Barclays PLC
Financed Emissions Methodology

BARCLAYS

Contents

Inside this book

Barclays' climate strategy

A strategy for a better financial future

Barclays' Climate Strategy

1 Achieving net zero operations

Barclays is working to reduce its Scope 1, Scope 2 and Scope 3 operational emissions consistent with a 1.5°C aligned pathway, and counterbalance any residual emissions.

2 Reducing our financed emissions

Barclays is committed to aligning its financing with the goals and timelines of the Paris Agreement, consistent with limiting the increase in global temperatures to 1.5°C.

3 Financing the transition

Barclays is helping to provide the green and sustainable finance required to transform the economies, customers and clients we serve.

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

Our climate strategy is driven by consideration of relevant risks and opportunities and in alignment with our Purpose: working together for a better financial future for our customers, clients and communities.

We have a clear shareholder endorsed climate strategy to achieve our ambition of being a net zero bank by 2050, by achieving net zero operations, reducing our financed emissions and financing the transition.

Achieving net zero operations

We are committed to achieving net zero operations and have continued to make progress, achieving a 51%Δ reduction of Scope 1 and 2 location-based greenhouse gas emissions milestone ahead of schedule. We continued to source 100%Δ renewable electricity for our global real estate portfolio and met our 90% Scope 1 and 2 market-based emissions reduction target – reducing these emissions by 93%Δ.

Reducing our financed emissions

We are also committed to reducing our financed emissions, those deriving from the activities of the clients that we finance and those generated in their respective value chains, by providing financial advice and support as they transition to a low-carbon economy.

We have now set 2030 emissions reduction targets for eight of the highest-emitting sectors in our portfolio: Energy, Power, Cement, Steel, Automotive manufacturing, Aviation, Agriculture and Commercial Real Estate; and have assessed the baseline and convergence point for our UK Housing portfolio. This meets our commitment under the Net-Zero Banking Alliance (NZBA) to set targets for material high-emitting sectors in our portfolio.

Our 2030 target-setting includes the integration of 1.5°C aligned scenarios, such as the International Energy Agency (IEA)'s Net Zero 2050 (NZE2050) scenario, in our financed emission targets, and includes ranges for certain sectors to reflect dependencies outside our control that will determine how quickly our financed emissions can be reduced in these sectors.

This year, we have further extended the scope of our calculations to cover the full in-scope balance sheet financed emissions, largely aligned to the Partnership for Carbon Accounting Financials (PCAF) Standard[1]. We used our methodology for measuring our financed emissions and tracking them at a portfolio level against the goals and timelines of the Paris Agreement – this methodology is called BlueTrack™.

Financing the transition

Capital is critical for a successful energy transition and we are focusing our financing to those clients actively engaged in the energy transition.

The scale of our business gives us the opportunity to help finance the energy transition – to use our global reach, products, expertise and position in the global economy to work with our clients, including those in the Energy sector, as they transition to a low-carbon business model.

Further information on our Climate Strategy can be found in our Annual Report. The focus of this paper is on our methodology to measure our financed emissions.

Notes:

Δ 2023 data subject to independent limited assurance under ISAE (UK)3000 and ISAE 3410. Current limited assurance scope and opinion can be found within the ESG Resource Hub: home.barclays/sustainability/esg-resource-hub/reporting-and-disclosures/

1. PCAF Standard – PCAF (2022). The Global GHG Accounting and Reporting Standard Part A: Financed Emissions. Second Edition. www.carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf

More details about our Climate Strategy can be found in our Annual Report: barclays.com/annualreport

Barclays' financed emissions methodology

Our approach is underpinned by our methodologies to estimate our full in-scope balance sheet financed emission and to track sector level emissions against the goals and timelines of the Paris Agreement

Our approach to tracking our financed emissions involves calculating an estimate of our full in-scope balance sheet financed emissions, using a methodology developed using the PCAF Standard and by setting targets for specific activities using our BlueTrack™ methodology.

Most of our emissions result from the activities of the customers and clients we finance, and those generated in their respective value chains – falling within the general definition of Scope 3 emissions (see page 4).

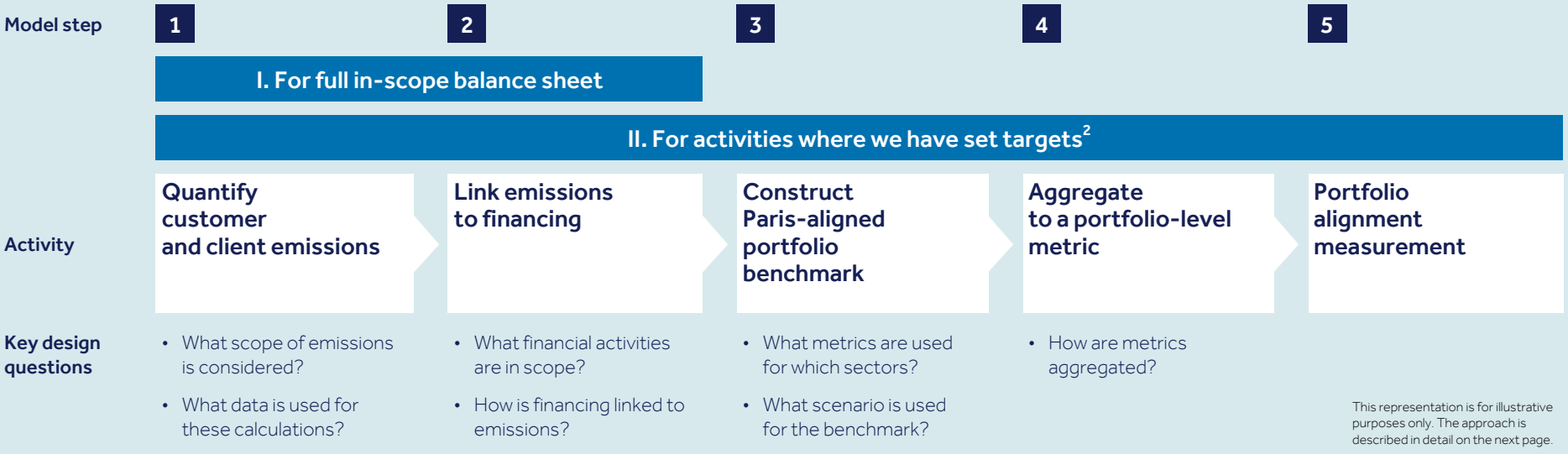
Our climate dashboards[1] show our financed emissions targets over time – and our progress towards them – by comparing the BlueTrack™ metrics for individual sectors against a benchmark emissions level.

Since 2020, Barclays has been an active member of PCAF, an industry wide-initiative that aims to build consensus on approaches to carbon accounting, disclosure and portfolio alignment.

In 2023, we calculated an estimate of our full in-scope balance sheet financed emissions as at December 2022. This has enabled us to calculate the coverage of our reduction targets across our portfolio – including integration of 1.5°C-aligned scenarios, with ranges for certain sectors – and to assess the extent to which the business is aligned to a well-below 2°C pathway. We intend to build on this assessment to deepen our understanding of the emissions associated with our financing activities. Informed by this work, we intend to consider the most appropriate approach to extend our target coverage with the aim of ensuring it covers relevant areas of the value chain and/or our financing activities. We will continue to evolve our approach over the coming years.

In certain circumstances, we will also consider restating, recalculating and/or re-baselining our metrics in order to reflect significant changes – such as material portfolio changes or data and methodological developments – that may compromise the relevance and consistency of our existing targets.

Our approach to track our financed emissions and set targets



Note:
1 Can be found in our Annual Report: barclays.com/annualreport
2 Includes convergence point set for UK Housing.

Barclays' financed emissions methodology (continued)

This paper is an update to the 'Introducing BlueTrack™' whitepaper first published in November 2020, and most recently published in February 2023. In this latest version, published in February 2024, we have detailed our methodology used to calculate an estimate of our full in-scope balance sheet financed emissions during 2023. In addition to our existing sector-specific methodologies, this updated version introduces the methodologies we use to measure our financed emissions for the UK Agriculture, Aviation[1] and UK Commercial Real Estate (CRE) sectors, for which we have this year published a 2030 target. The UK Residential Real Estate sector is also being expanded to include housing associations and small business buy-to-let lending, and is now tracked against a UK Housing convergence point.

Calculating our financed emissions

Our approach to calculating financed emissions under the BlueTrack™ methodology was already based on the PCAF Standard, with some key exceptions . Starting this year, we have extended the scope for calculating the financed emissions metrics to cover our full in-scope activities. Hence, we have pivoted our approach to measuring our financed emissions across two key steps:

I. For our full in-scope balance sheet: calculating financed emissions based on methodology developed using the PCAF Standard by (1) quantifying customer and client emissions; and (2) attributing emissions to our financing. This covers the activities for which we have already calculated emissions under the BlueTrack™ methodology.

II. For activities covered under a target incorporating 1.5°C scenarios: we updated our baseline emission calculations (following Steps 1 and 2 as set above) for year-end 2023 and continue to use the BlueTrack™ methodology, (3) construct Paris aligned benchmarks; (4) calculate portfolio-level metrics; and (5) measure progress against our targets.

I. For our full in-scope balance sheet

1. Quantifying customer and client emissions

The first step is to quantify emissions produced by the customers and clients to which we provide financing.

Emission boundaries

The GHG protocol[2] defines emissions in three categories, or 'Scopes':

a. Scope 1 emissions are those directly from owned or controlled sources, including from fuel burned by a company in their office and/or plant

b. Scope 2 emissions are indirect emissions from the generation of power or energy purchased by a company

c. Scope 3 emissions are those indirectly occurring in a company's value chain, including those arising from the production of goods and services provided by the company.

Our calculations are based on the Scope 1 and 2 emissions for all our clients and Scope 3 emissions for specific activities. The PCAF Standard recommends a phase-in approach which requires Scope 3 reporting for select sectors over time. We acknowledge that the availability and consistency of reported Scope 3 emissions from clients varies across sectors. For the purpose of our current estimation we have estimated Scope 3 emissions only for the following activities where we have set targets integrating 1.5°C scenarios: Upstream Energy, Automotive manufacturing (downstream only), Aviation (upstream only) and Agriculture (upstream only).

The PCAF Standard recommends calculating financed emissions at client-level granularity. However, we have sought to calculate financed emissions at client activity level. Our clients often participate in multiple activities with different emission profiles across the value chain, meaning their company-reported emissions may not have the level of granularity and consistency we require.

We measure Scope 2 emissions using a market-based approach where available. However, such data is often scarce – so these emissions are often measured using location-based methods.

Key data sources

For the calculation of our financed emissions, we rely on external sources for emissions data – for which the quality is currently evolving. At an activity level, we employ the full range of PCAF Data Quality options to estimate client emissions. Please refer to the section on Data Quality on the page 5.

For certain activities, such as Cement and Steel, we rely on reported emissions. Where we require company-reported emissions we source this data from S&P Trucost.

For specific activities – such as Upstream Energy (fossil fuel exploration and production), Power generation, Automotive manufacturing and air travel from Commercial Aviation – we source physical activity data from specialist providers Asset Impact and PACE (Platform for Analysing Carbon Emissions).

For our UK Housing and CRE sectors, our primary data source is the information held within Energy Performance Certificates (EPC).

Where we require an estimation of emissions based on economic activities, we either calculate the implied emission factors based on our own portfolios, or externally source them from the PCAF web-based emission factor database.

Fall-back methodologies

Our methodology seeks to assess emissions with the most granular approach possible. For corporate sectors, this means we model emissions metrics at the level of the specific subsidiary that we provide financing to, rather than aggregated at the level of the parent company.

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

For an immaterial part of our balance sheet (c. 1%), where the appropriate sector fall-backs could not be reliably obtained we have used the overall portfolio average economic emissions intensity to estimate emissions.

Note:

1. For Aviation we have set an emissions intensity target using a target range - which is the same approach we have previously taken for Power, Cement, Steel. While we are clear on the reduction required to align with the IEA NZE2050 pathway – the higher emissions reduction in the range – we recognise there are dependencies outside our control that will determine how quickly our financed emissions intensity can be reduced in these sectors. The lower emissions reduction in the range reflects our view of the sector, client pathways and commitments at the time of setting the target. We seek to achieve the higher emissions reduction, consistent with our net zero ambition, but achieving it will depend on external factors
2. The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, www.ghgprotocol.org/corporate-standard

Barclays' financed emissions methodology (continued)

Overrides

In certain cases the data, fall-back inputs or modelled outputs are overridden using expert judgement.

To facilitate this, we run a series of filtering exercises identifying which data – including both emissions and financial data – may be important or stale to the portfolio metric. We review this by comparing it to other published sources, including news articles and company reports, and through 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 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

We do not allow company-purchased offsets such as carbon credits to reduce emissions. We feel it is most important to focus a metric on operational activities under a company's control, rather than relying on unrelated offsets – the availability of which may be limited.

The methodology does allow company-operated removals such as on-site carbon capture at a plant. However, given this is currently marginal in the context of emissions – according to the IEA, <0.01% of electricity generated from fossil fuels operates with carbon capture technology today – there is no impact on the metrics.

Data quality

The PCAF Standard provides guidance to measure data quality through a Data Quality (DQ) hierarchy ranging from DQ1 (best) to DQ5 (worst), specific for each asset classes. Our estimation of data quality is based on the PCAF Standard's guidance. Our current data quality is dispersed across DQ1-2 (reported emissions) to DQ3 (deriving emissions from production data) and DQ4-5 (using revenue- and asset-based emission factors)[1]. For activities where we set targets, data quality is mostly concentrated across DQ1-2 and DQ3. We disclose the distribution of our portfolio externally based on these data quality buckets.

2. Attributing emissions to our financing

The second step is to attribute customer and client emissions to the financing provided to measure absolute emissions – which calculates the fair share of the company's emissions over time. This involves defining in-scope financing activities, determining how provided financing should be spread across the various business activities for diversified corporates, and appropriately linking each financing portion to the respective absolute emissions or emissions intensity metric.

Products in scope

We have aligned our scope of coverage not only to the PCAF Standard but also, notably, to include undrawn commitments, contingent liabilities, and capital markets financing. We include capital markets financing facilitated in the last 12 months prior to the reporting date.

