



Carbon footprinting methodology for underwriting portfolios

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Executive summary



This report summarises a range of options, methodologies and barriers for the carbon footprinting of insurance companies' underwriting portfolios. This will help insurers to work towards understanding the challenges and eventually disclosing the carbon intensity of their underwriting portfolios.

In this way the report responds to a number of financial sector initiatives, including the Task Force on Climate-related Financial Disclosures (TCFD), and also regulatory actions, such as Article 173 of the French Energy Transition Law and the Bank of England / PRA Supervisory Statement 03/19, that motivate measurement and disclosure of carbon intensity and climate risk.

It is important to note that this report does not recommend a "standard" for the insurance industry. It is rather an exploration of the different carbon footprinting methodologies that may be applied to underwriting portfolios and the barriers to applying them. This includes the very important topic of data quality and availability.

However, a general approach and methodology have been described, tested and discussed within the working group with differing results. In some instances, this allows an insurer to identify the overall distribution of carbon intensity within their underwriting portfolio and "hotspots" of carbon intensity, depending upon scope of the application and data availability/quality. In others, the testing revealed various challenges, including lack of availability of data, which required assumptions and workarounds which can distort the results and become a limiting factor in the analysis. There are limitations of applicability, in particular across different insurance lines of business such as in personal lines motor and home insurance portfolios.

In this report we focus on Weighted Average Carbon Intensity (WACI) methodologies and metrics. Care should also be taken to ensure that absolute CO₂e emissions metrics, if they are used, and CO₂e intensity metrics are disclosed separately and deployed for different purposes. Typically, absolute measures of CO₂e emissions are used in investment asset portfolios to understand what is being financed, whereas using intensity measures of CO₂e emissions helps to understand where the risk is in the portfolios. We have focussed on WACI methodologies and metrics in underwriting portfolios to help identify and understand carbon intensity hotspots in those portfolios.

A particular challenge to the insurance industry is one of double counting. Calculating carbon intensity based on a client's premiums should not be compared to where the premium is invested. At present, there is no methodology to either resolve the carbon intensity of the investing and underwriting portfolios of an insurance organisation, or to create an aggregated carbon footprint at the organisational level, except for scope 1 and 2 emissions (i.e. insurer's own operations) alone.

An evolution of climate-related risk metrics for the financial services sector is currently underway, driven in part by the requirements of the TCFD framework, but also increasingly by regulators. These remain largely qualitative in nature. Carbon footprinting methodologies in underwriting portfolios as described in this report are just the start - a first step to identifying carbon intensity hotspots as an indicator of where the risk is in the portfolios, using intensity measure of CO₂e emissions, where this data is available or of a good enough quality.

1. Introduction carbon footprinting

1.1 Background/context on carbon footprinting

As asset owners and asset managers are supporting international efforts on carbon reduction in line with the 2015 Paris Climate Agreement's target of limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C, many have announced decarbonisation measures, such as reducing exposure to carbon-intensive sectors. To support these actions, carbon footprinting has seen increasing popularity in the financial sector over the last years, as a method of measuring and disclosing carbon emissions, both of own operations as well as of investment portfolios.

This development was spurred by a number of industry initiatives, such as the Montreal Carbon Pledge or the Portfolio Decarbonisation Coalition, as well as by regulatory actions, such as Article 173 of the French Energy Transition Law, motivating measurement and disclosure of the metric. Accordingly, the ranks of service providers offering to assess the carbon footprint of investment portfolios have grown a great deal in recent years. A 2017 PRI-Novethic assessment found 59% of asset owners and 55% of asset managers surveyed using a carbon footprint of their portfolio¹.

However, as these developments broadly focused on investments, the opposite side of insurers' balance sheets has received considerably less attention. Accordingly, carbon footprinting methodology quantifying the exposure of re-/insurers to carbon emissions of underwritten risks is currently underdeveloped and the emissions associated with insurers' core business remain unmeasured and undisclosed, albeit that the ability to footprint where premiums are invested is currently possible.

Despite the metric's maturity for investment portfolios, caveats prevail, which are likely to also occur in the development of a carbon footprinting methodology for insurance liabilities. Current data

challenges, affecting both the coverage and quality of existing data, as well as a lack of common accounting guidance or frameworks on how to measure and report GHG emissions, specifically in terms of scopes to include, still hinder a comprehensive uptake. Additionally, as a carbon footprint is a snapshot in time and not dynamic enough a measurement to analyse transition dynamics among economic players and the potential of avoided emissions, its sole disclosure may be misleading and accompanying it with contextual forward-looking information is necessary.

Measuring the carbon footprint of insurance liabilities/portfolios comes with similar caveats, but also has the potential of serving a similar purpose as for investment. It can inform the creation and implementation of a comprehensive climate change strategy, by giving the opportunity to compare to global benchmarks, to identify priority areas and actions for reducing emissions, and track progress in making those reductions as long as a standardised approach can be found. According to the PRI², investors who have already measured the portfolio carbon footprint say that it improved their understanding of portfolio risks and opportunities presented by climate change, helps to react to stakeholder inquiries, and demonstrates commitment to tackling climate change.

The TCFD³ in its 2017 report recommends the reporting of a WACI by asset owners and asset managers, while recognising the metrics shortcomings. However, it sees it as "a first step and expects disclosure of this information to prompt important advancements in the development of decision-useful, climate-related risk metrics." In a similar fashion, investigating carbon footprinting methodologies to quantify carbon emissions of insurance liabilities is a first, but necessary step in managing carbon risks in insurance portfolios.



1.2 Differentiation to similar initiatives

As carbon footprint measurement of insurance portfolios potentially becomes a crucial element in understanding and managing climate risks and opportunities, it can be expected that more and more insurance companies will get involved into this topic. At the moment several initiatives in the financial sector are dealing with the topic of climate change risk management and disclosure, in particular in the broader context of the TCFD. Some of these initiatives and working groups focus on the question how to implement the recommendations of the TCFD for specific financial industries like banking, investments and insurance.

The CRO Forum's Working Group wants to ensure that our contribution is complementary rather than conflicting with the work of other initiatives. As of today, we know of no other initiatives that are focusing on the topic of carbon footprint measurement of underwriting portfolios.

Taking a brief look on the landscape of current activities in the financial sector, the initiatives of the United Nations Environment Programme Finance Initiative (UNEP FI) are particularly noteworthy. In 2018, the UNEP FI Principles for Sustainable Insurance Initiative (PSI) officially launched an Insurance Pilot Group on the implementation of the TCFD recommendations⁴. While insurers are also major

investors, this initiative focuses on the assessment of climate risks in their core insurance portfolios and products with the ability to understand whether they can meet long term climate targets.

The PSI TCFD Insurance Pilot Group aims to develop a new generation of risk assessment tools designed to enable the insurance industry to better understand the impacts of climate change on their business and – by incorporating the latest scenario analysis – to assess climate-related physical, transition and litigation risks in insurance portfolios.

This work follows equivalent work by leading banks⁵ and investors⁶, all convened by UNEP FI for the purpose of advancing financial sector know-how on climate change and the adoption of the TCFD's recommendations. Through work like this, climate risk transparency in the financial sector will likely increase significantly in the future.

As some members of the CRO Forum's Working Group are also part of the PSI TCFD Insurance Pilot Group, significant overlap between the two groups' work has been avoided. In conclusion, the CRO Forum's Working Group on carbon foot-printing will complement similar initiatives in the context of climate change risk management and disclosure.

¹ PRI & Novethic, September 2017, Investor Action on Climate Change, <https://www.unpri.org/download?ac=1871>

² PRI, May 2015, Discussion Paper: Reducing Emissions Across the Portfolio, <https://www.unpri.org/download?ac=1876>

³ <https://www.fsb-tcfd.org/>

⁴ <https://www.unenvironment.org/news-and-stories/press-release/un-environment-convenes-worlds-insurers-assess-intensifying-climate>

⁵ <https://www.unepfi.org/banking/tcfd/>

⁶ <https://www.unepfi.org/investment/tcfd/>

1.3 Overview of carbon metrics and disclosures used in investments, and operational foot printing across industries

Relevance of carbon emissions to the financial sector

Initiatives like CDP, formerly known as “Carbon Disclosure Project”, and the Greenhouse Gas (GHG) Protocol have encouraged companies across all sectors and industries to report their carbon footprint for a number of years, and disclosure normally adheres to the relevant scope 1, 2 and 3 emissions described in the GHG Protocol. Scope 1 and 2 emissions are the direct and indirect emissions stemming from things like vehicle use, corporate facilities and energy consumption from production or operational activities.

Scope 3 emissions, which are also indirect, refer to other activities in the full supply-chain, or value-chain, not captured within scopes 1 and 2. Corporate supply chains are complicated to understand, so reporting these emissions is both challenging and complex, and hence there are currently considerable gaps in what is currently disclosed. The direct relevance to financial institutions is that Scope 3 includes the GHG emissions from within a company’s investment activities, defined as ‘financed emissions’, and based upon ‘ownership logic’ (i.e. if investors own x% of an investee’s market capitalisation then they also own x% of that issuer’s emissions).

