2e Scope 1 and Scope 2 emissions, calculated on a gross basis
Greenhouse gases measured	CO_2e as obtained from company reports
Scope 1 and 2 emissions estimation	Derived from client reported data, but adjusted where necessary to align within fixed boundary
Production estimation	Total cement manufactured from client reported data
Barclays financing and attribution	Financing provided or arranged The share of a company's financing that relates to in scope activities This is estimated by using the share of revenue that the client derives from those activities
Treatment of missing production data	Not applicable
Benchmark scenario	IEA NZE2050
Target baseline year	2021

Our approach by sector – Steel

Steel is an engineering and construction material used in buildings, industrial infrastructure, vehicles, equipment and consumer goods. The process of manufacturing steel is carbon-intensive which requires mixing iron and carbon at very high temperatures, typically fueled by coal. To decarbonise, the sector requires greater use of carbon capture and storage, increasing the use of electric arc furnace (EAF) together with renewable electricity and greater use of recycled scrap steel.

1.A. What metrics are used as benchmarks for the Steel sector and why?

1.A.1 Our model uses an emissions intensity metric to measure the performance of our Steel portfolio.

1.A.2 We have selected an emissions intensity metric because a reduction in the carbon intensity from manufacturing processes, through an increase in efficiency and investment in technology, are the key drivers of decarbonisation for this pathway, rather than a material reduction in the products' use.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 The emissions benchmark for our steel portfolio is taken from the IEA's World NZE2050 scenario, which is combined with forecast production volumes. The higher end of the 2030 target range is taken from the NZE2050 World scenario. Regional granularity is not available in this scenario. Steel is an important construction and building material, and as the need for buildings and infrastructure continues to grow globally, reducing steel-related emissions is crucial for future sustainability.

1.B.2 Steel can be produced via two main processes, using an integrated blast furnace/basic oxygen furnace (BOF) or an EAF. Integrated producers create steel from iron ore and need coal as a reductant, EAF producers use steel scrap or direct reduced iron (DRI) as their main raw material.

1.B.3 To reduce emissions, the steel industry requires greater use of EAF technologies alongside increased use of scrap and DRI, although this requires the availability of renewable electricity and of high-quality steel scrap.

1.B.4 The IEA only produce granular forecasts for the direct emissions associated with the manufacturing of steel and do not provide forecasts for the electricity generated for this purpose, either on-site on through the grid.

1.B.5 The NZE2050 scenario also does not provide production forecasts and as a result, we have had to make some assumptions to infer an intensity metric such that it aligns to the reporting boundary. Steel producers could use biomass as an alternative fuel to reduce CO_2e emissions. However, a key limiting factor is that biomass, such as dried sugar, is not readily available globally at the level required to reduce carbon emissions on a significant scale.

2.A. What scope of emissions are included, and why?

2.A.1 Most of the emissions generated in the manufacturing of steel come from iron making (from iron ore), steelmaking and in the preparation of materials, e.g. steel production uses coke and involves high temperature combustion resulting in a large amount of emissions.

2.A.2 Steel production can be broken down into primary and secondary production, where the latter is considerably less energy intensive, although the availability of scrap may not be sufficient to meet demand.

2.A.3 We use a fixed boundary system for the steel sector where we measure all emissions from the midstream operations of a steel plant's manufacturing activities, which are typically Scope 1 and 2 emissions. We attribute all emissions from a steel plant, including coal coking, iron ore sintering, hot metal production, and crude steel production.

2.A.4 We chose this boundary because a significant proportion of the emissions for these sectors are produced during the manufacturing process.

2.A.5 The methodology does not calculate emissions from the rolling and casting of steel and emissions from raw material extract (iron ore or coke) or the steel product's lifecycle use, which are typically Scope 3 in many cases due to low materiality and to align with the scenario benchmark.

2.A.6 As we use company-reported data, all greenhouse gases are typically included in company estimates. However, CO_2 is the most material gas by far for the sector.

2.B. What data is used for these calculations?

2.B.1 Given the small number of clients we have in the sector and that most of them disclose emissions and production data, we utilise company-reported data to calculate emissions intensity in the steel sector.

2.B.2 In certain situations, where company emissions data does not align to the reporting boundary, we apply adjustments using expert judgement. One company has been adjusted on this basis to date.

Our approach by sector – Steel (continued)

3.A. What financing activities are considered in scope, and why?

3.A.1 All financing activities as explained on page 6 are in scope.

3.A.2 Green financing for the Steel sector is not eligible for dedicated purpose green financing under Barclays Sustainable Finance Framework.

3.B. How is provided financing linked to company-level emission metrics?

3.B.1 Once company-level emissions metrics are calculated, those metrics need to be linked to the financing that we provide. We approach this in the same way as the Power metric as described on page 17.

3.B.2 A fall back table is used where revenue share data is not available as shown in Figure 14.

Figure 14: **Standard Revenue Adjustment Matrix**

Sector	Sub-Sector	Production Primary	Production Other	Revenue Share Primary	Revenue Share Other
Steel	Steel	K types K types –	– N types N types	100% / K 75% / K 0%	0% 25% / N 25% / N

4.A. How are client-level measurements aggregated for the Steel portfolio?