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 include both the drawn and undrawn portions of the facilities as of the reporting date. The use of limits is less applicable for lending in mortgages captured in the UK Housing sector, so we instead use the drawn balance in line with the PCAF Standard.

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, for example – however, drawn amounts are typically much lower than the limit and using them would under-represent the financing Barclays has contractually committed to provide. It would also expose carbon metrics to volatility that cannot be controlled – for example, at times of an increase in drawn amounts – that would not be informative for the management of our activity, and that may be related to the near-term liquidity needs of a company rather than investment in carbon-generative activities.

In addition to lending, our model considers debt and equity financing arranged in the capital markets sourced from Dealogic as in scope. This is a key element of our approach and ensures 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 the Dealogic league table credit if there are several banks in the syndicate.

However, for deals where Barclays has been a co-manager, since Dealogic assigns zero credit to co-managers we pro-rate it by the Barclays fee share. Barclays is allocated 33% of the pro-rated financing amount, with the remaining proportion allocated to investors that align with the PCAF Standard on Facilitated Emissions published in December 2023.

Emissions attribution

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

We take an activity-based view of calculating financed emissions. If a company straddles multiple activities – for example having one subsidiary that extracts fossil fuels and another that generates power – the former would be counted as part of the Energy portfolio, and the latter as part of the Power portfolio.

We have also consistently used the book value of equity and debt to measure the attribution factor for all clients, while the PCAF Standard recommends using the Enterprise Value Including Cash (EVIC) for listed entities. In the case of UK Housing and CRE, property emissions are allocated on the basis of loan-to-valuation (LTV) – with the valuation assessed at the point of origination where available, and otherwise at the latest value (fixed).

In the Power and Automotive sectors, loan facilities and capital market transactions are assumed to have a zero intensity if the proceeds are used for zero- or low-carbon activities – renewable power generation, for example – and are classified as 'green' dedicated purpose financing under Barclays' Sustainable Finance Framework (SFF)[1].

Notes

1. Barclays Sustainable Finance Framework, home.barclays/content/dam/home-barclays/documents/citizenship/our-reporting-and-policy-positions/Barclays-Sustainable-Finance-Framework-V4-1.pdf

Barclays' financed emissions methodology (continued)

II. For activities with targets integrating 1.5°C scenarios

3.Constructing Paris-aligned portfolio benchmarks

We 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.

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

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 IEA's Sustainable Development Scenario (SDS). At the time, SDS was aligned to a 1.7°C world and was 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 this SDS scenario.

Later, we updated BlueTrack™ to include 2030 targets for Energy, Power, Cement, Steel and Automotive based on the IEA's NZE2050 scenario. These targets remain unchanged. The NZE2050 scenario is aligned with a goal to limit global temperature rises to 1.5°C with a 50% probability.

For UK Housing and Agriculture, we have set a 2030 convergence point and target respectively, based on the UK Climate Change Committee (CCC)'s Balanced Net Zero (BNZ) pathway, which sets out a roadmap for decarbonising the UK economy by 2050.

For UK CRE, we have set a 2030 target based on the Carbon Risk Real Estate Monitor (CRREM) pathways, which offer decarbonisation trajectories for different property types and are considered the most appropriate by industry standards. The CRREM scenario provides the relevant granularity as it understands that different properties will have different decarbonisation levers and trajectories.

For the Aviation sector, we have set a 2030 target based on emissions from commercial air travel, in accordance with the Mission Possible Pathway's Prudent (MPP PRU) scenario published in 2022. It is a 1.5°C-aligned aviation decarbonisation strategy highlighting the efforts required to reach to net-zero emissions in the sector.

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

Next, we aggregate company-level emission measurements and financing information into portfolio-level metrics. In this step, in addition to the absolute financed emissions, we also calculate the physical intensity. This is the average intensity of our portfolio, weighted by our exposure to each company, typically adjusted for the proportion of revenue they generate from the in-scope activity. This defines how much CO_2e (carbon dioxide equivalent) is released on average for a certain amount of economic activity or material produced for the activities where we have set targets – except for Energy and Agriculture, where targets have been set on an absolute emissions basis.

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.

5.Portfolio alignment measurement

We have set targets for eight sectors listed in this paper, articulated as percentage reductions compared to a baseline reporting year, and a convergence point for our UK Housing portfolio. Our financed emissions in our target year must therefore be calculated on a consistent basis to this baseline. However, as we continue to refine 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.

As a result, direct, like-for-like comparisons of financed emissions 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[1]. This ensures a fair representation of the cumulative progress we have made to date. Additional information, including a worked example for Energy, is provided in Appendix 2.

Notes
1 www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022-extended-dataset

Our approach to calculate an estimate of financed emissions

Deriving the scope of coverage of our activities relevant for measuring financed emissions

We have prepared an estimate of our full in-scope balance sheet financed emissions. The scope of financing covered goes beyond the asset classes covered by the PCAF Standard, ensuring alignment for activities where we have already set targets incorporating 1.5°C scenarios.

1. What is the approach to determining in-scope activities?

a. As a starting point to estimate the scope of activities for which we want to assess the financed emissions, we have considered the Group balance sheet as at FY2022. Hence, these numbers follow a lag of one year when compared to other disclosures based on December 2023 in this paper. The lag of one year is due to the lead time required to fully analyse our entire in-scope exposures.

b. We have subsequently excluded two categories:

i. Assets specifically excluded by the PCAF Standard (2.b)

ii. Assets for which the associated emissions are already being measured and reported elsewhere in the Bank (2.c).

c. We have then included additional activities for which PCAF has not yet established the methodology – but which we believe should be considered for calculating financed emissions (3.a).

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2. What has been excluded from the Group-level balance sheet to arrive at the in-scope activities?

a. The calculated financed emissions of counterparties constitutes Scope 3 Category 15 ('Investments'), following the PCAF Standard's use of Greenhouse Gas Protocol definition

b. We have excluded assets for which the methodology for measuring financed emissions is not covered under PCAF. Examples include retail lending (personal lending, retail cards), cash and bank balances, trading portfolio assets and reverse repos. An exhaustive list has been provided in the exhibits below

c. We have excluded the emissions associated with our Property, Plant and Equipment and Retirement benefit assets. Similarly, we have excluded lending to internal Barclays counterparties.

3. What has been additionally included to arrive at the in-scope activities?

a. We have included certain in-scope activities for specific sectors where we have already set targets not yet covered by the PCAF Standard. These include:

i. Undrawn commitments for loans and advances

ii. Contingent liabilities – for instance Trade Finance bonds, guarantees and/or indemnities and letters of credit.

b. We have included capital markets financing activities for our calculations, noting that PCAF released its Standard for calculating facilitated emissions based on capital markets financing activities in December 2023. Aligned to the PCAF Standard, we consider 33% of Barclays' share of capital markets financing activities to calculate the financed emissions.

4. How does our approach align with the PCAF asset class definitions?

a. We have identified the scope of coverage based on a methodology developed using the PCAF Standard. The tables below map our choice of in-scope financing to the preferences laid out by the PCAF Standard.

Our approach to calculate an estimate of financed emissions (continued)

Figure 1: **Identification of in-scope exposure to calculate financed emissions**

Category	Reasons
Total Barclays' balance sheet	
Exclusions:	
Cash and bank balances, cash collateral and settlement balances, derivative financial instruments, goodwill and intangible assets, current tax assets, deferred tax assets, other assets, trading portfolio assets (including drawn loans),retail lending (personal lending, retail cards) and reverse repos	Exposures specifically excluded by the PCAF Standard
Property, plant and equipment	Emissions covered under Barclays' Scope 1 and Scope 2
Retirement benefit assets	Emissions on Barclays Bank UK Retirement Fund reported separately as part of Task Force on Climate-Related Financial Disclosures Report 2022
Total Barclays' on-balance sheet exposure in scope for computing financed emissions	
Inclusions:	
Total in-scope undrawn commitments and contingent liabilities	
Capital markets financing (33% of Barclays' share)	
Total Barclays' activities considered for financed emissions calculations	

Our approach to calculate an estimate of financed emissions (continued)

Figure 2: **In-scope activities mapped to PCAF asset classes**

Asset classes	What is covered	Comments
Listed Equities and Corporate Bonds (excluding sovereigns)	Equity and debt securities Known purpose bonds will not be separated out and will be treated as general corporate purpose bonds	Sovereign counterparties are considered as a separate asset class
Business Loans (including Contingent Liabilities and excluding Sovereigns)	Business loans Contingent Liabilities (Letters of Credit, BGIs) Also includes undrawn commitments from sovereigns, project finance	N/A
Unlisted Equities	N/A	Any financing will end up being treated as business loans. Exposure is not material for Barclays.
Mortgages	Secured mortgages	N/A
Project Finance	All project finance	N/A
Commercial Real Estate	Property-specific methodology as defined by PCAF not followed. These are treated as business loans.	N/A
Motor Vehicle Loans	N/A	Exposure is not material for Barclays.
Capital Markets Financing	Deals where Barclays' role was as underwriter or co-manager for DCM, ECM and Loans, including for sovereign entities	Excludes securitisation and advisory services Excludes activities where clients did not receive proceeds (classified as No Proceeds to Issuer by Dealogic)
Sovereign Loans and Debt	Sovereign loans and debt securities.	N/A

Our approach to calculate an estimate of financed emissions (continued)

Estimating the financed emissions for in-scope activities

Financed emissions are calculated by applying an attribution factor to client emissions. Client emissions are calculated using a range of data quality options, ranging from reported emissions to sector-average emission factors.

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

a. We have computed our overall financed emissions based on our clients' Scope 1 and Scope 2 emissions as of December 2022.

b. For sovereigns, we have separately calculated Scope 1 emissions with and without the impact of land use, land-use change, and forestry (LULUCF).

c. We note there are specific emissions required to be reported separately by the PCAF Standard. In our current estimate, we have not yet separately considered the following as it will entail additional modelling and/or data sourcing that was out of scope for the current year's exercise:
   i. Biogenic emissions
   ii. Avoided and removed emissions
   iii. Impact of carbon offsets
   iv. Lifetime emissions within project finance.

d. The PCAF Standard recommends a phase-in approach requiring Scope 3 reporting for select sectors over time. We acknowledge that the availability and consistency of reported Scope 3 emissions from clients varies across sectors. For the purpose of our current estimation, we have included Scope 3 emissions only for activities where we have set targets incorporating a 1.5°C aligned scenario.

e. As the level of consistency and transparency of Scope 3 emissions reported and fall-back emission factors improve, we will also evaluate increasing the span of our financed emissions reporting to cover additional activities under our clients' Scope 3 emissions.

2.B What data is used for these calculations?

a. Based on the PCAF Standard, we use a range of data feeds to estimate client emissions:
   i. We source emissions data for our clients from S&P Trucost
   ii. For specific activities such as Upstream Energy, Power generation and Automotive manufacturing, we source physical activity data from Asset Impact, a specialist provider of asset-level data
   iii. For Aviation, we source physical activity data from PACE, an external data provider
   iv. For UK Residential Mortgages, we source EPC data from the Department for Levelling Up, Housing and Communities (DLUHC)
   v. Where we require estimation of emissions based on economic activities, we either calculate implied emissions factors based on our portfolios or externally source them from the PCAF web-based emission factor database (September 2023 version) and S&P sector averages (December 2023 version).

b. We also source client financial data from S&P Capital IQ to calculate client emissions based on the emission factors.

c. Barclays' on-balance-sheet, undrawn commitments and contingent liabilities data is sourced from internal databases. Barclays' capital markets financing activities data is sourced from Dealogic.

Our approach to calculate an estimate of financed emissions (continued)

Figure 3: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Date of source used for calculation of full in-scope financed emissions
Barclays' exposure	Lending	Internal	December 2022
	Capital Markets	Dealogic	December 2022
	Revenue share	S&P Trucost	December 2022
Client emissions	Reported/estimated	S&P Trucost	December 2022
	Emissions factors	PCAF Database (Scope 1 and 2) S&P Trucost Sector Averages	PCAF emissions factor database, September 2023 release S&P Trucost sector averages, December 2023 release
Client financials	Total Debt	S&P CapIQ	December 2022
	Total Equity	S&P CapIQ	
	Total Revenue	S&P CapIQ	
	Total Assets	S&P CapIQ	

4 How do we calculate client emissions?

a Our underlying approach to estimating client emissions is to calculate these separately at an activity level.

b We use the business activity revenue share data from S&P Trucost as a starting point to identify the activity mix of a client. This is then multiplied by the appropriate revenue-based emissions factors to calculate 'emissions share' from each activity.

c Where the revenue share is not available from S&P Trucost, we assume the business activity is 100% aligned to the NAICS[1] code of the counterparty. Where the NAICS code of the counterparty cannot be determined with certainty, we assume the business activity is 100% aligned to the BIC[2] code.

d In cases where sufficient data is not available at the counterparty level, we source emissions data at the parent level.

e We employ a mix of DQ options to estimate client emissions from each activity. We have provided the DQ distribution in our Annual Report for Scopes 1, 2 and 3 separately.

f For Mortgages, we source EPC data to estimate emissions or use a fallback to sub-portfolio economic intensity if EPC is unavailable.

Note:
1 NAICS – North American Industry Classification System.
2 BIC – Barclays Industry Classification, the system used for to classify clients and counterparties for internal Barclays purposes.

