Carbon Impact Analytics

How to measure the contribution of a portfolio to the energy and climate transition

Methodological guide for investors and asset managers

Version 2 – September 2018

carbon impact analytics

carbone 4

INTRODUCTION

In a world transitioning to a low-carbon economy, it is crucial that investors and asset managers be equipped with strategies and tools to select the financial assets most likely to thrive. Carbon Impact Analytics is a response to this pressing yet unfulfilled need.

This methodology was developed by Carbone 4 in collaboration with Mirova, Natixis Asset Management subsidiary dedicated to responsible investment. MAIF, a mutual insurance company, is also an early sponsor of the methodology.
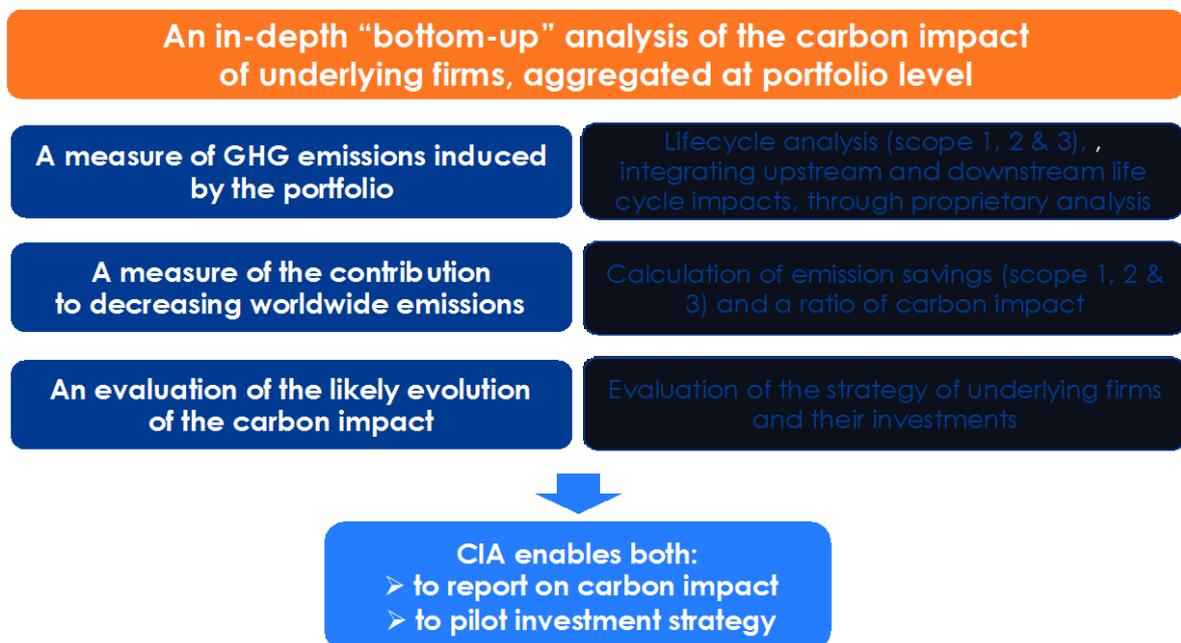
Carbon Impact Analytics (CIA) intends to measure and compare the contribution of financial assets and portfolios to the low-carbon economy.

This guide details the methodological principles of Carbon Impact Analytics. It is aimed at portfolio managers and asset owners interested in implementing Carbon Impact Analytics, and more broadly, to anyone seeking details on the methodology.

EXECUTIVE SUMMARY

CARBON IMPACT ANALYTICS: AN INNOVATIVE METHODOLOGY TO MEASURE THE CLIMATE CHANGE IMPACT OF AN INVESTMENT PORTFOLIO

For an investor, measuring financial assets' climate change impact is a necessary step in building portfolios which contribute to the shift to a low carbon economy, both for limiting carbon risks and seizing low carbon opportunities. Hence Carbone 4, in collaboration with Mirova, has developed an innovative methodology that goes beyond carbon footprinting. Carbon Impact Analytics provides asset managers with an in-depth, "bottom-up," analysis of the carbon impact of a portfolio and its underlying firms, as illustrated below.