4.A.1 Emission intensity is calculated as a function of each company's emissions per tonne of steel produced. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 15 contains a full list of data sources used for each calculation component.

$$\sum_{\text{Company}} \left[\frac{\text{Company emissions}}{\text{Production}} \times \text{Barclays financing} \right] \Big/ \sum_{\text{Company}} \text{Barclays financing}$$

Our approach by sector – Steel (continued)

Figure 15: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Barclays financing	Lending	Internal	Dec 2022
	Capital Markets	Dealogic	Dec 2022
	Revenue Share	S&P TruCost	Aug 2022
CO_2e emissions factors Scope 1 and 2	N/A	Company reports	Latest available
Production	N/A	Company reports	Latest available

Figure 16: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Steel manufacturers
Intensity type	Physical intensity (CO_2e emissions per tonne of steel produced), expressed in tCO_2e/t Crude Steel
Emissions scope	Emissions generated from midstream operations of a steel production, notably coal coking, iron ore sintering, hot metal production and crude steel production Relate to the CO_2e Scope 1 and Scope 2 emissions
Greenhouse gases measured	CO_2e as obtained from company reports
Scope 1 and 2 estimation	Derived from client reported data, but adjusted where necessary to align within fixed boundary
Production weighting	Total steel manufactured from client reported data
Barclays financing and attribution	Financing provided or arranged The share of a company's financing that relates to in scope activities. This is estimated by using the share of revenue that the client derives from those activities
Treatment of missing production data	Not applicable
Benchmark scenario	IEA NZE2050
Target baseline year	2021

Our approach by sector – Automotive

The automotive sector comprises the development, manufacturing and distribution of vehicles used to transport individuals and goods. The majority of emissions are generated from the combustion of oil to power internal combustion engine vehicles (ICEV), often referred to as tailpipe emissions, but the production processes required to manufacture vehicles can also be intensive. Well-to-tank (WTT) emissions can also be material and result from the oil production processes or electricity used to power electric vehicles (EV). Decarbonisation will require a shift to EVs together with more renewable forms of electricity, less carbon-intensive raw materials and promoting more efficient options to travel, including greater use of public transport.

1.A. What metrics are used as benchmarks for the Automotive sector and why?

1.A.1 Our model uses an emissions intensity metric to measure the performance of our Automotive portfolio.

1.A.2 Our chosen metric is CO_2e/vkm (emissions per vehicle km) for new vehicles sold in a given year rather than those currently on the road (and sold in previous years). This best represents what is in control of our clients.

1.A.3 We have selected an emissions intensity metric because decarbonisation is mainly driven by a significant increase in the use of electric vehicles (powered by renewable energy) rather than a reduction in the number of cars on the road or km driven.

1.A.4 Ideally we would prefer to use emissions per passenger km to account for a vehicle's transport utilisation. However, there are data limitations on load factors that would need be used to convert vehicle kms into passenger kms and how they vary over time in the NZE2050 scenario (assuming vehicle sharing will increase).

1.A.5 We include light duty vehicles (LDVs) only, which incorporates cars, vans and light trucks with a Gross Vehicle Weight Rating (GVWR) of < 3.85 tonnes (8,500 lb).

1.A.6 The GVWR is the maximum permissible weight that can be carried safely when being used on the road. The IEA classifies vehicles with GVWR below 3.5 tonnes as LDVs which is in line with the definition across Europe and Asia, while the US EPA classifies vehicles below 3.85 tonnes as LDVs.

1.A.7 The scope excludes all heavy duty vehicles (HDV), including buses and lorries given their usage differs from LDVs and that they follow a different and slower transition pathway.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 The emission intensity benchmark is based on the IEA's World NZE2050 scenario.

1.B.2 Our assessment of the NZE2050 scenario indicates that the intensity of new vehicles needs to reduce by c.64% from 2022-30 in this scenario.

1.B.3 Regional granularity is less relevant for this sector as the majority of automotive manufacturers produce and sell vehicles globally.

1.B.4 Currently, the IEA only produce granular pathways for tailpipe emissions associated with the stock of vehicles on the road so we have to make adjustments to convert this to a new cars sold in a given year, including, assessing the rate of retired LDVs and the growth in sales of EVs and hybrid vehicles.

1.B.5 The NZE2050 scenario relies on two key levers to reduce the tailpipe emissions intensity of new vehicles, notably the shift to the electrification of LDVs and improvements in the fuel efficiency of all powertrains.

1.B.6 It should be noted that while an increase of EVs will lead to reduced tailpipe emissions in transportation, there are other potential environmental and social costs from the extraction of minerals and battery production. Some of these minerals are already in short supply today so it will be important to increase recycling rates in the future.

2.A. What scope of emissions are included, and why?

2.A.1 Our reporting boundary is defined as Scope 1, 2 and Scope 3 emissions from LDV manufacturers.

2.A.2 All greenhouse gases are included in the metric. For tailpipe emissions, we only measure CO_2 as this is the most material gas emitted as part of the combustion process.

2.A.3 We only include tailpipe emissions and exclude WTT emissions as these include factors outside of a manufacturer's control, i.e. the emission intensity of electricity and oil production, and because data is not available at the required granularity.

2.A.4 Our methodology assigns all downstream tailpipe emissions to the manufacturer because they play a major role in the type of vehicles sold and are in control of their manufacturing processes.

2.A.5 We also include Scope 1 and 2 emissions from our clients, manufacturing operations although they form an immaterial component when compared to tailpipe emissions.

2.A.6 We intend to monitor upstream Scope 3 emissions inherent in a car's supply chain (mainly from battery production and raw material manufacturing), however, these are not included in the target as there is no recognised pathway for how these emissions should decline over time. We will measure these emissions using the GREET[a] (Greenhouse Gases, Regulated Emissions, and Energy Use) model.

a. https://greet.es.anl.gov/

Our approach by sector – Automotive (continued)

2.B. What data is used for these calculations?

2.B.1 We use data from Worldwide Harmonized Light Vehicle Test Procedures (WLTP) sourced from Asset Impact, to measure Scope 3 emissions.

2.B.2 We also source production volumes from Asset Impact, who in turn source it from Auto Forecast Solutions.

2.B.3 A WLTP laboratory test is used to measure fuel consumption and CO_2 emissions from passenger cars, as well as their pollutant emissions. It introduces more realistic testing conditions to better reflect the on-road performance of a car.

2.B.4 Based on 2018 data, there is a gap of c.14% between WLTP and real-world CO_2 emissions. However, this is a better approximation than previous test cycles, where the difference could be as high as 40% or higher for Hybrid vehicles.