Our approach to calculate an estimate of financed emissions (continued)

Figure 4: **Approach for estimating emissions mapped to PCAF DQ scores**

Activity	Data Quality option employed	PCAF DQ Mapping
Upstream Energy	Estimated based on production data Estimated based on average portfolio economic intensity if production data is not available	DQ 3 if production data and company value is available. DQ 5 if production data or company value is not available
Power generation		
Automotive manufacturing		
Aviation	Estimated based on production data	DQ 3
Cement	Reported emissions	DQ 1-2 if reported emissions and company data is available DQ 5 if production data or company value is not available
Steel		
Agriculture	Estimated based on economic-activity-based emissions factors	DQ 4-5
Mortgages	Estimated based on data available in EPC certificates Estimated based on average sub-portfolio economic intensity if EPC is not available	DQ 3 if EPC is available. DQ 5 if EPC is not available
Other activities	Reported emissions if available Fall-back to economic-activity-based emissions factors if reported emissions are not available	DQ 1-2 if reported emissions and company data is available DQ 4-5 if reported emissions or company data is not available

Figure 5: **Illustrative calculation of Scope 1 and 2 emissions shares**

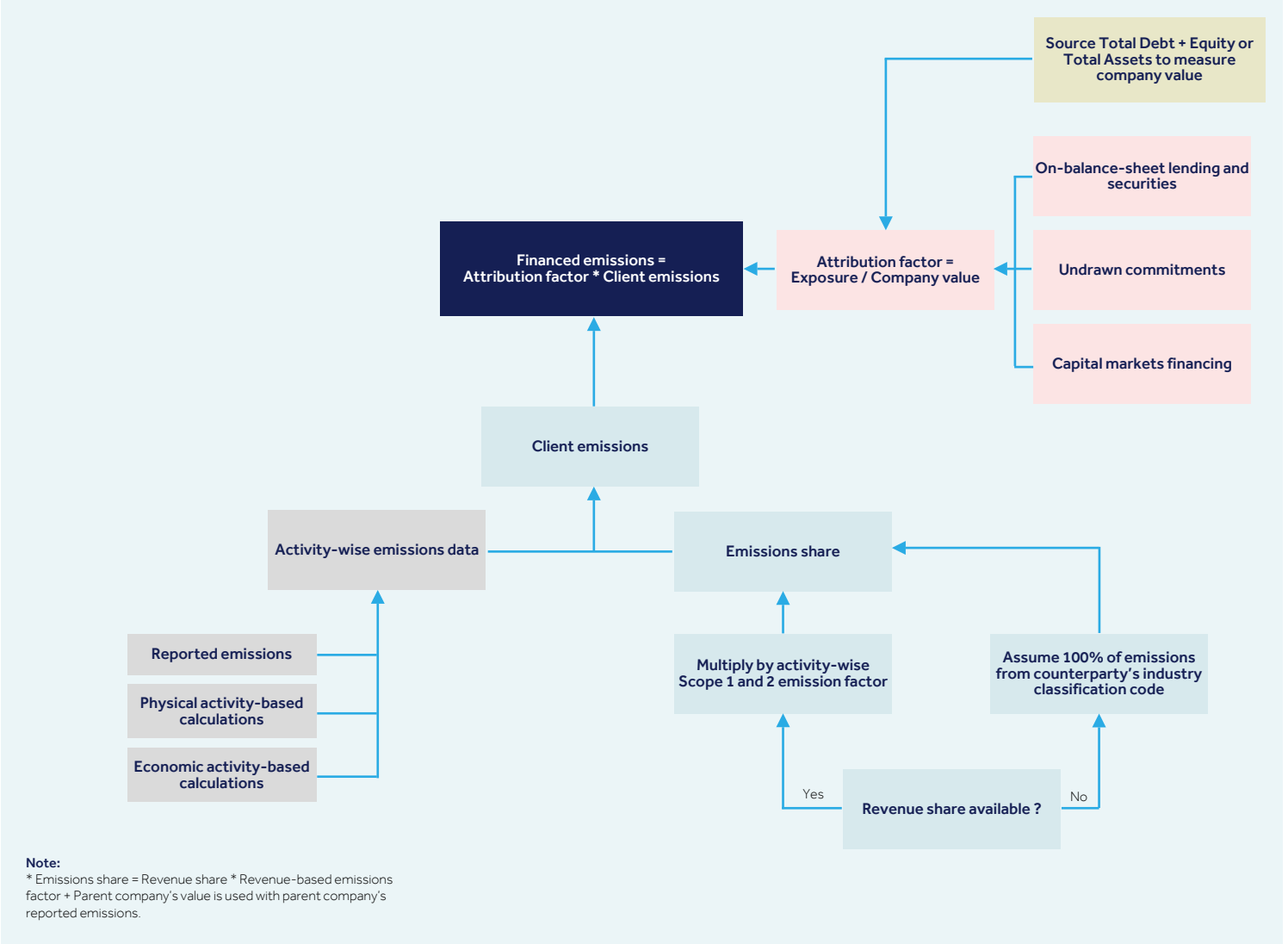
Trucost business activity ID	Revenue share %	Emission factor linked to the business activity	Emissions share (%)	Mapping to sectors where we have set targets	Covered under targets incorporating a 1.5°C scenario	Approach to calculating emissions
A	40%	3	57%	Oil and Gas exploration	Yes	Estimated based on production data Estimated based on average portfolio economic intensity if production data is not available
B	30%	2	29%	Power generation	Yes	
C	30%	1	14%	Power distribution	No	Reported emissions if available Fall-back to economic-activity-based emissions factors if reported emissions are not available
Total	100%		100%			

Our approach to calculate an estimate of financed emissions (continued)

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

When calculating our proportion of a client's emissions, we use financing provided as at December 2022 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. The PCAF Standard recommends using EVIC for calculating company value where it is available. While there is some merit in using EVIC for listed companies, and while some of our peers prefer this approach, upon careful consideration it has been agreed to consistently use the book values – 'total equity + total debt' – where available, and 'total assets' as a fall-back approach permitted under the PCAF Standard. Given that PCAF-based emissions reporting is an annual activity, and where progress in financed emissions needs to be monitored across multiple years, it is prudent to opt for an approach that is standardised and scalable across the entire portfolio – and on which the effect of market volatility is limited across time periods.

Figure 6: **Indicative approach to calculate financed emissions**



Note:
* Emissions share = Revenue share * Revenue-based emissions factor + Parent company's value is used with parent company's reported emissions.

Our approach by sector – Energy

The Energy sector covers the production, processing and distribution of hydrocarbon fuels and their derivatives. Hydrocarbons are mostly used as an energy source, but 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 – for example automotives and power generation – but also through production processes including flaring, venting and unexpected leaks across the supply chain. Efficiency upgrades, early detection of leaks and carbon capture may reduce emissions, but decarbonisation will largely rely on the 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 GHGs emitted by an entity over time. For example, if a company emits 10 tonnes of CO_2 this year, its absolute emissions measurement would be 10 tonnes.

1.A.3 We have chosen this metric because the Energy sector cannot reduce its emissions intensity beyond a certain point – burning a barrel of oil will always produce a similar quantity of emissions, for example – 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 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 emissions 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 publishes a methane tracker that suggests 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 is included, and why?

2.A.1 For the Energy sector, we include all companies that extract fossil fuels.

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 solely involved in refining or trading oil, for example, 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. Most of the emissions related to a given unit of fossil fuels are released into the atmosphere during combustion – for example 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 resulting emissions.

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

2.A.5 In our previous update we 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 that 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, as detailed in Figure 7.

Our approach by sector – Energy (continued)

Figure 7: **Our 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[1] (Oil Production Greenhouse Gas Emissions Estimator) and the PRELIM[2] (Petroleum Refinery Lifecycle Inventory Model) lifecycle assessment models to calculate Scope 1 and 2 emissions, which provides increased granularity of energy intensity. For example, 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 production levels reported by 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)[3] lifecycle assessment analysis to estimate CO_2 emissions factors, allowing 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[4] 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 observe far lower intensities than average. The intensity of Norwegian gas, for example, 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 production levels reported by the IEA.

Natural Gas Liquids (NGLs)

Scope 1 and 2 emission 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)[5] and combustion rates and emissions intensities from the Energy Information Administration (EIA)[6].

The derived intensity factor is less than half that 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 Scope 1 and 2 intensity factors are also less common but generally form a much smaller part of the overall lifecycle emissions 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, whether that is lignite, subbituminous, bituminous, or anthracite, for example. We estimate using the mid-point of a range provided by the US Environmental Protection Agency (EPA)[7].

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 vary depending on the extraction method – the average methane intensity of underground mines, for example, is around eight times more intensive than surface mines. We assess methane using the Global Energy Monitor[8], which follows the methodology developed by the Pacific Northwest National Laboratory and the EPA.

Scope 3 CO_2 emission factors are estimated from the EPA.

1 www.eao.stanford.edu/research-project/opgee-oil-production-greenhouse-gas-emissions-estimator
2 www.ucalgary.ca/energy-technology-assessment/open-source-models/prelim
3 www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf
4 www.iea.org/data-and-statistics/data-tools/methane-tracker-data-explorer
5 www.netl.doe.gov/
6 www.eia-international.org/
7 www.epa.gov/
8 www.globalenergymonitor.org/

Our approach by sector – Energy (continued)

Figure 8: **Key criteria for assessing the Global Warming Potential (GWP) of methane**

No	Criteria	Description	Preferred measure
1	**Comparability**	• The standard convention set out by the United Nations is to measure GHGs using a GWP100 basis. • Typically, companies disclose emissions on a GWP100 basis, which also aligns to the approach adopted by our peers and aids 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, with an average life of 12 years. This makes it challenging to compare. • The Intergovernmental Panel on Climate Change (IPCC) is currently debating the usefulness of a GWP20 measure, given a GWP100 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 reduces the overall impact of methane in the portfolio, thus reducing 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[1].

2.B.2 Fossil fuel energy content for oil, gas and NGLs (MJ) and production for coal (tonnes) is obtained from specialist data provider Asset Impact and converted into emissions using a variety of techniques depending on the fuel – as shown in Figure 7.

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, and 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 Using 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 this context, during 2023 we continued to work with RMI's Centre for Climate-Aligned Finance. In August 2023, we became a Founding Consortium Funder of RMI's Oil Climate Index plus Gas (OCI+), which will enable us to achieve greater integration of methane emissions data in our risk models and guide our decision making.

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 widely used in company reporting. Figure 8 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 production levels as reported by the IEA. Figure 9 shows the derivation from the IEA.

Note:
1 www.pacta.rmi.org/

Our approach by sector – Energy (continued)

Figure 9: Derived emissions factors from the IEA for fossil fuels[1]

Technology	Annual emissions ($MtCO_2$)	Annual production (Mtoe)	Emission factor (gCO_2/MJ)
Coal	15,330	4,065	90
Oil	10,963	4,460	59
Natural Gas[2]	7,499	3,441	52
NGLs[2]	n/a	n/a	24

2.B.10 For 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 classified as Upstream Oil and Gas and miners is greater than 90% by exposure as at December 2023. This is driven by better data coverage for the larger borrowers and across clients of the Investment Bank, versus 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, we estimate our financed emissions for Upstream companies without data. 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 – where the company is an Upstream company, for example – the absolute emissions are estimated based on the portfolio average of the sub-sector. This will also reduce a change in the metric due to an expansion in coverage that would not be reflective of a change in Barclays' portfolio emissions.

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

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

Green financing for activities in the Energy sector does not have a differentiated treatment for the purposes of financed emissions[3].

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 (EV) as it relies on market capitalisation, which can create volatility – Barclays' absolute emissions would increase if a company's stock price falls, for example, and vice versa. In addition, EV uses debt net of cash, which is why the PCAF Standard recommends using EVIC – which is increasingly becoming the norm. Using EV also 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. Note that, while this approach reduces volatility, it will not eliminate it where there are material shifts in a company's book value of total debt and equity.

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 versus other funders of a company 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 10 contains a full list of data sources used for each calculation component.

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

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

Note
1. www.iea.org/reports/world-energy-outlook-2023
2. www.eia-international.org/
3. To clarify, please note that, in previous versions of our Financed Emissions Methodology Whitepaper, where we have stated that certain sectors are 'not eligible for dedicated purpose green financing under Barclays SFF', this has meant that activities in those sectors cannot be treated as 'green' for the purposes of financed emissions and assumed to have zero intensity, as is the case for activities which are classified as dedicated purpose green financing under the Barclays SFF in the Power and Automotive sectors. We have sought to clarify this further in this latest version of our Financed Emissions Methodology Whitepaper.

Our approach by sector – Energy (continued)

Figure 10: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays' financing	Lending	Internal	December 2023
	Capital Markets	Dealogic	December 2023
Company value	Total Debt	S&P CapIQ	December 2023
	Total Equity	S&P CapIQ	December 2023
	Total Assets	S&P CapIQ	December 2023
CO_2 emission 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 emission factors Scope 1 and 2	Oil	Estimates derived from OPGEE and PRELIM models	2020
	Gas	IEA Methane Tracker	2023
	Coal	Global Energy Monitor	2021
	NGLs	IEA Methane Tracker	2023
CO_2 emissions factors Scope 3	Oil	IEA	2023 estimate from 2023 WEO Report
	Gas	IEA	2023 estimate from 2023 WEO Report
	Coal	EPA	2018
	NGLs	EIA	2021
Production	NGLs	EIA	2021
	Oil	Asset Impact	2023 full-year forecast as at September 2023
	Gas	Asset Impact	2023 full-year forecast as at September 2023
	Coal	Asset Impact	2023 full-year forecast as at September 2023
	NGLs	Asset Impact	2023 full-year forecast as at September 2023

Our approach by sector – Energy (continued)

Figure 11: **Key choices to calculate the absolute metric**

Key choice	Description
Sector boundary	Upstream Energy (producers of coal, oil, 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
GHGs 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; EPA for energy content and CO_2 estimates; and Global Energy Monitor for methane as described in Figure 7. Checked against company disclosure, for material cases, if available
Scope 3 estimation	Derived from asset-level fossil fuel extraction (tonnes 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 17 Checked against company disclosure for material cases, if available
Barclays' financing and attribution	Financing provided or arranged The share of 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 production data is not available, 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 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 emissions intensity to be the primary emissions 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 – representing the higher reduction in emissions in our target range. The IEA does not publish further geographic granularity in order to set a benchmark at an OECD level, however we would expect 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 electricity total emissions by 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 resulting from the combustion of 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 This 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 sectors generally comprise the i) upstream emissions from fossil fuel extraction; ii) the purchase of power from upstream generation companies; and iii) the downstream combustion of natural gas transported to final consumers – for example for residential or commercial heating.

2.A.4 This year we analysed upstream gas, coal and bioenergy emissions for the Power portfolio, with a focus on methane, using statistics from international trade, emission factors and IEA's Methane Tracker. If we were to include upstream emissions, our 2022 Power metric would have increased by c12%[1]. However, current data does not allow us to examine the impacts with sufficient granularity, so we have not made amendments to the methodology this year.

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 more than 99% of GHG emissions from the combustion of oil, gas and coal. Other GHGs are more prevalent in the wider process of hydroelectricity and the use of biomass – but, as we describe below, these are currently not measured.