One of the recommended disclosures in the ‘metrics and target’ pillar of the TCFD proposes that companies disclose Scope 1, Scope 2, and, if appropriate, Scope 3 GHG emissions. The TCFD provides supplemental guidance for the financial sector, including asset owners and asset managers, which states that “both should provide the WACI, where data are available or can be reasonably estimated, for each fund or investment strategy” (i.e. the carbon footprint of their investment portfolios). In essence, this report focuses on how to measure Scope 3 emissions of insurers underwriting portfolios.

Portfolio carbon footprinting

Carbon footprinting is essentially a measure of the GHG emissions of an underlying company, most commonly allocated to its investors.⁷ A portfolio carbon footprint is an extension of this principle and represents the sum of the proportional amounts of each investee company’s emissions, proportional to the weighting of the investment in the total portfolio.⁸ It enables asset owners, and asset managers, to compare portfolio emissions to global benchmarks and identify priority areas for reduction, such as the largest carbon emitters and/or most carbon-intensive companies in certain asset classes.

Basic carbon footprinting represents an absolute value of total GHG emissions ‘owned’ by the portfolio, but it needs to be normalised⁹ to be comparable across companies, sectors, or portfolios. Data can be normalised in terms of revenue, sales, market capitalisation, products, or employees, to arrive at different carbon footprint metrics. For an overview see table “Carbon footprint metrics” on the right.

The most commonly adopted metric, and the one recommended by the TCFD for an investment portfolio, is the ‘WACI. This metric describes the portfolio exposure to carbon-intensive companies expressed in tonnes CO₂ per \$M of revenue to obtain the carbon intensity of the each holding, and weighted relative to the value of the investment in the portfolio. The primary benefit of this metric is that it can be more easily applied across asset classes since it does not rely on the (equity) ownership approach.¹⁰ One of the drawbacks is that using revenue to normalise the data favours companies with higher pricing levels relative to competitors and is therefore distorted by different competitive strategies in the marketplace.

⁷ WRI, UNEP-FI and 2° Investing Initiative Portfolio Carbon Initiative: Climate Strategies and Metrics - Exploring Options for Institutional Investors

⁸ PRI Climate Change Strategy Project <https://www.unpri.org/download?ac=1876>

⁹ There are different approaches to ‘normalise’ a portfolio which lead to different outputs, as partly described in the rest of this section. These are not necessarily substitutes, but just different approaches depending on what is being analysed and communicated. For example To understand the investment portfolio’s normalised carbon footprint per amount invested, it is necessary to normalise by the portfolio market value.

To understand the efficiency of a portfolio in emissions per unit of output, it is necessary to normalise by an issuer’s accounting figure such as sales/revenues.

The normalisation approach that is recommended by the TCFD, is to normalise an issuer’s emissions by issuer’s sales/revenues and multiply it with the portfolio weight of the issuer to get the WACI

¹⁰ www.fsb-tcfd.org: Implementing the Recommendations of the Task Force on Climate related Financial Disclosures (June 2017)

Table 1 Carbon footprint metrics

Source: TCFD (see Appendix 1) and MSCI

Questions answered	Metric	Description
What is my portfolio’s exposure to carbon-intensive companies?	Weighted Average Carbon Intensity (WACI)	Portfolio’s exposure to carbon-intensive companies, expressed in tons CO ₂ e ¹¹ / \$M revenue
What is my portfolio’s total carbon footprint?	Total carbon emissions	The absolute GHG emissions associated with a portfolio, expressed in tons CO ₂ e
What is my portfolio’s normalised carbon footprint per million dollars invested?	Carbon emissions	Total carbon emissions for a portfolio normalised by the market value of the portfolio, expressed in tons CO ₂ e / \$M invested
How efficient is my portfolio in terms of total carbon emissions per unit of output?	Carbon intensity	Volume of carbon emissions per million dollars of revenue (carbon efficiency of a portfolio), expressed in tons CO ₂ e / \$M revenue

¹¹ CO₂e, or carbon dioxide equivalent, is a standard unit for measuring carbon footprints. The idea is to express the impact of each different GHG (methane - CH₄, nitrous oxide - N₂O and fluorinated gases - “F gases”) in terms of the amount of CO₂ that would create the same amount of warming. That way, a carbon footprint consisting of lots of different GHG can be expressed as a single number. Standard ratios are used to convert the various gases into equivalent amounts of CO₂. These ratios are based on the global warming potential (GWP) of each gas, which describes its total warming impact relative to CO₂ over a set period – usually a hundred years.



The formula to calculate the WACI (tons CO₂e per \$M revenue), as recommended by the TCFD and adopted by many solutions providers, is:

$$\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{current portfolio value}} * \frac{\text{issuer's Scope 1 and Scope 2 GHG emissions}_i}{\text{issuer's \$M revenue}_i} \right)$$

The Carbon emissions metric is based upon the concept of ownership and shows the total carbon emissions of the portfolio normalised by its market value. It aggregates the investor's financed emissions across all companies in the portfolio, weighted by the relative value of the investment in the portfolio, and then divided by the portfolio value to show tonnes of CO₂ per \$M invested. Normalising the data by the portfolio market value makes it a good metric for comparing a portfolio's emissions to another portfolio and/or a benchmark.

The formula to calculate the portfolio carbon footprint (tons CO₂e per \$M invested) is:

$$\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{issuer's market capitalization}_i} * \text{issuer's Scope 1 and Scope 2 GHG emissions}_i \right)$$

current portfolio value (\$M)

Of all these different carbon footprint methods, the intensity metrics are the most common methods used in investment portfolios today and have the advantage that they are aligned with the TCFD framework and can give a risk-based view. Use of an absolute method of carbon footprinting of the underwriting portfolio for example total carbon emissions together with the intensity method could also help answer different questions as described in the table on the previous page.

Lessons from legislative requirements

Enacted in August 2015 in France, the Energy Transition Act includes a set of interdependent provisions affecting a wide range of corporate, non-financial and financial entities operating:

- Provision III requires listed companies and/or large non-listed firms to report on the financial risks stemming from climate change as well as the measures to mitigate them,
- Provision IV clarifies pre-existing carbon disclosures requirements on direct and indirect emissions. Through an implementing measure, reporting requirements were extended to major indirect emission sources (scope 3), (i.e. those linked to the use of the products and services of the company as well as to the supply chain),
- Provision VI requires a wide range of companies operating in the financial industry (e.g. asset management companies, institutional investors) to report on the way ESG criteria are considered in their investment process and decisions with a specific focus on climate related risks as well as an assessment of the contribution of the asset allocation to the transition to a low carbon economy and to the international and domestic climate objectives.

Provisions III and IV are designed to provide institutional investors with the data they need to comply with provision VI.

These provisions were supplemented by extensive implementing measures, notably provision VI in which a particular attention is devoted to climate change. Through these implementing measures, reporting entities should report on the type of climate risks considered (physical, transition), the methodology used to analyse these risks, as well as additional relevant information (e.g. potential financial losses). Regarding the integration of the analysis in their investment strategy, reporting companies are expected to report on the ways they assess the consistency of their holdings with indicative targets.

The article 173¹² and its implementing measures doesn't prescribe any particular methodology or metrics to be reported since the intention is to foster the development of best practices.

After two reporting exercises, according to Novethic, it appeared that the vast majority of institutional investors measured their portfolios' carbon footprint and that this method, in spite of its limitations, was spreading. Indeed, *"of the 73 reports analysed in 2017-18, 86% engaged in this exercise for at least a portion of their assets. This figure was only 74% last year, out of 69 identified reports"*¹³.

Roughly half of these investors outlined the limitations tied to the method, notably the fact that the carbon footprint is not a forward-looking indicator but rather a snapshot of the portfolio at a given time. The "Review of the application of the provisions of Article 173-VI on investors' extra-financial reporting" shares this view¹⁴. This report, presented by the French government in 2019, underlined the widespread use of the measurement of climate impact through the carbon footprint of investment portfolios by those subject to the French regulation, as well as the static nature of this impact measurement.

The report also referred to the recommendations made by the French insurance supervisory authority, which is responsible for ensuring compliance by entities subject to the obligations of Article 173. The supervisory authority emphasised the usefulness of carbon footprint for assessing the risk of a portfolio of assets or liabilities but notes that this measure is still backward-looking and therefore does not permit an assessment of the portfolio's exposure to climate change risk¹⁵.

When it comes to the method used for measuring the carbon footprint of the portfolio, Novethic notes heterogeneous methods and GHG scope coverage. Reporting on emissions avoided or saved is also increasing although not yet widespread.