2.B.5 The NZE2050 scenario adjusts for the gap between test cycle data and real-world emissions, however, we do not apply any adjustments to WLTP data as there is no data on the factor used by IEA. Additionally, a hybrid vehicles' fuel economy and emissions can also vary significantly depending on user behaviour and also varies significantly for corporate fleets vs private vehicles. In particular, behaviours can be influenced by purchase subsidies and tax cuts as opposed to environmental concerns. The availability of easy and fast-charging options could influence this even further.

2.B.6 For Scope 1 and 2 emissions, we utilise S&P TruCost Emissions' data who source it directly from company reports. If companies do not report their emissions, we estimate their emissions using the GREET model.

2.B.7 We assume an average vehicle is driven for 150,000 km across its entire lifetime. We are aware that the range can vary significantly, particularly for electric vehicles, however there is limited data available on this. Our primary metric is not sensitive to vehicle average lifetime km as the materiality of Scope 1 and 2 emissions reduces significantly once converted (to emissions per vehicle.km) and included with tailpipe emissions.

2.B.8 We are aware that companies operate across different parts of the value chain. In particular, reported data may not distinguish between emissions from battery production and assembly and would therefore result in higher Scope 1 and 2 emissions for those who manufacture their own batteries, or those who produce a significant portion of HDVs. However, our analysis suggests a negligible impact of this limitation.

2.B.9 Companies that supply manufacturers with parts are excluded as their emissions profiles will not be comparable.

3.A. What financing activities are considered in scope, and why?

3.A.1 All financing activities as explained on page 6 are in scope.

3.A.2 We exclude direct financing to captive financing arms, sellers and distributors as they act as a marketplace connecting buyers and sellers. They have limited control on the design of vehicles being sold in the market. However, we include the proceeds where facilities can be used for the vehicle manufacturing process.

3.A.3 Certain financing activities in the Automotive sector (loan facilities or capital market transactions) are specifically flagged as 'Green' and assumed to have a zero tailpipe intensity if the proceeds are primarily used for manufacturing LDVs with zero tailpipe emissions.

3.A.4 We use Barclays Sustainable Finance Framework to identify activities as Green, where the dedicated purpose of financing is Vehicle Energy Efficiency. Each deal is reviewed on a case-by-case basis such that if a share of the overall financing is only expected to be used for alternative purposes, that part of the financing continues to receive regular treatment.

3.A.5 Note, deals flagged as Green will continueto be assigned the company specific Scope 1 and 2 intensity.

3.B. How is provided financing linked to company-level emission metrics?

3.B.1 Once company-level emissions metrics are calculated, those metrics need to be linked to the financing that we provide. We approach this in the same way as the Power metric as described on page 17.

3.B.2 We do not weight our financing according to the portion of revenue each company-generates from LDVs (as opposed to HDVs) as sensitivity analysis suggests the impact on the metric is immaterial.

3.B.3 We exclude any financing that is made directly and solely for the use of financing (captive) entities as this is used for selling, rather than manufacturing vehicles.

Our approach by sector – Automotive (continued)