2.A.8 For renewable power, the majority of emissions arise from the construction of 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 dam construction and the degradation of biomass in newly created reservoirs. There are various studies providing approximations that vary significantly depending on the geospatial features of the dam – however, the estimates are significantly lower than the intensity factors of fossil fuels.

Note:

1 This represents an expansion in the boundary of emissions, rather than an increase in real portfolio emissions. This would require a re-baselining of the metric and adjustment of the transmission pathway to reflect.

Our approach by sector – Power (continued)

2.A.10 Other upstream emissions, notably from the purchase of electricity by transmission and distribution companies, continue to be included as a Scope 1 emission where we lend directly to the power generator itself.

2.A.11 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 emission factors and asset utilisation rates.

2.B.2 The electricity capacity data used is obtained from Asset Impact.

2.B.3 As 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 IEA estimates of the carbon content of each fuel type. Figures 6 and 7 show the capacity and intensity factors derived from the 2023 IEA World Energy Outlook at a World and OECD level respectively, as of 2023.

2.B.4 We recognise this approach makes use of simplifying assumptions, and that both emission 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. Renewable power asset utilisation is naturally limited by local weather – requirements for wind or sun, for example – which vary by geography. Emission 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 most recent (2023) update.

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 Loan facilities or capital market transactions are assumed to have a zero intensity if the proceeds are used for renewable power – such as electricity generation under SFF[1] – and are classified as 'green' dedicated purpose financing under the SFF. The 33% allocation for 'green' capital markets activity is equal to that of other capital markets activity.

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 this approach could lead to some double-counting in the benefit from renewable production, as the company's overall emissions intensity may already account for the specific renewable generation financed via these green products. This may become more material over time. We also acknowledge that, at any point in time, the company may not have allocated all of the proceeds of the issuance.

Figure 12: Derived capacity factors from the IEA for power generation[2]

Technology	Annual electricity generation (TWh)	Generation capacity (GW)	Capacity factor
Coal	10,427	2,236	53%
Oil	709	423	19%
Natural Gas	6,500	1,875	40%
Nuclear	2,682	417	73%
Hydro	4,378	1,392	36%
Bioenergy	687	168	47%
Solar	1,291	1,145	13%
Wind	2,125	902	27%

Figure 13: Derived emissions factors from the IEA for Power[2]

Technology	Annual emissions ($MtCO_2$)	Annual electricity generation (TWh)	Emissions factor ($kg\ CO_2/MWh$)
Coal	2,180	2,249	969
Oil	161	204	789
Natural Gas	1,413	3,454	409

Notes:

1 Version 4.0 Sustainable Finance Framework.
2 https://www.iea.org/reports/world-energy-outlook-2023

Our approach by sector – Power (continued)

Figure 14: **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 emissions metrics?

3.B.1 If financing is provided to a Power company, we apportion 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 where we have exposure to large companies with relatively small Power businesses.

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 14.

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

4.A.1 Emissions 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 15 contains a full list of data sources used for each calculation component.

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

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

Our approach by sector – Power (continued)

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

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays financing	Lending		December 2023
	Capital Markets		December 2023
	Green Financing		December 2023
	Revenue Share	S&P Trucost	December 2023
CO_2 emission factors Scope 1	All generation		2023 estimate from 2023 WEO Report
Capacity factors	All generation		2023 estimate from 2023 WEO Report
Production	All generation	Asset Impact	2023 estimate from 2023 WEO Report

Figure 16: **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
GHGs 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 using the share of revenue the client derives from those activities
Treatment of missing production data	N/A
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 and industrial and transport infrastructure, and is the core component in concrete. The manufacturing process is carbon-intensive and requires a chemical process called calcination, which occurs at high temperatures. The options proposed to abate its emissions include reducing the use of clinker, implementing carbon capture technology, using renewable forms of electricity, and 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, is the key driver 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 NZE2050 World scenario, combined with forecasted production volumes. The higher end of the 2030 target range is also taken from the NZE2050 World scenario. Regional granularity is not available in this scenario. In addition, cement is an essential building block of economic and infrastructure development, and IEA pathways do not predict a rapid reduction in its use.

1.B.2 Cement is a hard-to-abate sector because most of the emissions generated are process emissions that cannot be avoided if cement production is to continue – direct emissions occur through a chemical process of calcination. The manufacturing process also generates emissions from the burning of 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. However, these result in small reductions – for example, clinker substitution by reducing the clinker-to-cement ratio.
- From 2030 to 2050, the levers are driven by investment and implementation of technology 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 currently a key challenge.

1.B.3 The IEA only produces granular forecasts for direct emissions associated with the manufacturing of cement – and does not provide forecasts for the electricity generated for this purpose, either on-site on through the grid. Previously, the NZE2050 scenario did not provide production forecasts and, as a result, we had to make some assumptions to infer an intensity metric that aligned to the reporting boundary[1].

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. We measure all emissions from an integrated cement plant – typically Scope 1 and 2 emissions – including 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 This 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 classed as Scope 3 due to low materiality and to align with the scenario benchmark.

2.A.4 We aim to measure all GHGs, 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 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 Cement sector, and that most of them disclose emissions and production data, we use 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 may 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 activities in the Cement sector does not have a differentiated treatment for the purposes of financed emissions.

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

3.B.1 Once company-level emissions metrics are calculated they need to be linked to the financing we provide. We approach this in the same way as the Power metric, as described on page 22.

3.B.2 A fall-back table is used where revenue share data is not available, as shown in Figure 17.

Note
1. The latest IEA WEO publication (2023) does include production data.

Our approach by sector – Cement (continued)

Figure 17: **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 Emissions 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 18 contains a full list of data sources used for each calculation component.

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

Our approach by sector – Cement (continued)

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

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays financing	Lending	Internal	December 2023
	Capital Markets	Dealogic	December 2023
	Revenue Share	S&P Trucost	December 2023
CO_2 emission factors Scope 1 and 2	N/A	Company reports	Latest available
Production	N/A	Company reports	Latest available

Figure 19: **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
GHGs measured	All GHGs as sourced from company reports
Scope 1 and 2 emissions estimation	Derived from client-reported data, but adjusted where necessary to align within a 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 the client derives from those activities
Treatment of missing production data	N/A
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, requiring the mixing of iron and carbon at very high temperatures – typically fueled by coal. To decarbonise, the sector requires greater use of carbon capture and storage, increased use of electric arc furnaces (EAF) and 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, is the key driver 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 NZE2050 World scenario, combined with forecast production volumes. The higher end of the 2030 target range is also 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 using an EAF. Integrated producers create steel from iron ore and need coal as a reductant, and 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 high-quality steel scrap.

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

1.B.5 Previously, the NZE2050 scenario did not provide production forecasts and, as a result, we had to make some assumptions to infer an intensity metric that aligned to the reporting boundary[1]. 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. Steel production, for example, 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 This methodology does not calculate emissions from the rolling and casting of steel, 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 We aim to measure all GHGs, however CO_2 is the most material gas by far for the sector.

Note
1. The latest IEA WEO publication (2023) does include production data.

Our approach by sector – Steel (continued)

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

2.B.1 Given the small number of clients we have in the Steel sector, and that most of them disclose emissions and production data, we use 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 may apply adjustments using expert judgement. One company has been adjusted 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 activities in the Steel sector does not have a differentiated treatment for the purposes of financed emissions.

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

3.B.1 Once company-level emissions metrics are calculated, they need to be linked to the financing we provide. We approach this in the same way as the Power metric, as described on page 22.

3.B.2 A fall-back table is used where revenue share data is not available, as shown in Figure 20.

Figure 20: **Standard revenue adjustment matrix**

Sector	Sub-sector	Production primary	Production other	Revenue share primary	Revenue share other
Steel	Steel	K types	–	100%/K	0%
		K types	N types	75%/K	25%/N
		–	N types	0%	25%/N

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

4.A.1 Emissions 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 21 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 – Steel (continued)

Figure 21: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays financing	Lending	Internal	December 2023
	Capital Markets	Dealogic	December 2023
	Revenue Share	S&P Trucost	December 2023
CO_2e emission factors Scope 1 and 2	N/A	Company reports	Latest available
Production	N/A	Company reports	Latest available

Figure 22: **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
GHGs measured	All GHGs as sourced from company reports
Scope 1 and 2 estimation	Derived from client-reported data, but adjusted where necessary to align within a fixed boundary
Production estimation	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 using the share of revenue the client derives from those activities
Treatment of missing production data	N/A
Benchmark scenario	IEA NZE2050
Target baseline year	2021

Our approach by sector – Automotive

The automotive sector comprises the development, manufacture 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 oil production processes or electricity used to power electric vehicles (EVs). Decarbonisation will require a shift to EVs and more renewable forms of electricity, lower use of carbon-intensive raw materials, and the promotion of 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 kilometres) for new vehicles sold in a given year, rather than those currently on the road (and sold in previous years). This best represents what our clients can control.

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

1.A.4 Ideally, we would prefer to use emissions per passenger kilometres to account for a vehicle's use. However, there are data limitations on load factors that would need be used to convert vehicle kilometres into passenger kilometres, 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) below 3.85 tonnes (8,500 lb).

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

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 emissions intensity benchmark is based on the IEA's NZE2050 World scenario.

1.B.2 Our assessment 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 produces granular pathways for tailpipe emissions associated with the stock of vehicles on the road – so we have to make adjustments to convert this to 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: 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 3 emissions from LDV manufacturers.

2.A.2 All GHGs 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 a manufacturer's control – such as the emissions 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 them using the GREET (Greenhouse Gases, Regulated Emissions, and Energy Use) model.

Our approach by sector – Automotive (continued)

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

2.B.1 We use data from Worldwide Harmonised 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, which in turn sources this data 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. This 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 vehicle's fuel economy and emissions can also vary significantly depending on user behaviour and for corporate fleets versus 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 use S&P Trucost emissions data, which is typically sourced 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 150,000km across its entire lifetime. We are aware that this range can vary significantly, particularly for electric vehicles, however there is limited data available on this. Our primary metric is not sensitive to average vehicle lifetime kilometres as the materiality of Scope 1 and 2 emissions reduces significantly once converted (to emissions per vehicle kilometres) and compared 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 that manufacture their own batteries or produce both HDVs and LDVs. However, a sensitivity analysis on our 2022 portfolio suggests a negligible impact from 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 and have limited control on the design of vehicles being sold in the market. However, we include financing such as lending to financing arms other than captive, where facilities can be used for vehicle manufacturing process.

3.A.3 Loan facilities or capital market transactions are assumed to have a zero tailpipe intensity if the proceeds are used for the manufacturing of electric vehicles (manufacture of new vehicles which are zero-direct emissions or the development and infrastructure for electric vehicles under Barclays SFF) and are classified as 'green' dedicated purpose financing under the Barclays SFF. Each deal is reviewed on a case-by-case basis such that if a share of the overall financing is expected to be used for alternative purposes, that part of the financing continues to receive regular treatment. The 33% allocation for 'green' capital markets activity is equal to that of other capital markets activity.

3.A.4 Deals flagged as green will continue to be assigned company-specific Scope 1 and 2 intensities.

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

3.B.1 Once company-level emissions metrics are calculated, they need to be attributed to the financing we provide.

We attribute 100% of our financing to auto manufacturing emissions for counterparties that are LDV manufacturers. We also attribute 100% of our financing to captive arms of auto manufacturing companies where use of proceeds can be directed towards auto manufacturing processes.

3.B.2 For counterparties that manufacture both LDVs and HDVs, we do not weight our financing according to the portion of revenue each company generates from LDVs only, A sensitivity analysis of our 2022 portfolio suggests the impact on the intensity metric is immaterial.

3.B.3 We exclude any financing 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 23: Lifetime emissions analysis

Fig 23A: 2020 world grid average
Emissions intensity (gCO_2e/km) –EV versus ICEV

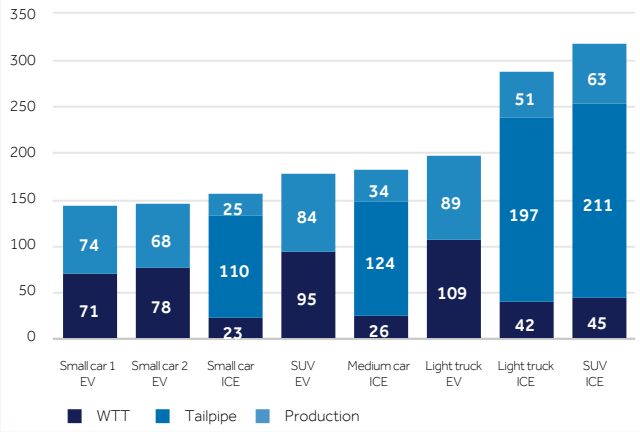


Fig 23B: 2030 world grid average
Emissions intensity (gCO_2e/km) – EV versus ICEV

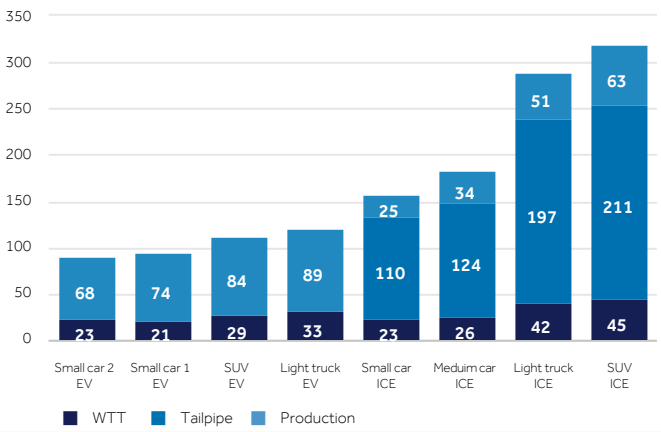


Fig 23C: 2020 Europe grid average
Emissions intensity (gCO_2e/km) – EV versus ICEV

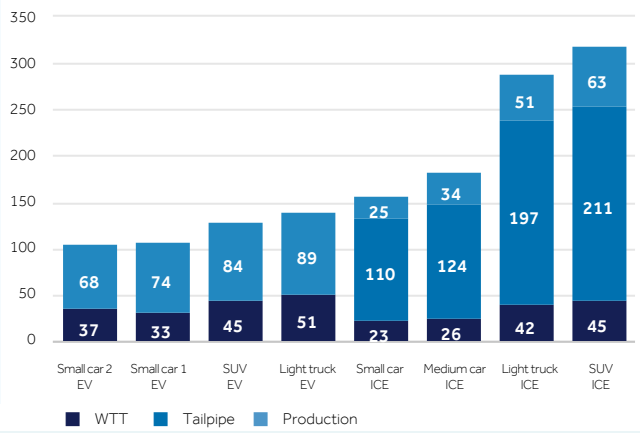
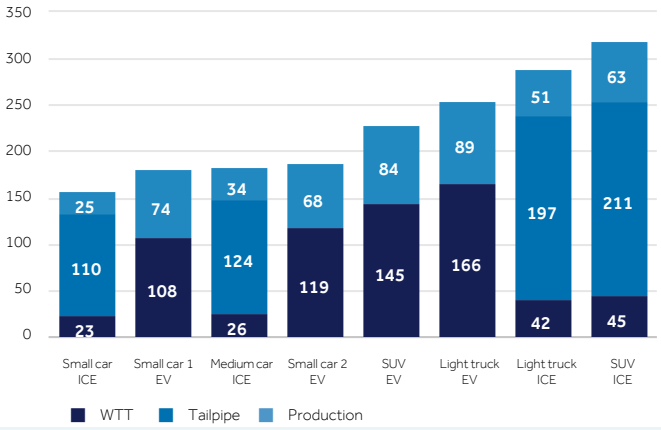


Fig 23D: 2020 India grid average
Emissions intensity (gCO_2e/km) – EV versus ICEV



As we developed our methodology in 2022, we assessed the lifecycle emissions of a sample of vehicles and considered how their emissions might evolve over time due to the decarbonisation of the grid.