¹² Anticipating the Sustainable Finance and Disclosures Regulation, article 173 has been replaced by article 29 of the law 2019-1147 "Energie et Climat" adopted in November 2019

¹³ 173 shades of reporting Season 2: Climate and ESG reporting of French institutional investors. Novethic, October 2018

¹⁴ "Review of the application of the provisions of the decree n°2015-1850 of 29 December 2015", section 2.4.1 "Investments' carbon impact measurements", page 17, July 2019

¹⁵ "Review of the application of the provisions of the decree n°2015-1850 of 29 December 2015", appendix 5: "recommendations made by the ACPR in the management of risks related to climate change", page 41, July 2019

Non-financial industries

In the carbon intensive sectors, that account for most of the global GHG emissions like energy, transport, infrastructure (e.g. iron, steel, aluminium, cement and glass), petrochemicals, agrichemicals and agriculture more broadly there have been a number of approaches to determine carbon footprint, mostly in the scope 1 and 2 emissions related closely to operations. These are typically the data available for use in financial services for carbon footprinting. Unfortunately, whilst these data are being more commonly reported and accessible from third party data providers, not all data sources are comparable. This makes the data used in portfolio carbon intensity often unreliable, especially when applied to underwriting portfolios, where there is a discrepancy between investment and industry coding systems and difficulties in assessing data for subsidiaries, or individual assets.

Some of these carbon intensive industries have also started to explore the use of carbon intensity metrics using lifecycle carbon intensities that aim to cover their scope 3 emissions too. This methodology, typically used for petroleum transportation fuels, aims to account for all of the GHG emissions associated with a product, from its production through to its use. Life-cycle carbon intensity analysis encompasses GHG emissions from producing crude oil, refining it into useful products, transporting crude oil and refined products, and combusting the fuel in an internal combustion engine—often referred to as a “well-to-wheels” analysis.

For electricity production from fossil fuels, the “well-to-wire” methodology, or metric is also used which is similar to a well-to-wheel lifecycle carbon intensity metric but incorporates assumptions on power plant efficiencies. Lifecycle carbon intensities can be a dynamic and objective measure to establish positions today and to help drive future decarbonisation of carbon intensive industries, by defining and measuring decarbonisation pathways. While complicating the task of the financial services companies in carbon footprinting their investment and underwriting portfolios, these scope 3 carbon intensity measures may have an important role in developing decarbonisation engagement strategies.

Supporting clients and investee companies to achieve the Paris Agreement goals is potentially an important goal of financial services climate change strategies but is beyond the scope of this report.



2. Methodology

2.1 Introduction

The objective of the CRO Forum working group is to explore the options for carbon footprinting methodologies to quantify carbon emissions in (re) insurance portfolios and to recommend approaches, whilst highlighting barriers, but not to set an industry standard.

The recommended general methodology needs to guarantee sufficient granularity to allow for meaningful conclusions. At the same time, it needs to be recognised that the comparability of the footprints amongst different industries and with the investment portfolio is helpful, but that the methodologies and metrics for underwriting and asset portfolios are different and underdeveloped. Care must be taken to avoid double-counting, or to simply add different metrics together when attempting to get an overall company-wide view. Implementation of the methodology also has to be feasible and practical. (Re)insurers assessing the carbon footprint of their liability portfolio should aim for an approach that enables consistency across the insurance industry, the company's business entities, and insurance portfolios where pragmatically feasible. Caution should be exercised in the potential misinterpretation of intensity metrics being applied to portfolios when only part of the portfolio is within scope of the calculation.

The methodology is thought to be an instrument measuring solely the carbon footprint, not directly aiming for an action-oriented steering. It provides the opportunity to identify carbon intensity hotspots in an insurance portfolio, which can be used as basis for future assessments of higher granularity that would guarantee differentiated insights for specific industries.

The general carbon footprinting methodology described in section 2.2 aims to create transparency on the carbon intensity of some parts of books and may allow for progress reporting through year-to-year comparison of the emission intensity of (re) insurance portfolios if the challenges of data quality/availability are met.

The next chapters describe a methodology generally applicable to a variety of industry segments and ensures comparability of emission intensity of different portfolios if the applied scope and terminology of insurers are the same. It also suggests industries and lines of business that could be assessed in the future.

2.2 Scope and metrics

The focus of the described general carbon footprinting methodology lies on scope 1 and scope 2 emissions of the insured's operations. It does not take into account other emissions in an insured's supply chain (scope 3) nor is the approach considering forward looking elements. It is also only applicable where the Scope 1 and 2 emissions of the insured client are available and reported to an acceptable level of quality.

It is proposed to measure WACI (tons CO₂e per \$M revenue) of a portfolio of *i* numbers of insurance transactions.

As a metric for the insured's carbon emissions, carbon intensity information per legal entity/company (commercial insurance) or individual insured (personal lines insurance) is recommended to be used, although other approaches could be explored. In case emission data on company level is not available, industry/country information can be used as best available estimates requiring a 3rd party proxy values for carbon emissions at these levels of aggregation.

To determine the value of the transaction relative to the overall size of the insurance portfolio, information on capital required / capacity / expected loss can be used alternatively to gross written premium based on the level of information available on a transactional level, but this would not allow any pure revenue-based comparability. The comparison of using WACI methodologies and metrics other than gross written premium are summarised in the table below.

$$\sum_n^i \frac{\text{gross written premium of insurance transaction}(i)}{\text{total GWP volume of insurance portfolio}} * \frac{\text{insured's Scope 1 and Scope 2 GHG emissions } (i)}{\text{insured's \$M revenue } (i)}$$

Table 2 Comparison proposed WACI methods

Proposed WACI method	Advantages/disadvantages	Data availability
Gross premium weighting	<ul style="list-style-type: none"> Probably the most consistent KPI Supply and demand impact on premium uncorrelated to emissions but leads to change in WACI Gross Premium only available on an overall basis, not per location/occupancy Insufficient quality for multi-peril/multi-location industrial business with different occupancies per location 	<ul style="list-style-type: none"> Easily available Reasonably homogeneous application across (re-) insurers
Gross (vs. net) premium weighting	<ul style="list-style-type: none"> Includes components with substantial premium differences dependant on location not GHG emissions Premium also includes other deductions / commissions Before reinsurance "normalisations" might be necessary to avoid double counting 	Similar data issues to GWP approach, but Net approach adds complication
Limit / sum insured / value / capacity weighting	<ul style="list-style-type: none"> No linear correlation to actual risk or premium Information consistent across industry, but many different limits, sums insured etc. 	
Risk capital weighting	<ul style="list-style-type: none"> Even more heterogeneous across the industry and might change over time Makes limited sense on a granular level 	Available (on policy level)



2.3 Required input data

In order to model the carbon footprint of (re) insurance portfolios, the following internal and external information is required on transactional level:

Internal:

- *Stock-listed insured's*: Information on company name and ideally an attributed unique identifier, for example BvD number
- *Government-owned insured's*: Information on country (risk location) and industry (ideally including an attributed unique identifier, for example NAIC code)
- *Privately-owned insured's*: Information on country (risk location) and industry (ideally including an attributed unique identifier, for example NAIC code)
- *Personal lines / individual insured's*: Information on home country of the insured (Type of insurance policy)
- *Reference data*: Information on gross written premium volume of transaction and the total portfolio. Alternatively, capital required / capacity / expected loss can be used depending on data availability on transactional level.

External:¹⁶

- Information on weighted average CO₂ intensity per legal entity / company (CO₂e / revenue)
- Information on CO₂ intensity per industry / country (CO₂e / revenue)
- Information on CO₂ intensity per insured / country (CO₂e / GDP)

Various external service providers offer carbon emissions data (Scope 1 and 2, carbon intensities) for companies, mainly stock-listed companies. As a rule, access to this data is subject to a fee or licenses are required. The working group cannot and deliberately does not want to make a recommendation for specific service providers, but it is worth comparing the data of different service providers. For a first overview, we recommend the study of the University of Hamburg from 2018 "Consistency of Corporate Carbon Emission Data".¹⁷

2.4 Double counting

One of the main benefits of using carbon intensity (e.g. tons CO₂e/ \$M revenue) rather than an absolute value (e.g. tons CO₂e) as a main metric relates to the issue of double counting. Assuming that the premium revenues from underwriting are treated separately from their use in investing.

Absolute metrics such as attributing the responsibility for carbon emissions in tons of CO₂e to an investment or insurance portfolio, mean that each ton of CO₂e emitted by an activity can only be attributed once, either to the emitting organisation or individual, an investor, lender, insurer etc. if the issue of double counting is to be avoided. The focus of absolute metrics is to assign responsibility for physical emissions is incredibly complex when applied in practice. For example, in marine cargo underwriting a decision, or assumption would need to be made as to what portion of the absolute emissions of the insured should be assigned to an individual cargo. This would vary enormously depending on the nature of the cargo itself.

The carbon intensity metric avoids the issue of double counting in its reporting. It is implicit in the calculation to derive the intensity but does not attempt to assign responsibility for emissions to one individual party. Instead, it describes the characteristics of a portfolio relative to the scope of the calculation.