Figure 17: **Lifetime emissions analysis**

Fig 17A: 2020 World Grid Average
Emission Intensity (gCO_2e/km) – EV vs ICEV

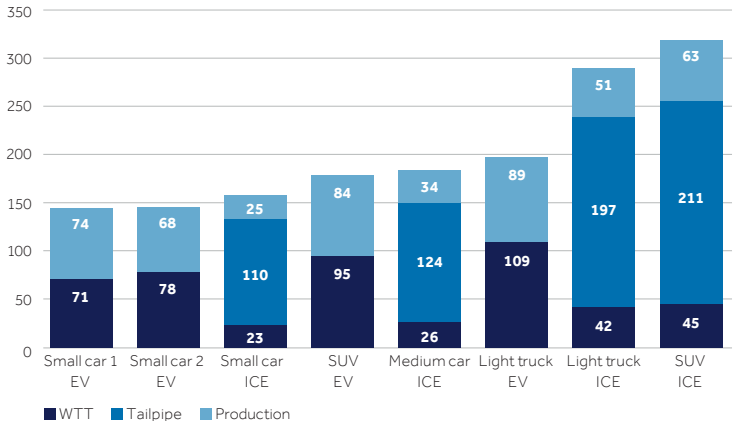


Fig 17B: 2030 World Grid Average
Emission Intensity (gCO_2e/km) – EV vs ICEV

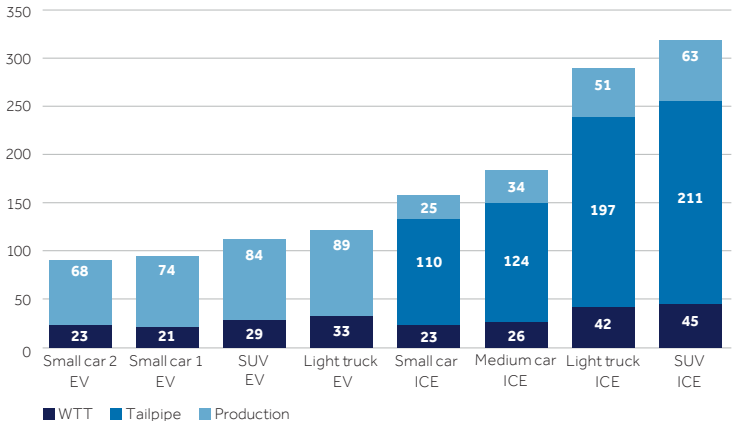


Fig 17C: 2020 Europe Grid Average
Emission Intensity (gCO_2e/km) – EV vs ICEV

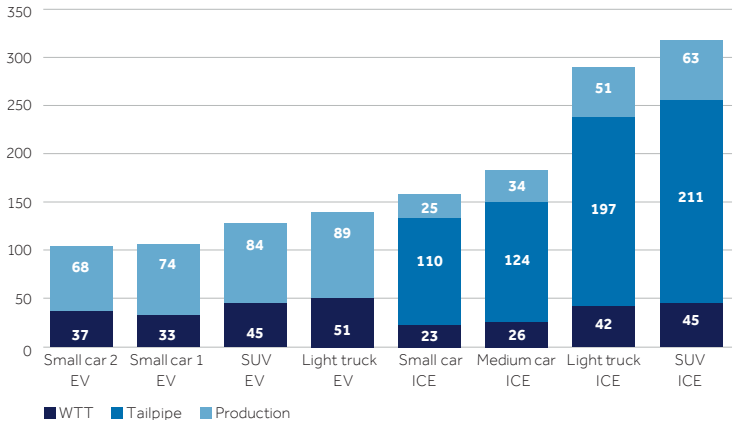
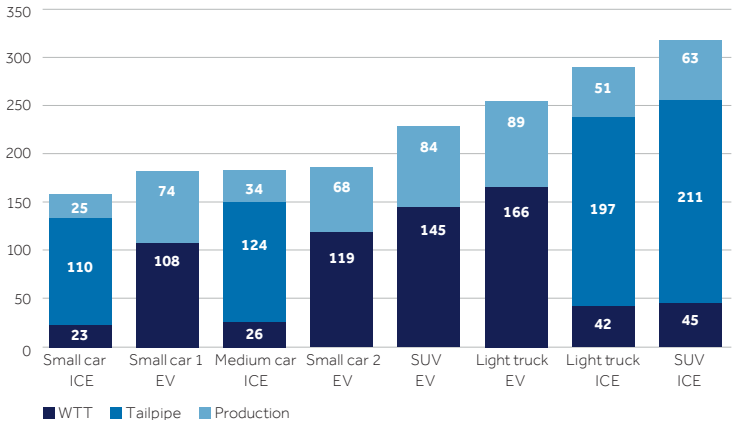


Fig 17D: 2020 India Grid Average
Emission Intensity (gCO_2e/km) – EV vs ICEV



As we developed our methodology, we assessed the lifecycle emissions of a sample of vehicles and how their emissions might evolve over time due to the decarbonisation of the grid.

Figure 17A shows the lifetime emissions (per km) of EVs and ICEVs assuming EVs source electricity from the world grid average.

Figure 17B shows the lifetime emissions assuming world electricity generation follows the NZE2050 pathway out to 2030.

Figure 17C shows the lifetime emissions assuming EVs source electricity from Europe.

Figure 17D shows the lifetime emissions assuming EVs source electricity from India.

Our findings showed that:

- EVs are typically less carbon intensive than ICEVs even after accounting for WTT emissions.
- The size of the vehicle is important and that a large EV can be more intensive than a small ICE driven in certain locations.
- Decarbonisation of electricity will be required to fulfill the potential of EVs.

Note: This is not a full projection as it only considers impact of changes in the grid intensity on WTT emissions of electric vehicles. We have not considered the impact on manufacturing emissions or the impact of improvement in ICEV efficiency.

Our approach by sector – Automotive (continued)

4.A. How are client-level measurements aggregated for the Automotive portfolio?

4.A.1 Emission intensity is calculated as a function of each company's emissions and total LDVs produced. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 18 contains a full list of data sources used for each calculation component.

$$\sum_{\text{Company}} \left[\frac{\text{Company emissions}}{\text{Production}} \times \text{Barclays financing} \right] \Big/ \sum_{\text{Company}} \text{Barclays financing}$$

Figure 18: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Barclays financing	Lending	Internal	Dec 2022
	Capital Markets	Dealogic	Dec 2022
	Green Financing	Internal	Dec 2022
	Revenue Share	S&P TruCost	Aug 2022
CO_2e emissions factors Scope 1 and 2	N/A	Derived from company-reported emissions, sourced from S&P TruCost	Aug 2022
CO_2e emissions factors Scope 3	N/A	Asset Impact	2022 full-year forecast as at Sep 2022
Production	N/A	Asset Impact	2022 full-year forecast as at Sep 2022

Figure 19: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Light duty vehicles' manufacturers
Intensity type	Physical intensity (CO_2e emissions per vehicle km travelled by LDV produced), expressed in gCO_2e/km
Emissions scope	Emissions generated from the manufacturing and the lifetime tailpipe emissions of new vehicles Relate to the CO_2e Scope 1, 2 and 3 emissions for automotive manufacturers
Greenhouse gases measured	CO_2e
Scope 1 and 2 estimation	Derived from client reported data
Scope 3 estimation	Downstream emissions are derived from WLTP test cycle data and sourced from Asset Impact
Production weighting	Total LDVs manufactured taken directly from Asset Impact
Barclays financing and attribution	Financing provided or arranged
Treatment of missing production data	Not applicable
Benchmark scenario	IEA NZE2050
Target baseline year	2022

Our approach by sector – UK Residential Real Estate

The Residential Real Estate sector comprises the use and construction of properties used for housing. The emissions attributed to this sector are the embodied emissions from the materials used in construction phase and emissions from the use and maintenance of the properties, primarily from water and space heating and power usage. Reducing emissions for this sector will require the use of less carbon intensive materials, retrofitting existing properties to increase their energy efficiency, facilitating the installation of non-fossil fuel heating systems, such as heat pumps, and changes made by individual homeowners to reduce energy consumption.

1.A. What metrics are used as benchmarks for the UK Residential Real Estate (RRE) sector and why?

1.A.1 Our model uses a physical intensity metric to measure the performance of our UK RRE portfolio following the methodology outlined in the PCAF framework. The physical intensity is a measurement of financed emissions per square metre of floor area.

1.A.2 We have chosen to align to PCAF as it has become the emerging standard for estimating residential real estate financed emissions. The asset class is also different from our corporate clients, i.e. homeowners do not have balance sheets or generate revenue, so we cannot maintain consistency with our other corporate sector methodologies.

1.A.3 Given demand for new UK housing is expected to grow in the upcoming decades, we believe that setting an absolute emissions target would not be appropriate.