Figure 23A shows the lifetime emissions per kilometre of EVs and ICEVs, assuming EVs source electricity from the world grid average.

Figure 23B shows the lifetime emissions assuming world electricity generation follows the NZE2050 pathway to 2030.

Figure 23C shows the lifetime emissions assuming EVs source electricity from Europe.

Figure 23D 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 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 the impact of changes in the grid intensity on the 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 Emissions 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 24 contains a full list of data sources used for each calculation component.

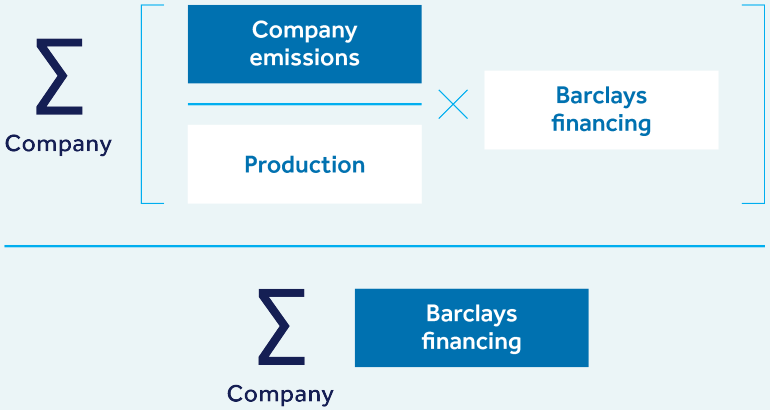


Figure 24: Summary of key data sources for each calculation component

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays financing	Lending	Internal	December 2023
	Capital Markets	Dealogic	December 2023
	Green Financing	Internal	December 2023
	Revenue Share	S&P Trucost	N/A
CO_2e emission factors Scope 1 and 2	N/A	Derived from company-reported emissions, sourced from S&P Trucost	December 2023
CO_2e emission factors Scope 3	N/A	Asset Impact	2023 full-year forecast as at September 2023
Production	N/A	Asset Impact	2023 full-year forecast as at September 2023

Figure 25: Key choices to calculate the intensity metric

Key choice	Description
Sector boundary	LDV manufacturers.
Intensity type	Physical intensity (CO_2e emissions per vehicle kilometre travelled by LDV produced), expressed in gCO_2e/km
Emissions scope	Emissions generated from the manufacturing and lifetime tailpipe emissions of new vehicles Relate to the CO_2e Scope 1, 2 and 3 emissions for automotive manufacturers
Greenhouse gases measured	All GHGs for Scope 1 and 2 CO_2 for Scope 3
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, sourced from Asset Impact
Barclays financing and attribution	Financing provided or arranged
Treatment of missing production data	N/A
Benchmark scenario	IEA NZE2050
Target baseline year	2022

Our approach by sector – UK Housing

The UK Housing sector comprises the use and construction of properties for residential purposes. The emissions attributed to this sector are the embodied emissions from the materials used in the construction phase, and operational 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, greening of the electricity grid, and changes made by individual homeowners to reduce energy consumption.

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

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

1.A.2 Given demand for new housing in the UK is expected to grow in the coming decades, and additional financing to help houses become more energy efficient will be required, we believe setting an absolute emissions target would not be appropriate.

1.A.3 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 BNZ scenario published by the CCC in 2020 and modified it to consider both Scope 1 and Scope 2 emissions for residential properties. This 'synthetic' pathway is used to benchmark our UK Housing portfolio.

1.B.2 The CCC is an independent UK Government body and sets out a roadmap for decarbonising the UK economy by 2050. This scenario is more relevant for our UK collateral base than the regional and global pathways from the IEA, and relies on government policies – including electricity grid decarbonisation, the roll-out of heat pumps, and regulations enforcing minimum EPC ratings.

1.B.3 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 using the latest grid emission factors published by the Department for Energy Security and Net Zero (DESNZ) for 2023 (based on 2021 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.4 Using these assumptions we estimate that the physical intensity of UK Housing will need to reduce to 19.3kg CO_2e/m_2 by 2030, down from 32.1 kg CO_2e/m_2 as of 2023.

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 and cooling, and the supply of fresh water, ventilation and power over a building's lifetime.

2.A.3 We recognise that a large proportion of lifecycle emissions from UK Housing come via the construction phase (embodied carbon). Our initial analysis of embodied carbon suggested it was responsible for more than 50% of lifecycle emissions of a property – however, as available data and published reporting standards currently only cover estimations of operational emissions, we have not included embodied carbon, although we may do in the future. Furthermore, it is estimated that c.80% of residential buildings present in 2050 already exist – and hence reducing the operational emissions of existing stock will be key,

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 suggested that our absolute emissions related to our financing of the UK's key gas suppliers are broadly similar to our absolute emissions for UK Housing.

Note:

1 www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

Our approach by sector – UK Housing (continued)

2.A.6 Bio methane can be used as an alternative to traditional gas but currently supplies less than 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 today and there are some public reports that have questioned its use. We will continue to monitor developments here.

2.A.7 The GHGs included in our estimate mainly comprise CO_2 but also include methane and nitrous oxide from fossil fuel combustion – either directly in boilers or indirectly in power plants. Fluorinated gases are currently not captured, due to both lack of information and the need for consistency with the scope of the selected benchmark.

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

2.B.1 We use data from the latest EPC certificates for properties where they are available[1], including the estimated energy consumption, fuel source and floor area. This is sourced via Hometrack and our internal team that specialises in address matching – who source EPCs from the Department for Levelling Up Housing and Communities (DLUHC)[2] .

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) that they do not reflect actual energy consumption. As a result we make a number of adjustments to the energy consumption data provided.

2.B.3 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, at which time coal and gas was far more prevalent in the energy mix. They also exclude the energy used to power appliances and do not take into account the behaviour of the occupants.

2.B.4 In our studies we have also observed a significant difference between estimated and observed energy consumption across all EPC bands, particularly those at either end of the spectrum.

2.B.5 Figure 26 shows a stylised illustration of how we convert emissions estimates from EPC certificates for use in our methodology.

2.B.6 Where a property does not have an EPC certificate (c.30% of our portfolio), we estimate 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 from DESNZ (formerly BEIS). Where we have no information on the property location or building type, we use a UK average intensity based on EPC, NEED and EC UK databases as shown in Figure 27.

2.B.7 We report a DQ score in line with the PCAF Standard. 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 score will likely require access to individual household energy consumption data not yet available.

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

3.A.1 In 2023, our methodology covered owner-occupied and buy-to-let lending in our UK Mortgages and Private Banking businesses.

We have now expanded the scope to include lending to our UK Social Housing and Business Banking businesses. Collectively, these businesses now make up the UK Housing sector.

Social Housing properties are completely residential in nature. Property lending in Business Banking is largely collateralised by residential assets, with a small proportion for commercial purposes. .

3.A.2 Financing of properties outside of the UK is excluded – notably our Italy Mortgages portfolio, which is in run-off, and certain assets in our Private Banking portfolio in Continental Europe. We also exclude buy-to-let warehousing lines of credit to mortgage originators or Mortgage Backed Securities.

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

3.A.4 Green financing for activities in the UK Housing sector does not have a differentiated treatment for the purposes of financed emissions.

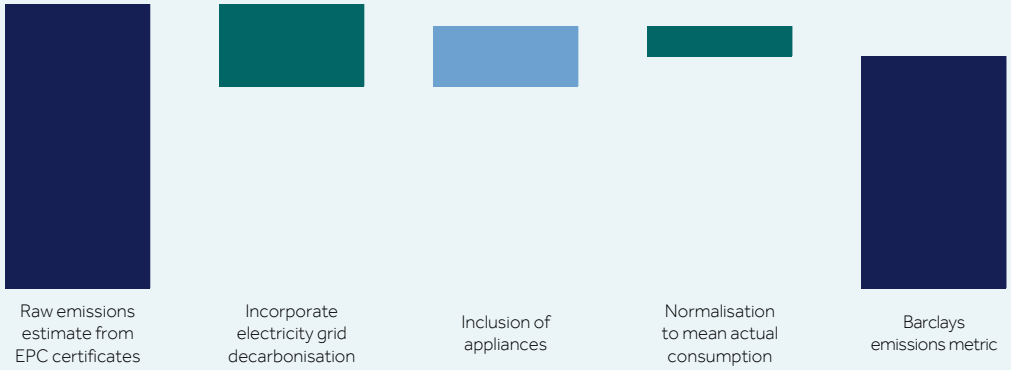
3.B How is provided financing linked to loan-level emissions metrics?

3.B.1 When calculating the attribution factor of a loan's absolute emissions, we use the loan outstanding as a proportion of property value at origination, in line with the PCAF Standard. Where the property value at origination is not available, we use the latest property value and keep it constant from the latest period. In cases where there are some additional unsecured lending, such as BGIs[3] and overdrafts in Social Housing, the attribution factor is adjusted to add these to existing secured lending.

Notes:
1 We use expired EPCs where available since they provide important information on property characteristics, even after they have expired.
2 www.epc.opendatacommunities.org/
3 Bonds, Guarantees and Indemnities.

Our approach by sector – UK Housing (continued)

Figure 26: **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.

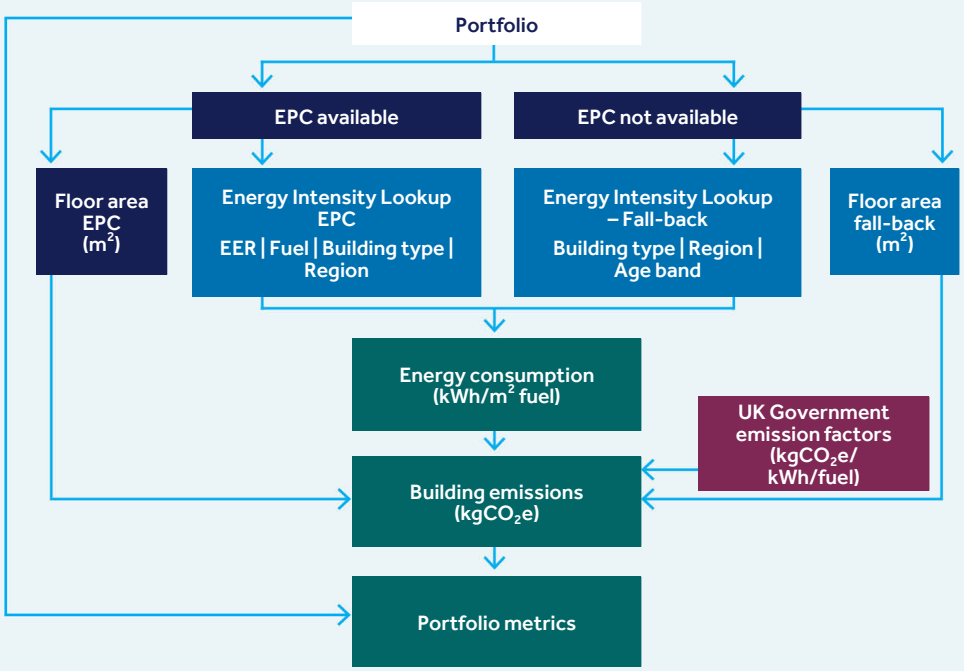
The variance between the raw emissions estimate from the EPC certificate and the BlueTrack™ metric can be stylised as per the graph on the left. It incorporates three adjustments:

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.

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

Figure 27: **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 DESNZ, the National Energy Efficiency Data-Framework[1] (NEED), complemented by sector-level figures summarised in the Energy Consumption in UK[2] (ECUK) and Digest of UK Energy Statistics[3] (DUKES).

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

Lastly, consumption of each fuel type is combined with the appropriate emission factor, using official reporting guidelines published by DESNZ 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.

1. www.gov.uk/government/collections/national-energy-efficiency-data-need-framework
2. www.gov.uk/government/statistics/energy-consumption-in-the-uk-2022
3. www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

Our approach by sector – UK Housing (continued)

4.A. How are customer-level measurements aggregated for the UK Housing portfolio?