2.5 Methodology approach

In order to provide transparency on the carbon footprint across the portfolio, ideally the following criteria would be achieved:

1. Transparency on the carbon intensity of different parts of the portfolio needs to be created.
2. Implementation of the proposed methodology needs to be feasible and practical.
3. The methodology is a snapshot in time of the carbon intensity of the portfolio, and not intended as a directional instrument or tool.

It is recommended to use carbon intensity information on the most granular level available, for example per legal entity. In case this information is not available, we recommend the use of holding level information or to rely on best available estimates (e.g. information per industry and country if these are available).

	Metric recommended	Metric for estimation
Commercial insurance	CO ₂ e intensity per legal entity	CO ₂ e intensity per industry (and country)
Personal lines insurance	-	CO ₂ e intensity per insured and country

The following considerations shall be taken into account:

Commercial insurance:

- **Financial sector:** Input information should be the carbon footprint of the real economy. In case the insured is a financial service provider, we suggest considering CO₂ intensity information of the ultimate beneficiary or the credit receiving company, assuming that this data is available and is considered part of the scope 1 and 2 emissions.
- **Transport:** For commercial transport insurance, we recommend to use the carbon footprint of the insured. For hull insurance covers, this means the footprint of the transporting company, for cargo business the footprint of the cargo owner shall be used. The carbon impact of the type of transport vehicle, cargo or distance are ignored for this specific approach.
- **Construction:** For engineering covers we recommend to use the carbon footprint of the insured construction company and therefore reflect the footprint of construction operations only, since the methodology only takes scope 1 and 2 emissions into account.

Personal lines insurance:

In the case of personal lines insurance, the methodology is based on the notion that the combination of an insured's activities makes up the total of the individual's carbon footprint. We therefore do not distinguish between different scopes of cover. For data availability reasons, the methodology proposes to use the CO₂ footprint per individual per country, although it is recognised that some insurers will apply this methodology to specific motor or home policies and their respective average carbon emissions.

In order to accompany society's shift towards a low carbon economy, we recommend all companies assessing the carbon footprint of their portfolios to move further towards higher granularity of information and to take strategic and future looking metrics into account.

When doing so, we recommend focusing on the industry sectors with the highest current emission intensities:

Commercial insurance:

- Energy production
- Agriculture industry
- Transportation industry
- Manufacturing industry

Personal line insurance:

- Automotive
- Property

In a next section, metrics are described that allow for higher granularity for the main GHG emission intense industry sectors by insurance line of business (LOB).

¹⁶ In practice to implement the general methodology, Scope 1 and 2 emissions are required to create the intensity metric. In many cases this will require the industry and country carbon proxy values.

¹⁷ This study investigates the consistency of corporate carbon emission data among a set of prominent global data providers. Busch, T. et al. (2018): Consistency of Corporate Carbon Emissions data. https://ec.europa.eu/jrc/sites/jrcsh/files/paper_timo_busch.pdf

3. Towards implementation of carbon footprinting by LOB and industry sector

3.1 Introduction

Before implementing a carbon footprinting methodology across an insurance underwriting portfolio, care should be taken to evaluate availability of data, appropriateness of sectoral classifications, and attribution of lines of business to industry sectors.

The CRO Forum working group has reviewed the potential for industry and LOB specific carbon footprinting methodologies. However, there are some generic issues that are important to consider when applying carbon footprinting methodologies to underwriting portfolios.

Classification

GICS code can be used to identify the Scope 1 and 2 CO₂e emission data. However, for Small and Medium Enterprises (SMEs) and unlisted companies this information is not readily available. Thus, for these companies CO₂e intensity per industry / country can be used as a top down approach as discussed in Chapter 2 if average emissions are available and the portfolio can be assigned to a corresponding

sector/country. Although in practice, the availability of average carbon emissions by sector and country are often not readily available, which makes estimation across portfolios challenging. Naturally, for an unlisted company working across multiple sectors, assumptions would need to be made on which industry coefficient is correct and in the case of a more complex, cross-border risk one specific country coefficient may not be accurate. The data collection process would therefore need to be significantly enhanced to handle and identify cases where the GICS code and CO₂e intensity information is not available, potentially utilising third-party data providers to provide estimates. This will take time to develop for any insurance underwriting portfolio and there are currently a limited number of third-party providers able to provide solutions. These solutions are also generally based on equity ownership investment codes which are not readily comparable to underwriting industry codes, requiring a conversion template to be created and implemented.

Allocation to LOB

For each LOB, further attribution to industry sector is required based on the type of insurance coverage purchased. Therefore, it will be required to identify the industry sector within the LOB, at a client level, which is likely to be a complex exercise for most insurers. There may be difficulties in mapping the LOB, depending on the individual insurance companies' definitions, to the LOBs specified in the methodological approaches described in this report. It is also highly likely that an insurer will be writing policies for the same client across multiple LOBs, which also needs to take into consideration the potential for double counting and is not yet factored into the methodology. This also makes comparability between (re)insurers challenging, if it is to be meaningful.

Disclosures

Insurers need to be careful about what information on carbon footprinting is publicly disclosed. Besides caution with regard to data quality and availability, the carbon footprint may lead to more detailed disclosures providing additional insights into the insurers' commercial data. This could be considered competitively sensitive information. Hence, more management discussion may be needed before an insurer takes a decision to disclose.

Double counting with premiums

As discussed in Chapter 2, double counting of CO₂e emissions within an underwriting portfolio is largely avoided through the use of carbon intensity measures, which compare emissions characteristics of a portfolio irrespective of its absolute size and as a direct measure to judge the level of a portfolio's link to the fossil fuel economy. There is still the challenge of double counting if these underwriting portfolio carbon intensity emissions are disclosed in combination with the carbon intensity emissions of the asset portfolio. It is important to note that the carbon intensity metrics are derived from the absolute carbon emissions data (see section 2) for both underwriting and for the asset portfolio. The only way to avoid double counting across both portfolios would be to account for the exclusion of absolute emissions on at least one of the assets or underwriting portfolios, with an appropriate adjustment on the other.

Many insurers are already progressing with carbon intensity mapping of their asset portfolios which is already more advanced in its application than for underwriting. The potential issue arises that

the premium derived from the risk is already being accounted for on the asset side of the insurance company. Insurers should be careful not to double count and avoid combining asset and underwriting carbon footprinting numbers. Depending on what use an insurer wants to make of its carbon footprinting data, as simple assessment of and disclosure tool, or as an engagement tool with clients and investee companies, different methodologies and metrics can be used or approaches such as heat maps of carbon intensity can be developed.

Reporting periods

There are considerable deviations between the period of cover of the insurance contracts and the carbon accounting periods. Lag of results should be expected due to those differences. Further impact is expected for policies in the industries that require a more granular approach, where the data can be either newer or older than the main sources on the standard method. As far as possible carbon emission data should use audited, and therefore reliable, values.

Different transaction weights

Depending on the transaction weight chosen, premium, capital required, expected loss, etc., the results may be distorted and make comparison difficult. Different expenses, size, risk appetite may change completely from insurer to insurer and may pose two different CO₂e emissions for a unique client.

A pragmatic approach to data

Wherever possible, the report applies the general methodology of carbon footprinting and respective data sources as described in Chapter 2. However, for certain industry and LOB combinations, where alternative measures, or methodologies are proposed, specific sources of publicly available data for the carbon footprinting are identified. Additionally, because of the difficulties foreseen in gathering some of the relevant data, detailed quantitative analysis on carbon emissions might only be feasible for insurers' most carbon intensive clients who make up a large percentage of the insurer's total underwriting portfolio. For clients who make up a small proportion of the underwriting portfolio, a simple quantitative analysis can be performed. Similarly, certain LOBs may be more exposed to GHG emissions than others. As with industry sector, the recommended approach is to focus on the LOBs which are most relevant in terms of overall GHG emissions in the overall underwriting portfolio.



As a first step, it is recommended to map premium volumes per sector and use that information to gain insight into how much insurance premium is exposed to the most carbon intensive sectors and to check if the insurance company is already assessing carbon on their invested premiums. Then a deep dive should be performed on the most carbon intensive sectors where there is the most significant exposure in the underwriting portfolio.

The outcomes by industry sector are summarised below, with more detailed LOB proposals in appendix 3.

3.2 Proposed approaches for carbon footprinting methodologies by industry sector

3.2.1 Energy sector

The general method was tested and is suggested as the carbon footprinting method most suited for application in the energy sector. This approach could be applied to most insurance lines of business (agribusiness, product liability, workers compensation, cyber, D&O, financial lines, marine – cargo, aviation, life pensions, life protection, and health) subject to data availability and assuming that the client’s emissions apply equally to all lines of underwriting business.