1.A.4 An alternative option could be to use financed emissions per occupancy rate, however, there is limited data to support this calculation and it would be overly complex.

1.B. What scenarios are used for benchmark construction, and why?

1.B.1 We have used the Balanced Net Zero (BNZ) scenario published by the Climate Change Committee in 2021 to benchmark our UK residential portfolio.

1.B.2 The IEA's NZE2050 scenario does not contain the regional granularity necessary for our portfolio.

1.B.3 This Climate Change Committee is an independent body from the UK Government and sets out a roadmap for decarbonising the UK economy by 2050. This scenario is more relevant for our UK mortgage base rather than the regional and global pathways from the IEA and relies on government policies, including electricity grid decarbonisation, rapid roll-out of heat pumps and regulations enforcing minimum EPC ratings.

1.B.4 The BNZ scenario includes pathways for water and space heating emissions and emissions relating to the supply of electricity. We have combined these pathways to arrive at an overall benchmark while also utilising the latest grid emissions factors published by the Department for Business, Energy & Industrial Strategy[a] (BEIS) for 2022 (based on 2020 actuals). The floor area of new builds is assumed to remain constant out to 2050 given there has been limited variance in yearly averages observed over the past decade.

1.B.5 Using these assumptions, we estimate that the physical intensity of UK RRE will need to reduce to 19kgCO_2e/m^2 by 2030, down from 32 kgCO_2e/m^2 as of 2022.

2.A. What scope of emissions are included, and why?

2.A.1 We measure operational emissions from water and space heating and indirect emissions from the use of electricity. This translates to the Scope 1 and 2 emissions for a homeowner, although the Greenhouse Gas Protocol only applies to companies and not individual homeowners.

2.A.2 Operational carbon emissions are generated by fuel consumption for heating/cooling, supplying fresh water, ventilation, and power over the course of a building's lifetime.

2.A.3 We recognise that a large proportion of lifecycle emissions from UK RRE come via the construction phase, i.e. embodied carbon. Our initial analysis of embodied carbon suggests it is responsible for >50% of lifecycle emissions of a property, however, as available data and published reporting standards only cover estimations of operational emissions, we have not included embodied carbon but may do in the future. Furthermore, it is estimated that c.20% of residential buildings in 2050 will be built between then and today.

2.A.4 We also acknowledge that we could instead focus on decarbonising the suppliers of gas, rather than targeting homeowners, as they also have an important role in the decarbonisation of heating.

2.A.5 Our preliminary analysis suggests that our absolute emissions related to our financing of the UK's key gas suppliers are broadly similar to our absolute emissions for UK RRE.

a. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1049346/2021-ghg-conversion-factors-methodology.pdf

Our approach by sector – UK Residential Real Estate (continued)

2.A.6 Biomethane can be used as an alternative to traditional gas but it currently supplies <1% of the UK market and suppliers publish very limited information on its supply. Furthermore, while low-carbon hydrogen may become a more readily available source for heating homes in the future, it is not a viable source of energy in homes today and there are some public reports that have put this into question. We will continue to monitor developments here.

2.A.7 The greenhouse gases included in our estimate mainly comprise of CO_2 but will also include methane and nitrous oxide from fossil fuel combustion (either directly in boilers or indirectly in power plants).

2.B. What data is used for these calculations?

2.B.1 We use the data held within EPC certificates for properties where they are available, including the estimated energy consumption, fuel source and floor area. This is sourced via Hometrack who in turn source it from BEIS[a].

2.B.2 We are aware of the limitations of using EPCs as the primary source of data for emissions measurements, including: i) incomplete coverage; ii) outdated certificates; iii) mapping issues and iv) they do not reflect actual energy consumption. As a result of these limitations, we make a number of adjustments to the energy consumption data provided within the EPC certificates.

2.B.3 Where a property does not have an EPC certificate (c.33% of our portfolio), we estimate the emissions using a derived intensity fall back table based on the construction age of the property, the building type and the region. This estimate is based on actual meter consumption data and sector-level statistics available from BEIS. Where we have no information on the property location or building type, we use a UK average intensity.

2.B.4 EPC certificates are used as a common basis for assessing expected energy costs across Europe but do not give a precise picture of emissions intensity. For example, they assume electricity is sourced from the UK's grid as of 2012, where coal and gas was much more prevalent in the energy mix. They also exclude the energy used to power appliances and do not take into account behavioural factors of the occupiers.

2.B.5 In our studies we have also observed that there is a significant difference between the estimated energy consumption and the observed energy consumption across all EPC bands, particularly those at either end of the spectrum.

2.B.6 Figure 20 shows a stylised picture of how we convert emissions estimates from EPC certificates for use in our methodology.

2.B.7 We also report a Data Quality score in line with the PCAF framework. Where we estimate emissions using an EPC certificate, we assign a DQ score of 3. Where we utilise the fall back approach, we typically assign a DQ score of 5. A higher data score will likely require access to individual household energy consumption data.

3.A What financing activities are considered in scope, and why?

3.A.1 Our boundary aligns with the PCAF framework for the Residential Mortgages asset class.

3.A.2 All financing activities under Barclays UK, Wealth and Private Banking businesses are included for all product types. Both owner-occupied and buy-to-let properties are in scope. Financing of properties outside of the UK are excluded, notably our Italy Mortgages portfolio which is in run-off, and certain assets in our Private Banking portfolio in Continental Europe.

3.A.3 We exclude any lending made indirectly to residential properties through an intermediary, for example, any lending to social housing charities, real estate companies, lending to landlords originated in our Business Banking business, buy-to-let warehousing lines of credit to mortgage originators or Mortgage Backed Securities.

3.A.4 A mortgage is included as in scope from the time the exposure is on our book to the complete repayment of the loan (including refinancing with an alternative lender).

3.A.5 We do not classify any financing as dedicated purpose green financing in UK RRE.