4.A.1 Emissions intensity is calculated as a function of each property's emissions and the floor area of the property. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. Figure 28 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 Housing (continued)

Figure 28: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Data of source used for 2023 report
Outstanding amount	N/A	Internal	December 2023
Property value at origination	N/A	Internal	December 2022
Building emissions	N/A	EPC certificates DLUHC[1] sourced through HomeTrack and DCM	September 2023
Floor area	N/A	Internal, EPC certificates DLUHC sourced through HomeTrack and DCM	September 2023

Note:
1. Department for Levelling Up, Housing and Communities (DLUHC)

Figure 29: **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. Social Housing across Barclays UK and Barclays International. Business Banking exposures in Barclays UK
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
GHGs measured	Carbon dioxide, 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, defined as the outstanding balance divided by the property value at origination (LTV). For Social Housing, all secured loans, unsecured loans and capital markets financing is included. In Business Banking lending to commercial landlords is considered but excludes lending to property companies set up in an opco/propco structure
Treatment of missing production data	Where EPC certificates are not available, we use the intensity information developed at property type, property age and region level, and apply the UK Government emission factor. Where no information on the property location or building type is available, we apply the UK average intensity
Benchmark scenario	BNZ scenario outlined by the CCC
Baseline year	2023

Our approach by sector – UK Commercial Real Estate

The Commercial Real Estate (CRE) sector incorporates loans for the purpose of purchase and refinance of commercial real estate. These assets could be used for income-generating commercial and residential purposes – for example retail, office space, student accommodation, build-to-rent, and so on. Emissions come from the materials used in the construction phase (embodied) and from the use and maintenance of the properties (operational), primarily from water and space heating and power usage. Reducing emissions for this sector will require the use of less-carbon-intensive construction materials, retrofitting existing properties to increase their energy efficiency, facilitating the installation of non-fossil-fuel heating systems, more efficient heating, ventilation and cooling (HVAC) systems , greening the electricity grid, and lower energy consumption by occupants.

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

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

1.A.2 We have chosen to align to the PCAF Standard as it has become the emerging standard for estimating real estate financed emissions.

1.A.3 We set a physical intensity target in line with the UK Housing sector.

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

1.B.1 We have used the CRREM (V2.02) pathway to benchmark our CRE portfolio, which is the most widely accepted and recognised pathway for commercial properties.

1.B.2 CRREM[1] is the leading global standard and initiative for operational decarbonisation of real estate assets. We use the second version of CRREM, published in February 2023, which includes decarbonisation pathways for real estate, down-scaled to the country and property type level from the global IEA NZE 2050 scenario.

1.B.3 The down-scaling methodology follows the Sectoral Decarbonization Approach (SDA) by SBTi.

1.B.4 The CRE sector comprises an array of different property types and uses. Properties will have varying emissions profiles based on their use and type – an average residential property, for example, will have a lower emissions output than an average high street retail unit.

1.B.5 Due to this varying emissions profile, any change in the use of a property has wider implications. Substituting the property is often complex and involves planning and regulatory considerations. Repositioning of assets through either conversion or redevelopment leads to a change in the property mix of our portfolio – and the consequent emissions profile. To monitor our progress, the benchmark needs to be updated and reflective of the property mix of our portfolio. We intend to monitor the make-up of our portfolio over time and, should there be any large shifts, we may update our benchmark accordingly.

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

2.A.1 We measure operational emissions (Scope 1 and 2) from water and space heating, and indirect emissions from the use of electricity.

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

2.A.3 We recognise that a large proportion of lifecycle emissions from CRE come via the construction phase (embodied carbon). However, as available data and published reporting standards only cover estimations of operational emissions, at this stage we have not included embodied carbon.

2.A.4 The GHGs included in our estimate are CO_2, methane and nitrous oxide from fossil fuel combustion, either directly in boilers or indirectly in power plants. Due to the lack of available data we have not considered fluorinated gases at this stage.

2.B What data is used for these calculations?

2.B.1 Sourcing property-level information for this portfolio has a number of challenges due to incomplete data or matching issues. We found that: i) addresses captured in our system are not consistent with those in the EPC registry; ii) the address line misses some key information, such as building unit number; and iii) different property types were listed within the same postcode.

2.B.2 Some of these challenges were overcome by the use of a Unique Property Reference Number (UPRN). fuzzy matching techniques and specialised software to match domestic and non-domestic EPC certificates to the properties held in our book. Certificates are sourced directly from the UK Government website and matched in our data warehouse.

2.B.3 We use the data from the latest EPC certificates for properties where they are available[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; and iii) mapping issues across both domestic and non-domestic EPCs. Properties used for residential purposes (c.25% our portfolio) use the emissions methodology outlined in the UK Housing sector.

Notes:
1 www.crrem.org
2 We use expired EPCs where available since they provide important information on property characteristics, even after they are expired.

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

2.B.4 In the case of non-domestic EPCs (c.75% of our portfolio), the EPC rating is directly proportional to the building's emissions as calculated by the UK Government's EPC methodology. This is a more straightforward approach than for domestic EPCs, where the EPC rating is derived from the cost of energies for the building and therefore the link to emissions is more complicated. For each property type, baseline emissions intensity from CRREM is adjusted using the published 'Asset Rating' given in the certificate, further updated for the latest grid emission factor, to arrive at a consistent EPC-informed emission.

2.B.5 Where a property does not have a matched EPC certificate (c.79% of our portfolio), we estimate the emissions. For domestic properties, this is done using the same intensity look-up created for the UK Housing sector. A four-step approach is followed for non-domestic properties: i) we start with baseline emissions intensity from CRREM; ii) electricity emissions fraction (by property type) is determined from BEES data; so that iii) emissions from electricity can be updated using the latest grid emission factor; iv) the product of the average floor area and average intensity gives the overall CO_2e for the property.

2.B.6 We are aware that EPC certificates do not consider all buildings emissions. Hence, we assess this using UK BEES[1] data for property type mentioned in step 'ii' above. Emissions due to activity – considered to come from electricity – and changes in the latest emission factors give us the most accurate emissions estimate.

2.B.7 Figure 30 shows a stylised illustration of our overall methodology, laying out how we estimate the portfolio metrics using internal property-level data, information from EPC certificates, CRREM and other relevant sources.

2.B.8 We also report a DQ score in line with the PCAF Standard. Where we estimate emissions using an EPC certificate, we assign a DQ score of 3. In cases where an EPC certificate is not available, but where the actual floor area is available (captured in our internal collateral data), a DQ score of 4 is assigned. Where we use the fall-back approach, we typically assign a DQ score of 5. A better score would require access to individual buildings' energy consumption data.

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

3.A.1 This sector includes all secured financing activities within our UK Corporate Bank real estate portfolio.

3.A.2 We provide financing to companies that typically use the proceeds for the purchase and refinancing of commercially let investment properties. For the completeness of this portfolio, we also considered any unsecured lending to these existing clients – typically in the form of revolving credit facilities.

3.A.3 We exclude commercial mortgages where we finance a company for its own operations.

3.A.4 We have not assessed our financed emissions for Real Estate Investment Trusts (REITs), where we typically lend on an unsecured basis due to insufficient availability of asset-level data critical for this sector. We will continue to explore sources for this data, including assessing specialised vendors.

3.A.5 Due to the lack of a unified metric of emissions measurement like the EPC in the UK, and less regulatory focus impacting coverage, the information available was limited for some portfolios. These are also lower materiality compared to our UK book. Hence,we exclude structured lending finance in the US, exposures in non-UK geographies, and our Wealth and Private Banking portfolio.

3.A.6 A loan is included from the time the exposure is on our book until it is fully repaid.

3.A.7 Green financing for activities in the UK CRE sector does not have a differentiated treatment for the purposes of financed emissions.

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

3.B.1 We use the attribution factor defined by the PCAF Standard. In the simplest case, this is the ratio of the financing – we use the limit, rather than the balance of the loan – to the latest property value, kept constant throughout the assessment period (as prescribed by PCAF).

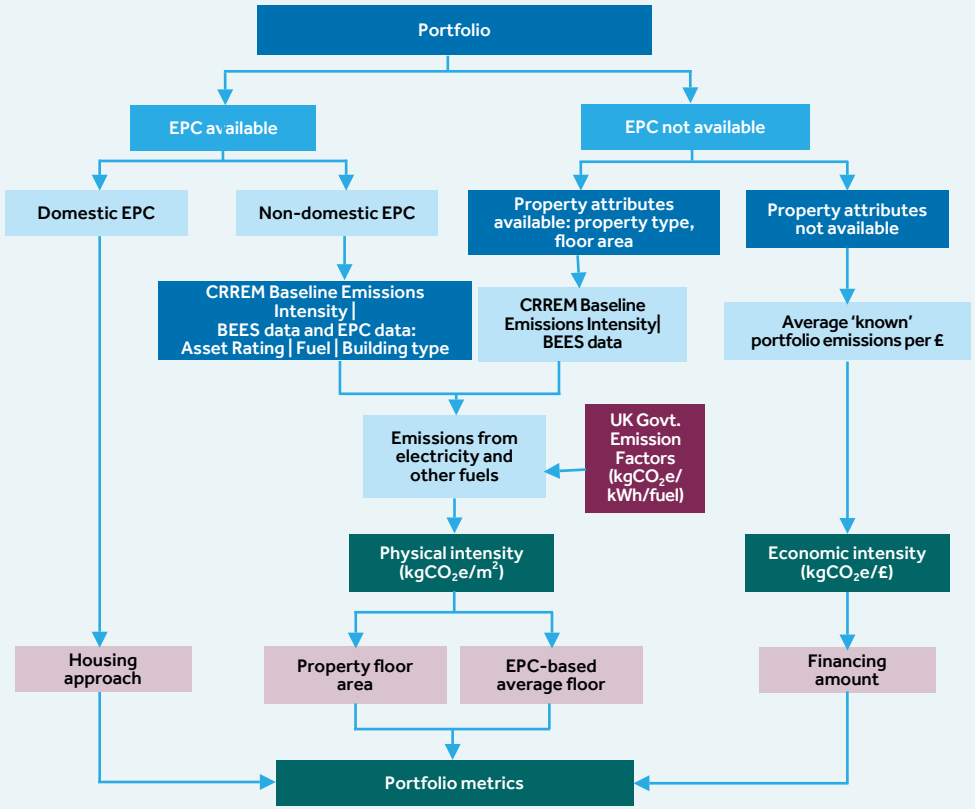
3.B.2 There are often complex cases where 'many-to-many' relationships exist between loans, customers and properties. Here, the approach is generalised to properly attribute the financed emissions from the collateral.

3.B.3 These cases include: loans secured by several properties (exposure is distributed among the properties); properties securing several loans (attribution at an overarching level of loans); unknown valuation of properties securing a loan (using average attribution from customers' properties of known valuation); and unsecured exposures in the social housing sector where no collateral is posted (emissions estimate based on the entire portfolio of properties owned by a given counterparty).

Notes:
1 www.gov.uk/government/publications/building-energy-efficiency-survey-bees

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

Figure 30: **Methodology**



Emissions calculations for CRE are modelled using information from CRREM, domestic and non-domestic EPCs, and UK BEES data for each property. Since different commercial properties decarbonise at different rates, the assessment considers property type as a key factor.

Where properties are residential, the model refers to the UK Housing methodology described in the previous section. For non-domestic properties, baseline emissions from CRREM are used as a starting value.

Overall building emissions consist of two parts: emissions covered by EPC; and those not covered by EPC. The former – from heating, cooling and lighting requirements – are proportional to the Asset Rating value of the EPC, while the latter – emissions from activities within the building – are determined using UK BEES data and are assumed to be entirely due to electricity use.

Overall emissions are adjusted following changes in grid emission factors for electricity. For properties where there are no certificates, CRREM's baseline emissions are supplemented to account for to-date electricity grid emission factor changes.

For segments of our portfolio where no property data is available, we estimate absolute emissions – but these are currently excluded from the physical intensity metric.

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

4.A. How are customer-level measurements aggregated for the CRE portfolio?

4.A.1 Emissions intensity is calculated as a function of each property's emissions and the floor area of the property. The portfolio metric is then calculated as an average weighted value using the proportion of total portfolio financing. For this year, the majority of the property assessment utilises the latest property value (fixed for the duration of the benchmark) – however, as internal data improves, the origination valuation may be considered. Figure 31 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 Commercial Real Estate (continued)

Figure 31: Summary of key data sources for each calculation component

Calculation component	Sub-component	Source	Date of source used for 2023 report
Outstanding amount	N/A	Internal	December 2023
Latest value (fixed)	N/A	Internal	September 2023
Building emissions	N/A	EPC certificates from DLUHC, sourced through DCM	November 2023
Floor area	N/A	Internal and EPC certificates from DLUHC, sourced through DCM	September 2023

Figure 32: Key choices to calculate the intensity metric

Key choice	Description
Sector boundary	Direct CRE lending to specific commercial landlords in UK only
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 the landlord's perspective
GHGs measured	CO_2, methane and nitrous oxide
Emissions estimation	Derived from EPC certificates (estimate of baseline energy intensity used where not available) and supplemented with updated grid emission factor
Production weighting	Floor area as derived from EPC certificates or estimated using property attributes
Barclays financing and attribution	All secured financing activities under Barclays International – CB CRE. The portion of the property for which Barclays financing 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, we use the intensity information developed at property type and region level and apply the UK Government emission factor
Benchmark scenario	CRREM version two scenario based on the IEA NZE2050 scenario.
Target baseline year	2023

Exploring an approach to measure emissions in US commercial buildings

Our value of our direct US secured book (<£2bn) is about one-third of the UK CRE book covered in the scope of the methodology. Our current approach excludes lending to US properties, given a lack of property-level data coverage at this stage.

While EPCs[1] are available for many of our UK properties, there is no equivalent in the US market.

One alternative is Energy Star, a voluntary energy certificate issued by the Environmental Protection Agency and US Department of Energy that promotes energy efficiency. For many commercial building types, the certificate is issued based on the energy efficiency compared to a set of benchmark buildings of the same type.

We have begun to explore Energy Star certificates as a source to estimate emissions for our US portfolio.

Notes:
1. www.epc.opendatacommunities.org/

Exploring an approach to measure emissions in data centres

Within our US book, data centres are approximately 10%-15% of our exposure – so we explored how the emissions from this property type should be accounted for.

Data centres come with unique challenges and carbon accounting nuances, as their emissions are primarily from the use of the IT equipment they host. In addition, they are hard to compare to any other real estate as the energy intensity – due to the high-energy-demanding IT equipment – is 15-100 times higher.

Data centres face a paradoxical situation where being more energy intensive per square metre is better overall in terms of efficiency – primarily due to the fact that large data centres can support more energy-intensive IT equipment and reach better cooling and computational efficiency, which are major factors in overall emissions. One large data centre may produce more emissions per square metre as it runs more energy-intense equipment, but its greater efficiency means overall emissions will be still lower than having multiple smaller data centres.

As a result, our methodology for estimating physical intensity is not appropriate. Our initial work suggests we should use Carbon Usage Effectiveness (CUE), which encourages decarbonisation along with improving the efficiency of data centres. We continue to monitor industry developments.