For other lines of business (property, liability, construction engineering, credit and surety, and marine hull) alternative methods to measure carbon footprint are more appropriate, where there is the public data available, for example CO₂e emissions per kWh, or MJ/BOE of asset insured, or for construction engineering, CO₂e per MW when operational. When deploying different methodologies and metrics in specific industry / LOB combinations, it is important to consider the comparability of methodologies and metrics across the underwriting portfolio and if this is readily achievable or an objective that you wish to achieve.

3.2.2 Agriculture

The overall agriculture carbon footprinting method proposed is CO₂e¹⁸ intensity per hectares/acres/sq.km Total Emissions of CO₂e from Agriculture and Land-use change and Forestry sectors (AFOLU as per IPCC¹⁹) per country²⁰ over Total Agricultural Land per country²¹. For arable farming, CO₂e intensity per kg crop yield is proposed (yield method - Total Emissions of CO₂e from Agriculture and Land-use change and Forestry sectors (AFOLU as per IPCC) per country over Agriculture Output per country²²). For livestock, CO₂e intensity per number of animals²³ is proposed (livestock method - Total Emissions of CO₂e from Agriculture and Land-use change and Forestry sectors (AFOLU as per IPCC) per country over total number of animals per country²⁴).

For agribusiness, property, liability, product liability, and worker compensation lines of business, agriculture/livestock/yield methods should be used. For all other lines of business, the general approach is been proposed.

¹⁸ CO₂e (CO₂ equivalent) measures are particularly important in agriculture, as CO₂ is not the primary driver of agricultural emissions of GHG, but N₂O and CH₄.

¹⁹ IPCC Climate Change and Land, Summary for Policymakers (Climate Change and Land an IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and GHG fluxes in terrestrial ecosystems) <https://www.ipcc.ch/report/srccl/>

²⁰ Data publicly available on <https://www.climatewatchdata.org/ghg-emissions> from CAIT or UNFCCC databases

²¹ Data publicly available on <https://data.worldbank.org/indicator/AG.LND.AGRI.K2>

²² Data publicly available on <https://data.oecd.org/agroutput/crop-production.htm>

²³ Recommended to only include Cattle, Sheep, Buffalo and Goat animals due to its high emission intensity <https://www.climatewatchdata.org/sectors/agriculture?emissionType=34&filter=#drivers-of-emissions>

²⁴ Data publicly available on <http://www.fao.org/faostat/en/#data/QA>

Land use change especially deforestation increases emissions intensity. This can be significant for agriculture in countries where high value forest, or peat land is cut down, burned or otherwise degraded for timber, palm oil, soya, beef/leather, pulp, rubber and minerals. This is especially the case in tropical regions with virgin rainforest intact, in other regions for example Europe, where forest, including boreal forest has already been lost, change in land-use may reduce impact of agricultural GHG emissions for example through introduction of regenerative farming techniques.²⁵

3.2.3 Manufacturing

Manufacturing for the purposes of carbon footprinting is defined as “Companies who make things in large quantities using machinery; industrial production.”

Method	Description & application
General methodology	CO ₂ e intensity per legal entity
GDP method (for clients for which the insurer has limited exposure or for clients for which the standard metric is not available)	CO ₂ e intensity per amount of GDP

GDP method, for clients for which the insurer has limited exposure or for clients for which the standard metric is not available, CO₂e intensity per amount of GDP.

For the GDP method, the following metric was used to measure the carbon intensity for an insured: The ratio of total emissions of CO₂e from Industrial process per country²⁶ to GDP contribution of the manufacturing sector per country²⁷.

Given the above information, the general metric, CO₂e intensity per legal entity, was tested due to the following:

- The general metric, will provide a more specific information based on the exposure of the insurance company;
- CO₂e intensity measure based on revenue is a good measure and indicator for manufacturing.

Within a manufacturing-based underwriting portfolio it may be easier to assess the insurance company’s total exposure to the carbon footprint, for a client and as well as for total portfolio, if the same metric is used for all LOBs. The GDP method can be used to estimate the CO₂e intensity, if the “CO₂e intensity per legal entity” information is: (i) not available or (ii) is difficult to compute, or (iii) as a simplified method for LOBs that are less relevant in terms of exposure for the insurer.

The general method and the GDP method, the total ratio of emissions of CO₂e from industrial process per country to GDP contribution of the manufacturing sector per country, has been tested as the overall carbon footprinting methodologies for the manufacturing sector. The standard methodology has been proposed as a primary metric for all lines of business. For lines of business with limited exposure or limited data availability, the GDP method is proposed.

²⁵ <https://www.wsj.com/articles/how-to-get-rid-of-carbon-emissions-pay-farmers-to-bury-them-11568211869>

²⁶ Data on Historical CO₂ emission from Industrial process: <https://www.climatewatchdata.org/ghg-emissions?sectors=511>

²⁷ Data showing Manufacturing value addition as % of GDP: <https://data.worldbank.org/indicator/NV.IND.MANF.ZS>

3.2.4 Personal lines: property

The general method was tested as the overall carbon footprinting methodology for personal lines, primarily due to limited data availability on individual carbon emissions.

Method	Description & Application
General - CO ₂ e intensity per insured and country	Due to the limited data availability on individual carbon emissions the general approach was tested, as defined in chapter 2 ²⁸
$\sum_n^i \frac{\text{gross written premium of insurance transaction}(i)}{\text{total GWP volume of insurance portfolio}} * \frac{\text{avg emissions per capita} * \text{avg expenses on property insurance}}{\text{avg consumption expenditure}}$	

Further consideration needs to be given to feasible approaches that are aligned with the approaches used by other sectors, in particular personal lines motor, using widely available data. For individual households, insurance underwriting data collected on energy usage (proxy might be type and size of an individual dwelling, apartment or house, number of rooms etc.) and the energy efficiency of the dwelling (construction type and age of property). Average carbon emissions per annum are also available in some countries which could also be applied to some policies.

3.2.5 Personal Lines: motor

Due to the limited data availability on individual carbon emissions the general method was tested, as defined in chapter 2.

The general method for personal lines motor insurance will enable comparison of the overall carbon intensity of personal lines with commercial lines as well as the carbon intensity of assets backing insurance policies. However, it will not provide any granularity that would enable these measures to be used to help management to reduce the carbon intensity of a specific motor portfolio or to offer solutions that help policyholders to reduce their carbon footprint (e.g. electric vehicle insurances) beyond country allocations. Similar issues exist for the general method with respect to commercial fleet policies.

However, most insurers already gather data as part of the underwriting process, which would enable more granularity to be provided and enable

the measures to be used to help management and customers reduce their carbon footprint. For example, when underwriting a vehicle, details are collected about the make and model of the vehicle. In the UK market, for example this information can be retrieved from widely available databases using just a car registration number. This enables information on type of engine, internal combustion engine, diesel, hybrid, electric, and engine size for example to be known and vehicles to be banded from a GHG emissions perspective. As discussed within the working group, the average emissions of vehicles can be applied to number of policies as a potentially more accurate calculation than the general method – further work would be needed on the proportion of annual financing of a vehicle and running costs in relation to the annual emissions.

In addition, other information regarding approximate annual mileage is often collected as part of the underwriting process. These two pieces of data could be used to band policies with different carbon intensities applied to each band, based on their emissions profile. The assessment of the degree of differentiation to be applied to each band could be based on analysis of the composition of the overall motor market in that country and an assessment of the contribution of motor vehicles to per capita carbon footprints. In addition, proxies for income are often collected as part of underwriting process. These could also potentially be used to band policies by carbon intensity more effectively (i.e. taking into account different income/consumption levels).

The approach described above for personal lines motor appears very achievable given that data is already readily available. A similar approach could be adopted for other personal lines, however there may be data gaps at present that make this more challenging in the short term. Information regarding insured properties (e.g. size, construction type, and age) could be used to derive a proxy for its energy efficiency, although actual energy efficiency ratings if available would be even better. However, it is less likely that information regarding energy usage information will be generally available or could be proxied as easily, although average carbon emissions for homes are available in some countries.

3.2.6 Transportation

Method

1. By LOB, identify clients from the transport sector. Identify the most material lines of business to the carbon emissions of the client, for example property.
2. Aggregate your GWP in the transport sector across LOBs.
3. Review availability of Scope 1 and 2 emissions²⁹ totals for each of the client in the corresponding year of covers or apply a proxy value for missing data. Consider the amount of Scope 1 and 2 emissions the insurer is accountable for or facilitating through the insurance provision. Adjustment/conversion may be needed if the proxy CO₂e value is designed with investments in mind.

Regarding the split of LOBs, generally insurance business is not allocated to a “transport” sector as such. Certain LOBs may have the classification, but not all and highly likely in Mid-Corp and smaller. Smaller (re)insurers may be unable to follow this approach without significant data review and classification. It is likely insurers would need to look at their specific lines of business in turn to see where there is a client from the transport sector, subject to internal data tagging or GICS classification, for example review of property book and clients within it relevant to transport sector.