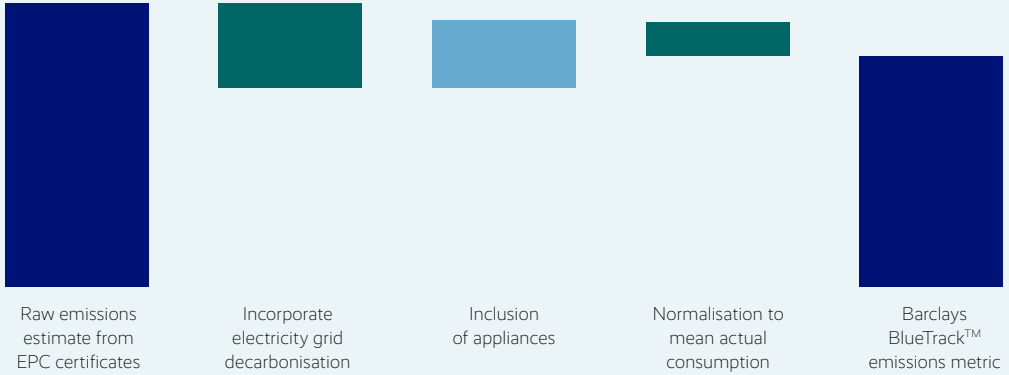
3.B How is provided financing linked to mortgage-level emissions metrics?

3.B.1 When calculating 'attribution factor' of a mortgage's absolute emissions, we use the loan outstanding as a proportion of property value at origination in line with the PCAF framework. Where the property value at origination is not available, we use the latest property value and keep it constant from the latest period.

a. https://epc.opendatacommunities.org/

Our approach by sector – UK Residential Real Estate (continued)

Figure 20: **Visual representation showing a reconciliation between EPC emissions and BlueTrack™ emissions**



While EPCs contain an estimate of emissions, we do not use these directly within the methodology. Instead we use the energy consumption estimate as our starting point.

The variance from the raw emissions estimate from the EPC certificate to the BlueTrack™ metric can be stylised as per the graph on the left. It incorporates three adjustments to take into account:

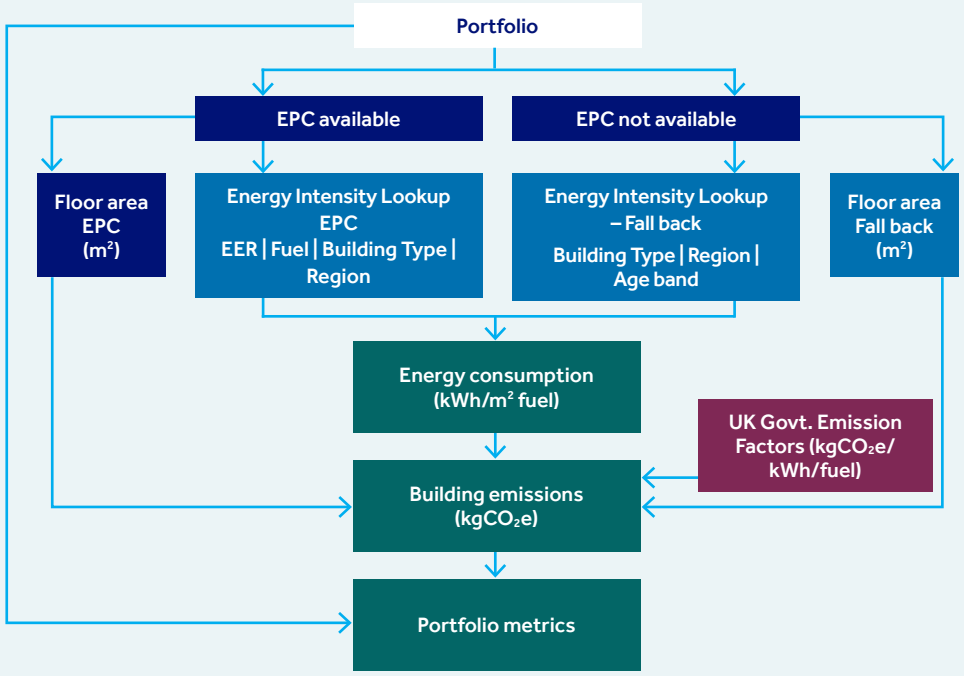
i) changes in the intensity of the grid and removal of upstream Scope 3 emissions (notably from the production of gas);

ii) the inclusion of emissions from the use of appliances; and

iii) a normalisation to actual consumption levels.

The electricity grid adjustment and removal of upstream Scope 3 emissions is the primary driver for our emissions estimate being lower than what is estimated from an EPC certificate.

Figure 21: **Methodology to estimate building emissions**



We base emissions calculations on estimated energy intensity of individual properties, which is derived from building characteristics, such as type, location, age and main fuel source or EPC rating (if available) and covers natural gas, electricity, oil, LPG, coal and wood as primary energy sources.

The intensity estimates are built from available EPC data and datasets published by BEIS; the National Energy Efficiency Data-Framework[a] (NEED), complemented by sector-level figures summarised in the Energy Consumption in UK[b] ECUK) and Digest of UK Energy Statistics[c] (DUKES).

To estimate annual energy consumption, we multiply the intensity by floor area, taken directly from EPC (where one exists) or estimated made using property details, such as its type, location and value.

Lastly, consumption of each fuel type is combined with the appropriate emission factor, using official reporting guidelines published by BEIS in combination with analysis from the CCC's Sixth Carbon Budget to arrive at an annual estimate of CO_2e for each property in the portfolio.

a. https://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework
b. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1110483/Energy_Consumption_in_the_UK_2022_10102022.pdf
c. https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

Our approach by sector – UK Residential Real Estate (continued)

4.A. How are customer-level measurements aggregated for the UK Residential Real Estate portfolio?