Our approach by sector – Aviation

The Aviation sector comprises the manufacture of aircraft, airport construction and ground operations, and air travel transporting passengers and goods. The majority of this sector's emissions come from the production (often referred to as well-to-tank) and combustion (tank-to-wake) of jet fuel for aircraft operations in commercial aviation. In the short term, decarbonisation may be achieved by shifting to sustainable aviation fuel and through fuel efficiency improvements. In the long run, battery and hydrogen aircrafts may also play a significant role. Shifting short-distance air travel to high-speed rail can also reduce demand, leading to lower emissions from the sector.

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

1.A.1. Our model uses an emissions intensity metric (gCO_2e/revenue tonne kilometers) to measure the performance of our Aviation portfolio.

1.A.2. We have selected an intensity metric because emissions reduction is driven by lower intensity (emissions per unit of traffic) while there is an increase in air traffic (passenger and cargo) in the benchmark scenarios.

1.A.3. Commonly used metrics to express air traffic (the denominator) include revenue tonne kilometers (RTK), revenue passenger kilometers (RPK), available tonne kilometres (ATK) and available seat kilometers (ASK).

1.A.4. RPK and RTK measure one paying passenger or tonne of cargo, transported 1km aboard an aircraft. ATK and ASK measure the total payload capacity of an aircraft.

1.A.5. RTK is our chosen metric because it measures the revenue-generating portion of available capacity actually used by operators. It also better captures airlines' efforts to improve operational efficiency (by increasing occupancy rates), resulting in lower emissions intensity. RPK to RTK[1]. conversion allows emissions from passenger and cargo traffic to be combined and measured with a single intensity metric.

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

1.B.1. The benchmark for our Aviation portfolio is based on the MPP PRU scenario for aviation. Released by MPP in its 2022 aviation strategy report, it is based on a bottom-up technical model of the Aviation sector and details a 1.5°C-compatible roadmap for Aviation to achieve net zero emissions by 2050.

1.B.2. Aviation is a hard-to-abate sector as there are limited feasible and cost-effective renewable alternatives. As per the MPP pathway[2] there are two levers that may play a crucial role in the overall decarbonisation of the sector in the short term:

a. Increased use of Sustainable Aviation Fuel (SAF) as a substitution for jet fuel, produced from sustainable biomass and renewable electricity.

b. Increased fuel efficiency, which can reduce final energy demand and emissions – for example through improvements in turbine efficiency, aircraft aerodynamics, air traffic management, flight and ground operations efficiency.

1.B.3. In the longer term, the introduction of hydrogen, battery and hybrid electric aircrafts may be a viable decarbonisation lever. However, these aircraft are not expected to enter the market at scale until the late 2030-40s, and are expected to be limited in their range of travel to only short- and medium-haul flights.

Therefore, the use of SAF will likely continue to be important to decarbonise long-haul flights.

1.B.4. A mode shift from short-haul flights to high-speed rail can lead to a reduction in demand for regional flights. MPP estimates this could yield a reduction potential of up to 2% of all commercial aviation emissions, but this shift is dependent on the expansion of high-speed rail networks.

1.B.5. The MPP PRU scenario provides granular information on the decarbonisation of the Aviation sector and the increase in the demand of air travel.

1.B.6. It projects a compound annual growth rate (CAGR) of 2.5% per year (2019-50) in global air travel demand but achieves a 95% reduction in GHG emissions over the same period. Residual emissions are counterbalanced by CO2 removal solutions to reach net zero.

1.B.7. The scenario also provides a breakdown of the contribution of each decarbonisation measure and the corresponding investments necessary for achieving the required targets.

1.B.8. The MPP PRU is also the chosen benchmark pathway for the Pegasus Principles which will launch publicly in the spring of 2024.

1.B.9. Barclays is a founding signatory to the Pegasus Principles, the first climate-aligned finance framework for the Aviation sector, developed by the Rocky Mountain Institute (RMI) in partnership with global banks and in consultation with leading airlines and lessors. This is a new set of principles giving banks a common framework to consistently measure and disclose their portfolio alignment with net zero pathways. Signatories are required to report in accordance with the guidance set out in the Principles.

1.B.10. We also assessed IEA's NZE scenario. While we have selected this benchmark for other sectors, we identified some challenges in using it for Aviation – notably, the lack of granularity necessary to construct a pathway based on well-to-wake intensity for commercial aviation, given the scope of the IEA scenario includes military and civil aviation, and includes tank-to-wake emissions only.

1.B.11. While the MPP PRU and IEA NZE pathways are not directly comparable due to differences in scope (well-to-wake versus tank-to-wake), we observe broad consistency in 2019 emissions from the sector (post adjustment) and an increase in air travel demand forecasts across both pathways.

Note:
1. Conversion of RPK to RTK includes passenger weight and weight of luggage carried by passenger.
2. www.missionpossiblepartnership.org/wp-content/uploads/2023/01/Making-Net-Zero-Aviation-possible.pdf

Our approach by sector – Aviation (continued)

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

2.A.1. The aviation value chain broadly consists of aircraft manufacturers, building and ground operators, aircraft operators (commercial, military, and so on) and suppliers (including fuel suppliers).

As per SBTi's aviation guidance 2021, jet fuel is the primary source of pollution – representing more than 90% of most airlines' value-chain emissions.

We include emissions related to the direct combustion of jet fuel by aircrafts (tank-to-wake) and upstream production and refining (well-to-tank). The emissions scope can differ based on the actual operator of the aircraft, as the owner may not necessarily be the operator.

2.A.2. Our methodology focuses on commercial passengers (including belly cargo) and dedicated cargo operators. Military aviation, corporate jets, general civil aviation, tour operators and multi-modal logistics companies are out of scope due to low materiality (share of sector emissions) and data availability challenges.

2.A.3. Measuring well-to-wake emissions is appropriate for the sector as SAF is one of the key decarbonisation levers in the short-term. SAF still generates emissions during the combustion phase, like jet fuel, but the emissions are offset by those sequested during the growth of the feedstock.

Moreover, depending on the type of feedstock used, the lifecycle emissions (both direct and indirect) of different SAF types will vary, impacting the actual amount of decarbonisation.

2.A.4. Our approach to include well-to-tank emissions for the Aviation sector differs from our approach to Automotive, the other transportation sector we assessed.

While the use of electricity is the key source of energy to power alternate technologies (EVs) in the Automotive sector, manufacturers do not have control of the fuel used for electricity generation – which impacts WTT emissions for EVs – in their sales locations. Conversely, airline operators have more control of the fuel source (SAF) used in their aircraft.

2.A.5. We include all GHGs in our upstream well-to-tank emissions estimates, but only consider CO_2 emissions for in-flight operations (tank-to-wake). This is based on the International Civil Aviation Organisation's[1] (ICAO) methodology, which provides standardised lifecycle emissions coefficients for different fuels, including conventional jet fuel.

2.A.6. Upstream GHG emissions and in-flight CO_2 emissions from the combustion of jet fuel are responsible for about one-third of the total climate impact of aviation. The other two-thirds could stem from short-lived, non-CO_2 effects such as contrails, in-flight NOx, soot and so on.

While there is a growing consensus that climate may be impacted by non-CO_2 effects, there is still a large uncertainty over the actual warming magnitude[2]. Due to the complex and variable nature of chemical reactions, these can have different impacts on the atmosphere depending on various factors – such as altitude, dispersion area, a region's atmospheric condition, time of day, the season of year and so on.

As a result, it is challenging to monitor non-CO_2 emissions comprehensively – and so they are out of scope of our methodology. This exclusion is in line with SBTi methodology and the Pegasus Principles.

2.A.7. The air traffic scope includes passenger, belly[3] and dedicated cargo[4] traffic.

2.B What data is used for these calculations?

2.B.1. The Aviation sector has good data availability on the number and type of aircraft operated by airlines, total flight distance, source and destination between which aircrafts operate, and total fuel burnt.

2.B.2. To calculate emissions from our Aviation portfolio, we source data from PACE (Platform for Analysing Carbon Emissions).

PACE tracks commercial aviation flights operating between airports worldwide. It models emissions for each flight by calculating the amount of fuel burnt between airports by respective aircraft type and variant. PACE's fuel burn methodology aligns with the ICAO's methodology.

2.B.3. PACE also models traffic metrics for passenger, belly and cargo payloads carried by aircraft, presented in RTK for airline fleets. We use emissions and traffic data to calculate our portfolio intensity metric.

2.B.4. While there is good data availability to enable emissions (numerator) modelling, there are data challenges in the availability of actual flight utilisation rate (occupancy) – and even more so for belly cargo – which impact the calculation of air traffic (denominator).

2.B.5. We have considered company-reported emissions and intensities as a potential source of data. However, there are challenges associated with the consistency of reporting at this stage.

2.B.6. Currently, there is no reliable data source providing accurate granular information on the use of SAF (and type) by airline operators, although the share of SAF in overall fuel usage is marginal.

Given the role of SAF in decarbonising the sector, we expect to continue engaging with data providers and counterparties to source relevant data in the future.

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

3.A.1. All financing activities (products) as explained on page 6 are in scope, including financing to commercial airlines.

3.A.2. We include exposures through asset-backed securities (ABS) in this sector, which represents financing to aircraft lessors. ABS are typically used to finance the purchase of an individual or pool of aircrafts, which are then leased out to airlines for passenger and cargo operations.

Note:

1. www.icao.int/environmental-protection/CORSIA/Documents/CORSIA_Eligible_Fuels/ICAO document 07 - Methodology for Actual Life Cycle Emissions - June 2022.pdf
2. www.sciencedirect.com/science/article/pii/S1352231020305689
3. Belly Cargo: Cargo transported in the lower deck (hold or belly) of a passenger aircraft. Belly cargo does not include passenger luggage.
4. Dedicated Cargo: Cargo transported on aircraft specifically flown for the purpose of transporting goods (without passengers).

Our approach by sector – Aviation (continued)

3.A.3. We also include exposures from our payments-acquiring business where we provide products that facilitate clients in accepting card payments. Barclays acquires the transaction, processes it, and settles the value to the client. In the event of default, potential credit losses could occur due to charge-backs. Acquiring is a contingent risk driven by processing transactions for the airline's clients for goods and services (flights) that have not yet been delivered

3.A.4. Advances made to our partner airlines through our Barclaycard business are also in scope. We have partnerships with airlines where we issue reward cards. As part of those partnerships, the Bank makes cash advances in anticipation of the number of reward points a customer will typically spend or redeem with the partner airline for the year ahead.

1 Green financing for activities in the Aviation sector does not have a differentiated treatment for the purposes of financed emissions.

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

3.B.1. Once company-level emissions metrics are calculated, they need to be linked to the financing we provide. If financing is provided to an airline company or aircraft lessors, our model assigns 100% of financing to its aircraft-operating business.

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

4.A.1 Emissions intensity is calculated as a function of each company's emissions and total air (passenger + belly and cargo) traffic. The portfolio metric is tabulated as an average weighted value using proportion of total portfolio financing.

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

Our approach by sector – Aviation (continued)

Figure 33: **Summary of key data sources for each calculation component**

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays' financing	Lending	Internal	December 2023
	Capital Markets	Dealogic	December 2023
	Asset Backed Securities	Internal	December 2023
	Payments	Internal	December 2023
	Barclaycard	Internal	December 2023
	Revenue Share	N/A	N/A
CO_2 emission factors (Scope 1 and 3)	N/A	PACE	December 2022
Activity	N/A	PACE	December 2022

Figure 34: **Key choices to calculate the intensity metric**

Key choice	Description
Sector boundary	Commercial passenger, belly cargo and dedicated cargo operators
Intensity type	Physical intensity (CO_2e emissions per revenue tonne kilometres), expressed in gCO_2e/RTK
Emissions scope	Direct in-flight emissions from fuel burnt through aircraft operations (tank-to-wake) and upstream emissions from production and refining of fuel (well-to-tank)
GHGs measured	CO_2 for Scope 1 All GHGs for Scope 3
Scope 1 and 3 emissions estimation	Well-to-wake emissions calculated from PACE based on fuel burnt by aircrafts that are operated for commercial purposes
Activity weighting	RTK sourced from PACE
Barclays financing	Financing provided or arranged
Treatment of missing data	N/A
Benchmark scenario	MPP PRU
Target baseline year	2023

Our approach by sector – Agriculture

Agriculture is a broad sector with a value chain spanning farm commodity production, manufacturing inputs such as tractors and fertiliser, and the distribution and sale of food and other agricultural products. The majority of Agriculture emissions occur during production on the farm. The sector requires changes in the production mix to respond to shifts in societal diets – in particular changes in the quantity and locality of meat and dairy production, improvements in the carbon intensity of production, and changes in how land is used to sequester carbon, including the critical importance of addressing deforestation in delivering on global climate and biodiversity goals.

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

1.A.1 Our model uses an absolute emissions metric to measure the performance of our UK Livestock and Dairy farming portfolio. This is chosen as Barclays' exposure to farming production, where the majority of emissions occur, is predominantly within the UK – and recognises the materiality of the Livestock and Dairy sub-sector to overall UK farming emissions.

1.A.2 We have selected an absolute emissions metric because the majority of emissions reduction is driven by a shift away from the production of meat and dairy towards alternative protein sources, as farmers respond to changing diets. While improvements in carbon intensity of the remaining production also contribute to emissions reductions, these are a small proportion of the total.

1.A.3 In addition, as farming covers a wide range of commodities, setting a single intensity metric presents a challenge. An intensity metric such as emissions per tonne may be inappropriate, as it is less intuitive to aggregate activities such as the production of milk with the production of beef, using tonne of production. We have also explored alternative metrics such as emissions per calories, but they present challenges and may lead to unintuitive second-order effects.

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

1.B.1 The emissions benchmark for our UK Livestock and Dairy portfolio is taken from the CCC BNZ pathway. It provides the geographical granularity needed to inform a UK-focused approach to Agriculture, which is particularly important given the emissions profile of UK Agriculture differs from other countries where issues such as deforestation may be more prevalent.

1.B.2 The pathway to net zero for UK farming will involve a number of decarbonisation activities. The most significant measures in the BNZ pathway, representing over 75% of decarbonisation, occur because of changes in consumers' diets – including a reduction in meat and dairy consumption. Additional levers include steps to reduce the intensity of food production, such as feed additives to reduce enteric fermentation emissions.