CO₂e emissions are commonly disclosed as intensity measure per passenger/ton of freight kilometre by transport service companies or per vehicle kilometre by transport OEM, which are also measures recommended for example by CDP and the Science

Based Targets initiative (SBTi). Various measures are in place to facilitate transport companies in calculating their Scope 1 and 2 emissions and are likely to cover energy generation/purchased, own fleet emissions, etc. All additional freight/distribution by a 3rd party would be Scope 3 and not reflected.

The estimation of distance-based emissions is also relevant, if data is available. Transport OEMs (e.g. auto manufacturers) commonly disclose intensity metrics in form of CO₂e per vehicle-kilometre, which might require application of a load factor, converting travel of vehicle to actual weight/number of passengers it carries – requiring Transport OEMs to use assumptions on how their vehicles will be utilised. Different approaches exist when determining the distance unit for the intensity measure, including “Shortest Feasible Distance”, “Planned Distance” or “Actual Distance travelled” – depending on approach correction factors might need to be applied.

Using average emission intensity figures for the industry might over-/underestimate an entity’s actual emission intensity depending on for example the vehicles it uses (e.g. trucking company using only long-haul heavy trucks vs. company operating mainly small last mile delivery trucks or regional aircraft operators vs. intercontinental operators). It is also important to adjust for the type of insurance you are providing and how material it is to the carbon emissions, for example property cover vs cyber cover. Also, it is important in case of using proxies focused on equity shares to convert to an effective rate which reflects that underwriting is not the same as owning a share of a business.

²⁸ Even the data required for the standard approach is not always readily available (like the average expenses on property insurance), so that under some circumstances even less granular estimations have to be made

²⁹ Specific transport related GHG factors and methods are important at the transport company level in determining their Scope 1 and 2 emissions. From an insurance perspective we are concerned from an aggregate portfolio level and would not have access/insight to the underlying company data or calculations.

4. Conclusions and outlook

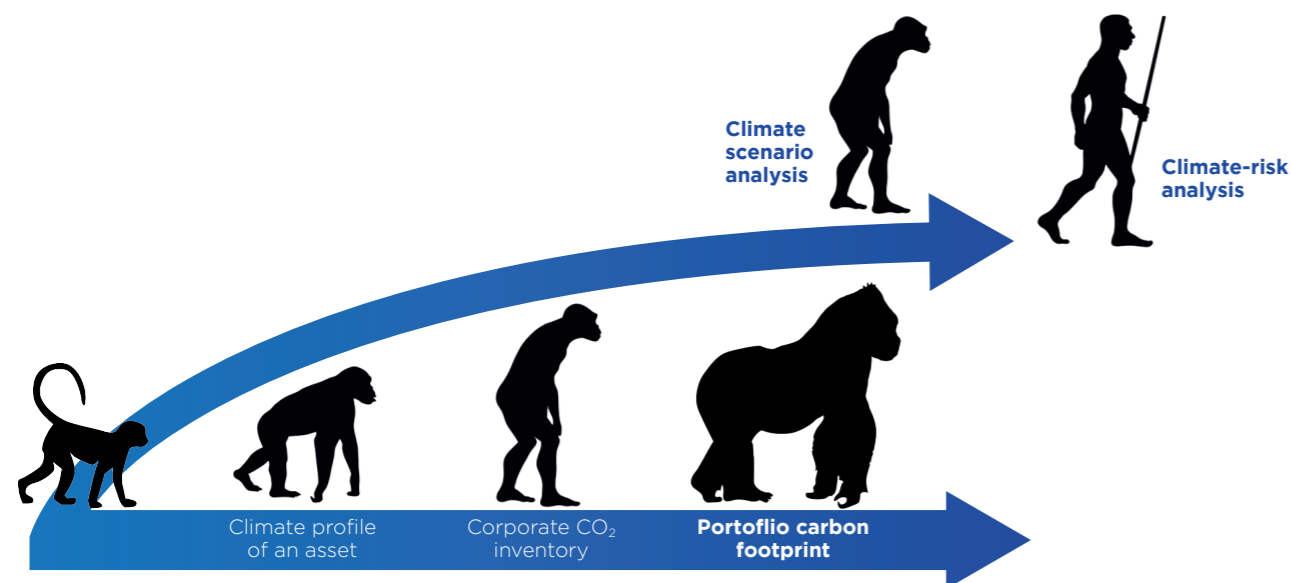
Care should be taken in the assessment and quantification of carbon footprinting across the asset and underwriting portfolios in insurance companies. As outlined in both Chapters 2 and 3, especially in the sections on double counting, the lack of comparability in the use of different carbon footprinting methodologies and metrics in different sector and LOB combinations can make it highly misleading to simply combine different CO₂e emissions data. Care should also be taken to ensure that absolute CO₂e emissions metrics and CO₂e intensity metrics are disclosed separately and used for different purposes.

Despite prevailing caveats and shortcomings, there is a strong demand for carbon emissions disclosure in financial markets. The TCFD's 2017 guidance on the implementation of its recommendations says: "Users of climate-related financial disclosures are specifically interested in how insurance companies are evaluating and managing climate-related risks and opportunities in their underwriting and investment activities. Such disclosure will support users in understanding how insurance companies are incorporating climate-related risks into their strategy, risk management, underwriting processes, and investment decisions."³⁰ Disclosure is a

requirement for any company who wants to keep its competitiveness in the market place where users have a high demand for more granular data on exposure to emission-intensive and other climate-related or -impacted activities.

An evolution of climate-related risk metrics for the financial services sector is currently underway, driven in part by the requirements of the TCFD framework, but also increasingly by regulators starting to mandate disclosure of climate change risk in financial portfolios. Not only in insurance, but in asset management and banking as well. Carbon footprinting methodologies as described in this report in underwriting portfolios in insurers is just the start, a foundational step to identifying carbon intensity hotspots as an indicator of where the risk is in portfolios (using intensity measure of CO₂e emissions) where this data is available or of a good enough quality. These different measures of CO₂e emissions are not only aimed for disclosure but can also be used to provide input to (re) insurers in their internal analysis of how their own processes (e.g. underwriting strategy or enterprise risk management) are aligned to its climate change-related strategies and objectives.

Source: 2°Investing Initiative



Further detailed analytical work using different methodologies, in particular scenario analysis and then using scenarios to determine potential impact on underwriting portfolios through the physical and transition risks of climate change is required to fully understand climate change risks in the financial services sector. These are not topics covered by this report, but are being developed in other programmes of work, such as the UK Bank of England's Climate Financial Risk Forum and the UNEP FI PSI workgroup on TCFD

Carbon intensity is a useful baseline metric for insurance liabilities. Its benefits as well as its shortcomings and related caveats in footprinting carbon emissions in underwriting portfolios have been described in this report. On the basis of this further work is needed in developing the described methodologies as well as in developing additional metrics.

A number of different metrics measuring alignment with the Paris Agreement goal of temperatures not rising above 1.5/2 degrees are currently being developed. These metrics tend to be easier to interpret and can incorporate forward looking elements (e.g. transition pathways of companies) and different intensity measures can be mapped to a single alignment metric facilitating aggregation. These metrics though require additional assumptions to be made which make them more subjective as well as potentially less transparent.

More importantly, both carbon intensity and alignment metrics both aim to measure the impact of the insurer on the environment, not the impact of the environment on the insurer's business (N.B. although both measures can be argued to be a transition risk indicator). If insurers want to develop metrics that can be used to steer and manage the business and enable climate-related transition and physical risks and opportunities to be identified, measured, monitored, managed and reported upon, then alternative more sophisticated risk metrics will need to be developed. These could take the form of analysis of the impact on the insurer's business of different climate scenarios as recommended by the TCFD.

Such analysis will require new tools to be built and data to be collected as existing tools are unlikely to be able to support such analysis without adjustment. That said particularly with respect to insurance liabilities existing natural catastrophe models could provide a good starting point for assessing impact of some physical risks.

Recommended disclosure standards by TCFD to re/insurance companies – metrics and targets

- Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.
- Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 GHG emissions, and the related risks. GHG emissions should be calculated in line with the GHG Protocol methodology³¹.
- Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.

The carbon footprinting methodologies discussed in this report can be aligned to the recommended TCFD disclosure standards. Currently, no standardised methodologies have been available for the carbon footprinting of underwriting portfolios. The methodologies assessed in this report will help insurance companies to consider the challenges in understanding their exposure to clients that have higher/lower GHG emissions and build this into their climate change risk management strategies as methodologies further develop.

Even being a snapshot metric, progress reporting can help to capture some of the effects of climate-related actions executed by companies. Based on the TCFD 2019 Status Report³², insurance companies displayed the lowest level of disclosure on the Metrics and Targets section in comparison to all other industries, as of 2018. There was even a decrease in disclosure in comparison to 2016 figures. Thus, this project is aligned with the need for better disclosure in the insurance industry.