4.A.1 Emission intensity is calculated as a function of each property's emissions and the square floor are of the property. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 22 contains a full list of data sources used for each calculation component.

$$\frac{\sum_{\text{Building}} \left[\frac{\text{Outstanding amount}}{\text{Property value at origination}} \times \text{Building emissions} \right]}{\sum_{\text{Building}} \left[\frac{\text{Outstanding amount}}{\text{Property value at origination}} \times \text{Floor area} \right]}$$

Our approach by sector – UK Residential Real Estate (continued)

Figure 22: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Vintage used for 2022 report
Outstanding amount	N/A	Internal	Dec 22
Property value at origination	N/A	Internal	Dec 22
Building emissions	N/A	EPC certificates BEIS, sourced through HomeTrack	Sep 22
Floor area	N/A	EPC certificates BEIS, sourced through HomeTrack	Sep 22

Figure 23: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Buy to Let and Owner Occupied mortgages in the UK. These mortgages reside in Personal Banking within Barclays UK and our Private Banking division in Barclays International
Intensity type	Physical intensity (CO_2e emissions per floor area), expressed in $kgCO_2e/m^2$
Emissions scope	Operational emissions that relate to the use of the property. Can be considered Scope 1 and 2 emissions from a homeowner's perspective
Greenhouse gases measured	CO_2, methane and nitrous oxide
Emissions estimation	Derived from EPC certificates (estimate of energy consumption used where not available) and supplemented with appliance energy consumption
Production weighting	Floor area as derived from EPC certificates or estimated using property attributes
Barclays financing and attribution	All mortgage financing activities under Barclays UK, Wealth and Private Business The portion of the mortgage for which Barclays finances is used, which is defined as the outstanding balance divided by the property value at origination (LTV)
Treatment of missing production data	Where EPC certificates are not available, use the intensity information developed at property type, property age and region level and apply the UK Government emissions factor. Where no information on the property location or building type is available, apply the UK average intensity
Benchmark scenario	BNZ scenario outlined by the Climate Change Committee
Target baseline year	2022

Known areas for future enhancement

Barclays recognises that while this is a third iteration of the methodology, this remains an emerging area with no consistent industry-wide approach to measuring emissions and that approaches continue to evolve. We believe that industry co-operation, particularly in setting common standards and transparent reporting, is important for our stakeholders. We continue to engage with peers, industry experts and academics to assess the transition to a low-carbon economy and consider emerging methodologies and taxonomies including in respect of carbon accounting and portfolio alignment.

5.A. Calculation granularity

Corporate and asset level information can be inconsistent, lack granularity and difficult to source. As company disclosures begin to improve, not least as a result of the TCFD guidelines and incoming regulatory reporting requirements, we are hopeful that this source of data will become sufficiently robust to play a much greater role in the calculation of BlueTrack™ metrics. This would allow us to account more easily for regional capacity factors, global carbon intensity factors and other GHGs.

In particular, we recognise that our approach to estimating methane is not sufficient to be tracked at a counterparty level given the difficulties that the industry faces in measuring emissions at this stage.

5.B. Data quality, including precision, coverage, matching and recalculations

Climate data, models and methodologies are evolving and not yet at the same standard as more traditional financial metrics nor yet subject to the same or equivalent disclosure standards, historical reference points, benchmarks or globally accepted accounting principles. Most of our data is collected from external sources and the quality and methodologies relating to the underlying data can be hard to assess. External sources then require mapping to Barclays' internal data. While we have set a framework that facilitates a robust matching process it is likely that residual issues will remain, for reasons such as mergers and acquisitions.

Asset Impact is our key data source for our most carbon-intensive sectors of Power, Energy and Automotives. While it has strong coverage across our key markets (US and Europe), it is not complete in more developing parts of the world, and does not include all sectors. There will also be cases, such as oil production owned by sovereign states, which are not captured within BlueTrack™ given the difficulties in assigning Barclays, fair share of the associated emissions.

Data coverage issues are of primary importance when calculating absolute emissions, but less important for the other metrics which are weighted averages. This is partially mitigated as larger clients also tend to have better quality data. We seek to make these issues and limitations transparent in relation to all the targets we set.

There are also issues with lags as most of our data is not available as at the reporting date. This is particularly important where we estimate the utilisation of power plants that can be impacted by many events such as rapid changes in fuel prices, geopolitical events and weather patterns. This may be particularly relevant in respect of FY22 and future years where energy price shocks and energy market capacity is constrained whether as a result of the Russo-Ukrainian conflict or for other reasons.

For sectors where we rely on company disclosed emissions, such as Cement and Metals (Steel), there are challenges around the granularity, consistency and transparency across data which may lead to inconsistencies in our metrics. Where we source data from company disclosures, our approach is to use the most recent reliable inputs.

There are also significant limitations in using EPC certificates for measuring emissions of properties, which can only reliably be solved by obtaining actual energy consumption data at a more granular level than is currently available.

We will continue working to enhance and refine BlueTrack™ over time, including as climate data quality improves, methodologies change and as company disclosures become more granular. We may re-perform estimates with the improved data that subsequently becomes available.

5.C. Company-level forecasting/ commitments

Through public company commitments and our corporate client relationships we are often aware of climate-related commitments clients have made, and we would like to reflect these in our approach over time.

5.D. Metrics

BlueTrack™ calculates a physical intensity and absolute emissions for each sector. We do not calculate an aggregated metric across sectors given the significant double-count of emissions across sectors, nor a temperature alignment metric.

We also feel, given the inherent uncertainty in emissions calculations, that it is important to develop a metric which estimates the level of uncertainty at a portfolio level. In 2023, we are progressing work on the prototype approach we initiated during 2022.

5.E. Other sectors

While we would expect to report emissions on our entire financing portfolio over time, BlueTrack™ will ultimately cover the most important sectors. In line with the NZBA's commitment statement, our initial targets focus on priority sectors where the bank can have the most significant impact, i.e. the most GHG-intensive sectors within their portfolios.

We will prioritise the extension of our approach to other sectors by considering, among other things, the magnitude of emissions from a sector, the amount of business that Barclays does in that sector, the feasibility of emissions reduction using existing technology, and the availability of emissions data.