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

2.A.1 Methane and nitrous oxide dominate emissions within this sector, with smaller amounts of CO_2. Methane largely arises from enteric fermentation and manure management related to livestock, and nitrous oxide from the application of fertilisers to agricultural soils. Our approach considers all three of these GHGs.

2.A.2 We acknowledge that CO_2 and methane have different warming characteristics, and that aggregating them requires the use of assumptions. Our approach to aggregation is the same as in the Energy sector – more detail can be found on page 17.

2.A.3 We use a fixed boundary system for the Livestock and Dairy sub-sector, where we measure emissions from farm land. While the majority of emissions occur within this boundary, we have also included emissions associated with activities upstream of the farm – notably feedstock production for livestock.

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

2.B.1 The farming industry is typically characterised by a large number of small farm holdings, which makes collating and processing data challenging. In addition, unlike other sectors where there are databases available of production activities and emissions, this is not currently available in the farming industry. While we are working on sourcing customer-specific activity data, in partnership with Oxford University and through engagement with our clients, the current calculation of emissions is estimated using revenue-based emission factors from PCAF, aligned to a DQ score of 4 or 5 under the PCAF Standard.

2.B.2 When customer activity data becomes available, we will aim to integrate this into the measurement calculation – allowing for greater specificity in calculating customer emissions.

2.B.3 We are also aware that there is a high level of uncertainty in the estimation of farm-level emissions using the carbon calculator tools available in the Agriculture industry. A recent study from Defra[1] has highlighted large deviations in emissions calculations when using these tools for a sample of farms – noting inconsistencies in the use of emission factors, for example. Barclays will seek to incorporate Defra's guidance within future enhancements of emissions calculations for farming customers.

Notes

1 Defra (2023), Harmonisation of Carbon Accounting Tools for Agriculture.

Our approach by sector – Agriculture (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 While the intention over time is for our approach to leverage customer activity data, current limitations mean that all farming revenues are captured for farmers categorised within the Livestock and Dairy sub-sector. This may include non-livestock and dairy farming revenue for those customers.

Green financing for activities in the Agriculture sector does not have a differentiated treatment for the purposes of financed emissions.

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

3.B.1 Once company-level emissions metrics are calculated, they need to be linked to the financing we provide. We approach this by using customer total assets as the measure of the value of that business.

3.B.2 Within the UK Livestock and Dairy portfolio, a large proportion of customers are not registered companies – and, as such, the concepts used in other BlueTrack™ sectors, such as book value of total debt and equity, are not appropriate measures.

4.A. How are client-level emissions aggregated for the Agriculture portfolio?

4.A.1 Total absolute emissions are calculated as a sum of Barclays' fair share of each client's absolute emissions. Each client's absolute emissions is estimated using the relevant industry-specific revenue-based emission factor from the PCAF database.

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

$$\text{Client emissions} = \text{Client revenue} \times \text{Emission factor}$$

Figure 35: Key choices to calculate the absolute metric

Key choice	Description
Sector boundary	Livestock and dairy farmers
Emissions scope	Emissions generated from activities related to farming of livestock and dairy cattle Relate to the CO_2e Scope 1, Scope 2 and Scope 3 upstream emissions
GHGs measured	CO_2, methane and nitrous oxide
Emissions scope estimation	Derived from customer revenue and asset data, and PCAF emission intensity factors
Production estimation	N/A
Barclays' financing and attribution	Financing provided, including all Agriculture mortgage facilities within Barclays UK
Treatment of missing production data	N/A
Benchmark scenario	BNZ scenario outlined by the CCC
Target baseline year	2023

Figure 36: Summary of key data sources for each calculation component

Calculation component	Sub-component	Source	Date of source used for 2023 report
Barclays financing	Lending	Internal	December 2023
Client financials	Company value	Internal	December 2023
CO_2e emission factors (Scope 1, 2 and 3)	N/A	PCAF Exiobase	January 2023

Known areas for future enhancement

Barclays recognises that, while this is the fourth iteration of our methodology, this remains an emerging area with no consistent industry-wide approach to measuring emissions – and that approaches continue to evolve. We believe 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 be difficult to source. As company disclosures begin to improve, not least as a result of the Task Force on Climate-Related Disclosures (TCFD) guidelines and incoming regulatory reporting requirements, we are hopeful this source of data will play a greater role in the calculation of financed emissions metrics over time. 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 within the Energy sector is not sufficient to be tracked at a counterparty level, given the difficulties the industry currently faces in measuring emissions.

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

Climate data, models and methodologies are evolving and are not yet at the same standard as more traditional financial metrics – nor are they 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 residual issues will remain for reasons such as mergers and acquisitions within corporate sectors or land sales in the Agriculture sector.

Asset Impact is our key data source for our most carbon-intensive sectors of Power, Energy and Automotive. While it has strong coverage across our key markets (the 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 – not captured within the Energy financed emissions metric, 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 time 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 years where energy price shocks and market capacity is constrained, for example, 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 Steel, there are challenges around 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.

Last year, for the residential mortgages book, we highlighted the limitations of using domestic EPC certificates for measuring emissions of properties, This challenge continues and can only reliably be solved by obtaining actual energy consumption data at a more granular level than is currently available. Furthermore, we identified challenges in matching EPC certificates to properties in the CRE sector given the differences in our internal addresses to the UK registry. Internal data enhancements are required to improve current matching rates.

Data for the Agriculture sector is particularly challenging as, unlike other sectors, databases of production activities and emissions are not currently available in the farming industry. We are working on sourcing customer-specific activity data, in partnership with Oxford University and through engagement with our clients

We will continue working to enhance and refine our financed emissions metric over time, including as climate data quality improves, methodologies change and company disclosures become more granular. We may re-perform estimates with the improved data that subsequently becomes available – which may lead to a re-baselining of our financed emissions metrics in future years.

Known areas for future enhancement (continued)

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

We calculate a physical intensity and absolute emissions for each sector. However, we make a choice to set a target against either of these metrics – with the exception of Agriculture, where data does not currently allow us to measure physical intensity. 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, it is important to develop a metric that estimates the level of uncertainty at a portfolio level. In 2023, we progressed work on the prototype approach we initiated during 2021.

5.E. Scenario benchmarks

We use a number of different scenarios to construct Paris-aligned portfolio benchmarks, including the IEA NZE, MPP PRU, CRREM and the BNZ published by the CCC.

While these scenarios have been selected carefully to reflect the appropriate decarbonisation pathway for our portfolios, there are a number of challenges – including consistency and coherency across sectors, and the granularity and emissions coverage of the scenarios. We often have to apply assumptions to the scenario data such that it aligns to our emissions boundary.

Furthermore, we are also aware that new scenario vintages are being published to reflect the latest data on emissions in the sector and the residual emissions budget, to remain Paris-aligned. We intend to review our portfolio benchmarks over time.

5.F. Ongoing work on portfolio alignment

We have now developed a high-level modelled assessment of the emissions associated with our financing activities across our portfolio, largely aligned to the PCAF Standard.

We intend to build on this assessment to deepen our understanding of the emissions associated with our financing activities. Informed by this work, we intend to consider the most appropriate approach to extend our target coverage – with the aim of ensuring it covers relevant areas of the value chain and/or our financing activities.

Together, our work to set financed emissions reduction targets as part of our commitment to the NZBA, and to establish a baseline assessment of the emissions associated with our financing activities consistent with the PCAF Standard, will aid our understanding of the extent to which our financing aligns with the goals and timelines of the Paris Agreement.

Appendix 1: BlueTrack™ Barclays Industry Classification codes

Figure 37: **Full list of BIC codes used to identify in-scope companies**

BIC Code	BIC Name	Sector	Sub-Sector
2321	Oil&Gas: Oil & Petroleum Refining & Marketing	Energy	Downstream
2322	Oil&Gas: Other Treatment of Petroleum Products	Energy	Downstream
5157	Wholesale Power and Gas	Energy	Downstream
5156	Wholesale: Fuels, Metals, Paper & Other Intermediate Products	Energy	Downstream
4526	Oil & Gas Contractors	Energy	Midstream
6030	Oil&Gas: Midstream, Transportation, Gathering and Processing	Energy	Midstream
1120	Oil&Gas: Service Activities incidental to Oil/Gas Extraction	Energy	Midstream
1010	Mining of Coal & Lignite; Manufacture of Solid Fuel	Energy	Upstream
1110	Oil&Gas: Extraction of Crude, Nat Gas, Bituminous Shale & Sand	Energy	Upstream
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
4010	Electricity Production & Distribution	Power	Generation
4036	Integrated Utilities - Private	Power	Generation
4037	Integrated Utilities - Public	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
2330	Nuclear Fuel Processing	Power	Generation
4040	Power Generation - Alternative Energy	Power	Generation
4041	Power Generation - Merchant Generators	Power	Generation
4042	Power Generation - Nuclear Energy	Power	Generation
4043	Power Generation - Other	Power	Generation
4044	Power Generation - Project Finance	Power	Generation
4045	Power Generation - Renewable Energy	Power	Generation
4046	Power Generation - Retail	Power	Generation
4014	Renewable Electricity Production and Distribution - Private	Power	Generation
4015	Renewable Electricity Production and Distribution - Public	Power	Generation
4016	Renewable Electricity Production and Distribution - Public (Cooperative)	Power	Generation
2650	Mfg. Cement, Lime & Plaster	Cement	Manufacture
2660	Mfg. Concrete, Cement & Plaster Products	Cement	Manufacture
2730	Iron & Steel Processing (inc. Rolling & Drawing)	Metals	Manufacture
1310	Iron Ores Mining	Metals	Manufacture
2710	Mfg. Basic Iron, Steel & Ferroalloys	Metals	Manufacture
2310	Mfg. Coke Oven Products	Metals	Manufacture
2750	Mfg. Metal Castings; Foundries	Metals	Manufacture
2740	Mfg. Precious & Non Ferrous Metals	Metals	Manufacture
1320	Non Ferrous Ores Mining	Metals	Manufacture
1450	Other Mining & Quarrying	Metals	Manufacture
3410	Mfg. Motor Vehicles	Auto	Manufacture
7019	Housing Associations	Commercial Real Estate	Property Investment
7027	Property Investment: Commercial	Commercial Real Estate	Property Investment
7057	Property Investment: Commercial - Aged Care/Retirement Living	Commercial Real Estate	Property Investment
7058	Property Investment: Commercial - Diversified	Commercial Real Estate	Property Investment
7055	Property Investment: Commercial - Healthcare	Commercial Real Estate	Property Investment
7056	Property Investment: Commercial - Hospitality / Leisure	Commercial Real Estate	Property Investment
7054	Property Investment: Commercial - Industrial	Commercial Real Estate	Property Investment
7051	Property Investment: Commercial - Multifamily/ Residential	Commercial Real Estate	Property Investment
7052	Property Investment: Commercial - Offices	Commercial Real Estate	Property Investment
7059	Property Investment: Commercial - Other	Commercial Real Estate	Property Investment
7053	Property Investment: Commercial - Retail	Commercial Real Estate	Property Investment
7028	Property Investment: Residential	Commercial Real Estate	Property Investment
7066	Property Investment: SPE - Aged Care/Retirement Living	Commercial Real Estate	Property Investment
7067	Property Investment: SPE - Diversified	Commercial Real Estate	Property Investment
7064	Property Investment: SPE - Healthcare	Commercial Real Estate	Property Investment
7065	Property Investment: SPE - Hospitality / Leisure	Commercial Real Estate	Property Investment
7063	Property Investment: SPE - Industrial	Commercial Real Estate	Property Investment
7060	Property Investment: SPE - Multifamily/ Residential	Commercial Real Estate	Property Investment
7061	Property Investment: SPE - Offices	Commercial Real Estate	Property Investment
7068	Property Investment: SPE - Other	Commercial Real Estate	Property Investment
7062	Property Investment: SPE - Retail	Commercial Real Estate	Property Investment
7012	Property Trading Companies	Commercial Real Estate	Property Investment
7075	Real Estate Operating Company (REOC) - Aged Care/ Retirement Living	Commercial Real Estate	Property Investment
7076	Real Estate Operating Company (REOC) - Diversified	Commercial Real Estate	Property Investment
7073	Real Estate Operating Company (REOC) - Healthcare	Commercial Real Estate	Property Investment
7074	Real Estate Operating Company (REOC) - Hospitality / Leisure	Commercial Real Estate	Property Investment
7072	Real Estate Operating Company (REOC) - Industrial	Commercial Real Estate	Property Investment
7069	Real Estate Operating Company (REOC) - Multifamily/ Residential	Commercial Real Estate	Property Investment
7070	Real Estate Operating Company (REOC) - Offices	Commercial Real Estate	Property Investment
7077	Real Estate Operating Company (REOC) - Other	Commercial Real Estate	Property Investment
7071	Real Estate Operating Company (REOC) - Retail	Commercial Real Estate	Property Investment
5521	Student Accommodation	Commercial Real Estate	Property Investment
6210	Scheduled Air Transport	Aviation	Air Transport
6599	Securitisation - Aircraft	Aviation	Asset Backed Securities
128	Dairy Farming	Agriculture	Food and Products
127	Hill & Upland Cattle & Sheep Farming	Agriculture	Food and Products
126	Lowland Cattle & Sheep	Agriculture	Food and Products

Appendix 2: Our approach to reporting financial emissions

Figure 38 shows how we are measuring progress made against our Energy metric from 2020–23.

Figure 38: **Tracking the progress made in our Energy sector**

	2020	2021	2022	2023	Definition
Reported (R_T)	75.2	58.1	51.7	42.5	R_T = Per methodology as at year T
Previous year recalibrated (RC_T)		75.2	58.4	51.6	RC_T = Per methodology at year T
Base year rebaseline (RB_T)		75.2	75.6	75.4	$RB_T = RB_{T-1} * RCT/R_{T-1}$
Cumulative progress (CP_T)		-23%	-32%	-44%	$CP_T = RT/RB_{T-1}$
Annual progress (AP_T)		-23%	-9%	-12%	$AP_T = CP_T - CP_{T-1}$

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 39: **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 (including additional GHGs, for example)	**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 (counterparty valuations or emissions estimates, for example)	**Capture in-year**	• The impact of updated external data will be included in 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