³⁰ Implementing the Recommendations of the TCFD 2017, <https://www.fsb-tcfid.org/wp-content/uploads/2017/12/FINAL-TCFD-Annex-Amended-121517.pdf>

³¹ GHG Protocol, <https://ghgprotocol.org/standards>

³² TCFD: 2019 Status Report, <https://www.fsb-tcfid.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf>

Appendices



Appendix 1: Common carbon footprinting and exposure metrics

TCFD: Implementing the Recommendations of the Task Force on Climate related Financial Disclosures (June 2017)

Metric	Supporting information	
Weighted Average Carbon Intensity (WACI)	Description	Portfolio's exposure to carbon-intensive companies, expressed in tons CO ₂ e / \$M revenue. <i>Metric recommended by the Task Force.</i>
	Formula	$\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{current portfolio value}} * \frac{\text{issuer's Scope 1 and Scope 2 GHG emissions}_i}{\text{issuer's \$M revenue}_i} \right)$
	Methodology	Unlike the next three metrics, Scope 1 and Scope 2 GHG emissions are allocated based on portfolio weights (the current value of the investment relative to the current portfolio value), rather than the equity ownership approach (as described under methodology for Total Carbon Emissions). Gross values should be used.
	Key points + / -	<ul style="list-style-type: none"> + Metric can be more easily applied across asset classes since it does not rely on equity ownership approach. + The calculation of this metric is fairly simple and easy to communicate to investors. + Metric allows for portfolio decomposition and attribution analysis. - Metric is sensitive to outliers. - Using revenue (instead of physical or other metrics) to normalise the data tends to favour companies with higher pricing levels relative to their peers.
Total carbon emissions	Description	The absolute GHG emissions associated with a portfolio, expressed in tons CO ₂ e
	Formula	$\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{issuer's market capitalization}_i} * \text{issuer's Scope 1 and Scope 2 GHG emissions}_i \right)$
	Methodology	Scope 1 and Scope 2 GHG emissions are allocated to investors based on an equity ownership approach. Under this approach, if an investor owns 5 percent of a company's total market capitalisation, then the investor owns 5 percent of the company as well as 5 percent of the company's GHG (or carbon) emissions. While this metric is generally used for public equities, it can be used for other asset classes by allocating GHG emissions across the total capital structure of the investee (debt and equity).
	Key points + / -	<ul style="list-style-type: none"> + Metric may be used to communicate the carbon footprint of a portfolio consistent with the GHG protocol. + Metric may be used to track changes in GHG emissions in a portfolio. + Metric allows for portfolio decomposition and attribution analysis. - Metric is generally not used to compare portfolios because the data are not normalised. - Changes in underlying companies' market capitalisation can be misinterpreted.

Metric	Supporting information	
Carbon footprint	Description	Total carbon emissions for a portfolio normalised by the market value of the portfolio, expressed in tons CO ₂ e / \$M invested
	Formula	$\frac{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{issuer's market capitalization}_i} * \text{issuer's Scope 1 and Scope 2 GHG emissions}_i \right)}{\text{current portfolio value (\$M)}}$
	Methodology	Scope 1 and Scope 2 GHG emissions are allocated to investors based on an equity ownership approach as described under methodology for Total Carbon Emissions. The current portfolio value is used to normalise the data
	Key points + / -	<ul style="list-style-type: none"> + Metric may be used to compare portfolios to one another and/or to a benchmark. + Using the portfolio market value to normalise data is fairly intuitive to investors. + Metric allows for portfolio decomposition and attribution analysis. - Metric does not take into account differences in the size of companies (e.g. does not consider the carbon efficiency of companies). - Changes in underlying companies' market capitalisation can be misinterpreted
Carbon intensity	Description	Volume of carbon emissions per million dollars of revenue (carbon efficiency of a portfolio), expressed in tons CO ₂ e / \$M revenue
	Formula	$\frac{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{issuer's market capitalization}_i} * \text{issuer's Scope 1 and Scope 2 GHG emissions}_i \right)}{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{issuer's market capitalization}_i} * \text{issuer's \$M revenue}_i \right)}$
	Methodology	Scope 1 and Scope 2 GHG emissions are allocated to investors based on an equity ownership approach as described under methodology for Total Carbon Emissions. The company's (or issuer's) revenue is used to adjust for company size to provide a measurement of the efficiency of output
	Key points + / -	<ul style="list-style-type: none"> + Metric may be used to compare portfolios to one another and/or to a benchmark. + Metric takes into account differences in the size of companies (e.g. considers the carbon efficiency of companies). + Metric allows for portfolio decomposition and attribution analysis. - The calculation of this metric is somewhat complex and may be difficult to communicate. - Changes in underlying companies' market capitalisation can be misinterpreted

Metric	Supporting information	
Exposure to carbon-related assets	Description	The amount or percentage of carbon-related assets ³⁴ in the portfolio, expressed in \$M or percentage of the current portfolio value
	Formula for amount	$\sum \$M \text{ current value of investments in carbon-related assets}$
	Formula for percentage	$\frac{\sum \text{current value of investments in carbon-related assets}}{\text{current portfolio value}} * 100$
	Methodology	This metric focuses on a portfolio's exposure to sectors and industries considered the most GHG emissions intensive. Gross values should be used
	Key points + / -	<ul style="list-style-type: none"> + Metric can be applied across asset classes and does not rely on underlying companies' Scope 1 and Scope 2 GHG emissions. - Metric does not provide information on sectors or industries other than those included in the definition of carbon-related assets (i.e., energy and utilities sectors under the Global Industry Classification Standard excluding water utilities and independent power and renewable electricity producer industries).

Appendix 2: Results of testing methodologies

A number of tests were carried out during the development of the carbon footprinting methodologies described in the paper. In particular the following methods and portfolios were tested:

- A portfolio of property and casualty risks in the manufacturing industry, specifically in the paper and steel sectors, using the general methodology proposed.
- A broad portfolio of property / casualty books, covering both facultative reinsurance and treaty reinsurance portfolios, using the general method. Then separately a special exercise on the energy portfolio, using the general method.
- A real estate property portfolio, from a specific country, using the general method and a portfolio of crop insurance in the agriculture sector in one country, using the industry-specific agriculture method.
- Testing on personal lines business, both in the property and motor insurance portfolios of a couple of different insurers with experimentation beyond the general methods.
- An industrial insurance portfolio was tested based on 3rd party country and sector proxies adjusted for the type of underwriting line, with proximity to the main emissions activity of the client, with feedback provided to the Working Group.

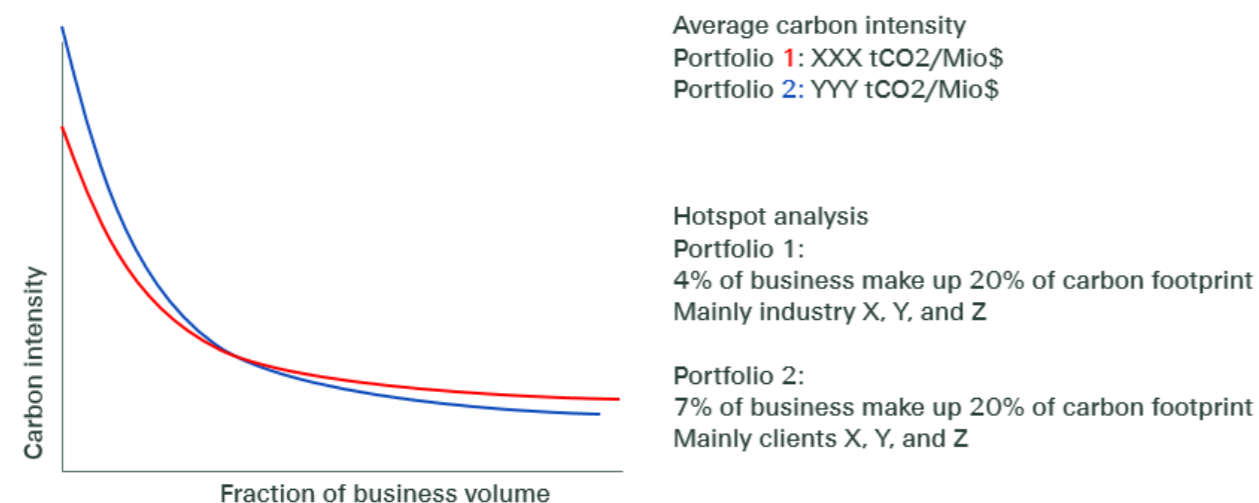
Overall these tests revealed that care must be taken when applying carbon footprinting methodologies to different portfolios, in particular at a specific industry or LOB level. There are significant challenges regarding the availability of both internal and external data. Precise carbon intensities can only be applied in a minority of the overall business volume and therefore assumptions need to be made to address data gaps.

By making certain assumptions to fill in data gaps, the general methodology could be applied across a broad portfolio of insurance property and casualty books. Data assumptions included:

- For some business, industry averages, or even country averages are needed.
- Treaty business is particularly challenging, largely depending on granular risk data.
- Access to own risk exposure data can be improved over time.
- Acquisition of external carbon intensity information can be improved as well.