Appendix 1: Barclays Industry Classification codes

Figure 24: **Full list of BIC codes used to identify in scope companies**

BIC Code	BIC Name	Sector	Sub-Sector
1010	Mining of Coal & Lignite; Manufacture of Solid Fuel	Energy	Upstream
1110	Oil & Gas: Extraction of Crude, Nat Gas, Bituminous Shale & Sand	Energy	Upstream
1310	Iron Ores Mining	Metals	Manufacture
1320	Non Ferrous Ores Mining	Metals	Manufacture
1450	Other Mining & Quarrying	Metals	Manufacture
6030	Oil & Gas: Midstream, Transportation, Gathering and Processing	Energy	Midstream
1120	Oil & Gas: Service Activities incidental to Oil/Gas Extraction	Energy	Midstream
4526	Oil & Gas Contractors	Energy	Midstream
2321	Oil & Gas: Oil & Petroleum Refining & Marketing	Energy	Downstream
2322	Oil & Gas: Other Treatment of Petroleum Products	Energy	Downstream
5156	Wholesale: Fuels, Metals, Paper & Other Intermediate Products	Energy	Downstream
5157	Wholesale Power and Gas	Energy	Downstream
4044	Power Generation - Project Finance	Power	Generation
4037	Integrated Utilities - Public	Power	Generation
4010	Electricity Production & Distribution	Power	Generation
4011	Non-renewable Electricity Production and Distribution - Private	Power	Generation
4012	Non-renewable Electricity Production and Distribution - Public	Power	Generation
4013	Non-renewable Electricity Production and Distribution - Public (Cooperative)	Power	Generation
4041	Power Generation - Merchant Generators	Power	Generation
4043	Power Generation - Other	Power	Generation
4046	Power Generation - Retail	Power	Generation
4036	Integrated Utilities - Private	Power	Generation

BIC Code	BIC Name	Sector	Sub-Sector
4014	Renewable Electricity Production and Distribution - Private	Power	Generation
4042	Power Generation - Nuclear Energy	Power	Generation
2330	Nuclear Fuel Processing	Power	Generation
4015	Renewable Electricity Production and Distribution - Public	Power	Generation
4016	Renewable Electricity Production and Distribution - Public (Cooperative)	Power	Generation
4040	Power Generation - Alternative Energy	Power	Generation
4045	Power Generation - Renewable Energy	Power	Generation
4020	Gas Manufacture & Distribution	Power	Distribution
4021	Gas Manufacture and Distribution - Private	Power	Distribution
4022	Gas Manufacture and Distribution - Public	Power	Distribution
4034	Gas Supply	Power	Distribution
4035	Gas Utility - Integrated	Power	Distribution
4038	Power Distribution & Transmission - Investor Owned (i.e. Electric Utilities - Regulated)	Power	Distribution
4039	Power Distribution & Transmission - Publicly Owned (i.e. Electric Utilities - Regulated)	Power	Distribution
2650	Mfg. Cement, Lime & Plaster	Cement	Manufacture
2660	Mfg. Concrete, Cement & Plaster Products	Cement	Manufacture
2310	Mfg. Coke Oven Products	Metals	Manufacture
2710	Mfg. Basic Iron, Steel & Ferroalloys	Metals	Manufacture
2730	Iron & Steel Processing (incl. Rolling & Drawing)	Metals	Manufacture
2740	Mfg. Precious & Non Ferrous Metals	Metals	Manufacture
2750	Mfg. Metal Castings; Foundries	Metals	Manufacture
3410	Mfg. Motor Vehicles	Automotive	Manufacture

Appendix 2: Our approach to reporting financial emissions

Figure 25 shows how we are measuring our progress made against our Energy metric from 2020–22. For 2022, our methodologies have been updated to include methane, adding more granularity to our estimate of the Scope 1 and 2 emissions for energy producers and a change in the data sourcing methodology adopted by Asset Impact.

Figure 25: Tracking the progress made in our Energy sector

	2020	2021	2022	Definition
Reported (R_T)	75.2	58.6	51.7	R_T = Per BlueTrack™ methodology as at year T
Previous year recalibrated (RC_T)		75.2	59.0	RC_T = Per BlueTrack™ methodology at year T
Base year rebaseline (RB_T)		75.2	75.7	$RB_T = RB_{T-1} * RC_T/R_{T-1}$
Cumulative progress (CP_T)		-22%	-32%	$CP_T = R_T/RB_T-1$
Annual progress (AP_T)		-22%	-10%	$AP_T = CP_T - CP_{T-1}$

Definitions

Reported = The metric as reported for the current year

Previous year recalibrated = The recalibrated metric for the prior year (T-1)
calculated using the same methodology and data in the current year

Base year rebaseline = The theoretical baseline metric as at the current year

Cumulative progress = Cumulative progress made towards the target in the current year

Annual progress = Progress made towards the target in the current year

Figure 26: Our approach to reporting financed emissions data

		Our approach
Error identified in our internal finance data or methodology	**Restatement**	• Financed emissions metrics for all years impacted by the error will be restated, including the baseline year.
Change our methodology and/or data sources to calculate financed emissions (e.g. including additional GHGs)	**Re-baseline**	• The updated methodology will be applied from the start of the current reporting period. • The last reported financed emissions spot metric will be recalculated using the new methodology / data source to provide the new baseline. This will ensure consistency of data and methodology when calculating our performance. • The recalculated baseline and the progress achieved to date will be used to disclose the theoretical baseline for the year the targets were originally set. • The cumulative progress will be the progress for the current reporting period (using the new methodology) and the progress up until the last reporting period (using the old methodology).
Updates to external counterparty data driven by timing lags when data is reported (e.g. counterparty valuations or emissions estimates)	**Capture in-year**	• The impact of updated external data will be included into the current period financed emissions data and the progress metric for the current reporting period. • Data lags are inherent to the process and Barclays will endeavour to use the latest available data. Historically reported metrics will not be updated for data lags.

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