When using the general methodology, as long as the portfolio you are characterising is large enough, typically the main (re)insurance portfolio of a medium-sized national or regional insurer, it is possible to identify an overall distribution of carbon intensity within the portfolio and carbon intensity hotspots. Not all hotspots can be measured with the highest precision, although the general methodology does give an indication of the most carbon intensive parts of the portfolio.

Chart showing sample results of general methodology testing on two different insurance portfolios



Some of the other challenges revealed by the testing were;

Carbon emissions data gaps: The requirement to develop “work-arounds” involving assumptions and averages to fill data gaps. It was not possible to directly integrate carbon intensity data developed for asset portfolios, which use ISIN codes and match them with policyholder data in the underwriting systems. “Work-arounds” can be developed using industry coding systems, but this tends to only work for small parts of the underwriting portfolio. Even the largest, commercially available, datasets of carbon intensity have only about 10,000 companies in the database and typically only at a holding/parent company level and not subsidiaries. There are typically no private companies in these datasets and even for the listed companies, it is necessary to assume industry average carbon intensities for subsidiaries. For other companies that are not in the databases, it is necessary to make assumptions and allocate industry, or country averages of carbon intensity. This ends up distorting the overall analysis and, in some portfolios, the outcome of the analysis is so skewed by these averages, that it is not meaningful.

Industry and sector data: For some specific carbon-intense sectors, for example the energy sector, it is possible to acquire more detailed and complete carbon emission intensity data than available from the commercial financial services data providers. Specialist energy industry data providers can offer data on individual producing assets (e.g. pipelines, oil fields, refineries etc.) not just at the listed company level, using CO₂ per barrel of oil equivalent (CO₂boe) as a metric. This can allow a more meaningful and granular level of carbon intensity analysis for specific hotspots in an overall underwriting portfolio.

Personal lines property and motor: For personal lines property/housing portfolios it was very difficult to find the data to rank different properties for example energy efficiency or energy usage of individual properties. It was even difficult to obtain average information, such as the area, or size of a property. It will require quite a lot of effort for insurers to change their systems and underwriting data requests, to gather appropriate data from their customers and to analyse the carbon intensity is on an individual level. It is possible, but it will be very time consuming, at least initially, to set up.

For the personal lines motor portfolios, there is a lot more data available, for example; size, or power of an engine, the type of engine (e.g. ICE, hybrid or EV) and km’s travelled. Insurers do have the data and information available on personal lines motor data, to develop a ranking of carbon emissions per policy based on size and type of engine and mileage/kms travelled. The challenge will be to use that data to create the average emissions per capita in a portfolio and to compare that with the market as a whole.

Appendix 3: Proposed approaches for carbon footprinting methodologies tested by industry sector

Appendix 3.1 Energy sector

Tested overall carbon footprinting method:

Method	Description & application
General method in chapter 2: methodology	CO ₂ e intensity per legal entity (Metric for estimation: CO ₂ e intensity per industry (and country) for commercial insurance and CO ₂ e intensity per insured and country for personal lines)

Tested carbon footprint method by LOB (if different from above)

Line of business	Method	Description & application
Agribusiness	Standard	Alternative discussed: CO ₂ e intensity per energy from biomass produced (CO ₂ e per MJ) Reasons for general: Limited data availability Limited materiality
Property	CO ₂ e emissions per kWh, MJ or BOE of asset insured	Reasons for alternative: Materiality given Data availability Limited granularity of standard methodology
Liability	CO ₂ e emissions per kWh, MJ or BOE of asset insured	Reasons for alternative: Materiality given Data availability Limited granularity of standard methodology
Product liability	Standard	
Workers compensation	Standard	Reason for general: Group wide coverage Limited materiality
Construction engineering	CO ₂ e emissions per kWh, MJ or BOE of asset insured, or per MW when operational	Reasons for alternative: Construction enables operation Data availability Limited granularity of standard methodology
Credit and surety	CO ₂ e emissions per kWh, MJ or BOE of underlying energy asset	Reasons for alternative: As per Property and engineering
Cyber	Standard	Reason for general: Group wide coverage Limited materiality
D&O	Standard	Reason for general: Group wide coverage Limited materiality
Financial lines	Standard	

Line of business	Method	Description & application
Marine	Cargo: standard Hull: CO ₂ e emissions per kWh, MJ or BOE of asset insured	Reason for general: Limited data availability
P&I	Standard	
Aviation	Cargo: standard Hull: not relevant	
Life pensions	Standard	
Health	Standard	
Life protection	Standard	
Machinery breakdown	CO ₂ e emissions per kWh, MJ or BOE of asset insured	
Environmental liability	Standard	
Business continuity	CO ₂ e emissions per kWh, MJ or BOE of asset insured	
Transportation (consolidation of different lines of business: marine, land and aviation)	Standard	

Appendix 3.2 Agriculture sector

Tested overall carbon footprinting method:

Method	Description & application
General	As per chapter 2: methodology
Agriculture method*	CO₂e³³ intensity per number of hectare/acre/sq. km <i>Metric for estimation:</i> Total emissions of CO ₂ e from agriculture and land-use change and forestry sectors (AFOLU as per IPCC) per country ³⁴ over total agricultural land per country ³⁵
Yield method (arable farming only)*	CO₂e intensity per kg crop yield <i>Metric for estimation:</i> Total emissions of CO ₂ e equivalent from agriculture and land-use change and forestry sectors (AFOLU as per IPCC) per country over agriculture output per country ³⁶
Livestock method (livestock only)*	CO₂e intensity per number of animals³⁷ <i>Metric for estimation:</i> Total emissions of CO ₂ e from agriculture and land-use change and forestry sectors (AFOLU as per IPCC) per country over total number of animals per country ³⁸

*Depending on arable farming or livestock farming, the method can be different

³³ Main gases on agricultural activity are CH₄ and N₂O. For Land-use change and Forestry, CO₂ is the key driver.

³⁴ Data publicly available on <https://www.climatewatchdata.org/ghg-emissions> from CAIT or UNFCCC databases

³⁵ Data publicly available on <https://data.worldbank.org/indicator/AG.LND.AGRI.K2>

³⁶ Data publicly available on <https://data.oecd.org/agroutput/crop-production.htm>

³⁷ Recommended to only include Cattle, Sheep, Buffalo and Goat animals due to its high emission intensity <https://www.climatewatchdata.org/sectors/agriculture?emissionType=34&filter=#drivers-of-emissions>

³⁸ Data publicly available on <http://www.fao.org/faostat/en/#data/QA>

Tested carbon footprint method by LOB (if different from above)

Line of business	Method	Description & application
Agribusiness	Agriculture, livestock or yield method	e.g. Arable and livestock farms.
Property	Agriculture, livestock or yield method	e.g. Farm buildings, contents, agricultural vehicles.
Liability	Agriculture, livestock or yield method	e.g. Damage to the environment or injury to others while at premises.
Product liability	Agriculture, livestock or yield method	e.g. Damage to others due to the farming product.
Workers compensation	Agriculture, livestock or yield method	e.g. Due to machinery/ vehicle accident, exposure to harmful substances or conditions.
Construction engineering	General	
Credit and surety	General	
Cyber	General	
D&O	General	
Financial lines	General	
Marine	General	
P&I	General	
Aviation	General	
Marine (hull)	General	
Marine (cargo)	General	
Life pensions	General	
Life protection	General	

Appendix 3.3 Manufacturing sector**Tested overall carbon footprinting method:**

Method	Description & application
General as per chapter 2: methodology	CO ₂ e intensity per legal entity
GDP method (for clients for which the insurer has limited exposure or for clients for which the standard metric is not available)	CO ₂ e intensity per amount of GDP

Tested carbon footprint method by LOB (if different from above)

Line of business	Method	Description & application
Agribusiness	Potentially limited relevance to manufacturing sector, so GDP method <ul style="list-style-type: none"> If the client is appropriately classified to the industry (i.e. manufacturer of machinery for agriculture classified as manufacturing company), this LOB may not be relevant. 	As above
Property	General method (relevant LOB for carbon emissions exposure)	As above - subject to availability
Liability	General (relevant LOB for carbon emissions exposure)	As above - subject to availability
Product liability	General (relevant LOB for carbon emissions exposure)	As above - subject to availability
Workers compensation	General (relevant LOB for carbon emissions exposure)	As above - subject to availability
Construction engineering	General (relevant LOB for carbon emissions exposure)	As above - subject to availability
Credit and surety	Dependent on exposure, General (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
Cyber	Dependent on exposure, General (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
D&O	Dependent on exposure, General (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
Financial lines	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
P&I	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
Aviation	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above - subject to availability
Marine (hull)	n/a	As above
Marine (cargo)	n/a	As above
Life pensions	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
Life protection	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above
Health	Dependent on exposure, general (if relevant LOB for carbon emissions exposure). Alternatively, if there is limited exposure, GDP method	As above