An in-depth "bottom-up" analysis of the carbon impact of underlying firms, aggregated at portfolio level

A measure of GHG emissions induced by the portfolio	Lifecycle analysis (scope 1, 2 & 3), , integrating upstream and downstream life cycle impacts, through proprietary analysis
A measure of the contribution to decreasing worldwide emissions	Calculation of emission savings (scope 1, 2 & 3) and a ratio of carbon impact
An evaluation of the likely evolution of the carbon impact	Evaluation of the strategy of underlying firms and their investments

CIA enables both:
➢ to report on carbon impact
➢ to pilot investment strategy

In this second version, Carbon Impact Analytics is designed to cover stocks and bonds of any listed company (even those not reporting their carbon footprint), sovereign bonds and green bonds.

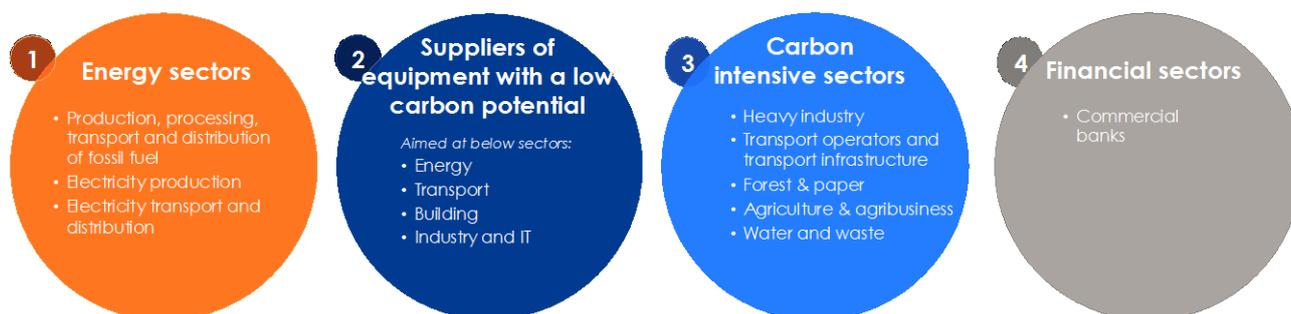# CORE METHODOLOGICAL PRINCIPLES OF CARBON IMPACT ANALYTICS

"Bottom-up" analysis

The analysis of the carbon impact of a portfolio begins with an in-depth assessment of each underlying firm, followed by aggregation at the portfolio level. This allows for differentiation between companies in the same business sector, and enables recognition of companies' efforts in integrating climate and energy-related issues in their strategic decisions and reporting.

Sectorial approach with specific insights for "high stakes" sectors

Challenges regarding the low-carbon transition vary depending on the characteristics of each economic sector. Therefore, Carbon Impact Analytics differentiates "high stakes" and "low stakes" sectors, and provides specific insights for "high stakes" sectors with tailored calculation principles for each sector.

"High stakes" sectors for which a detailed Carbon Impact analysis is performed are detailed below:

1 Energy sectors
- Production, processing, transport and distribution of fossil fuel
- Electricity production
- Electricity transport and distribution

2 Suppliers of equipment with a low carbon potential
Aimed at below sectors:
- Energy
- Transport
- Building
- Industry and IT

3 Carbon intensive sectors
- Heavy industry
- Transport operators and transport infrastructure
- Forest & paper
- Agriculture & agribusiness
- Water and waste

4 Financial sectors
- Commercial banks

Aggregation at portfolio level eliminates emissions double-counting

Double-counting of GHG emissions arises when the same ton of GHG emissions is counted more than once within a portfolio due to the aggregation of companies' indirect emissions within the same value chain. While consolidating the carbon impact of a portfolio, Carbon Impact Analytics reprocesses results (both induced and emissions savings) to eliminate most double-counting.

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A methodology and a tool developed by Carbone 4

1 CONTEXT AND OBJECTIVES OF CARBON IMPACT ANALYTICS

1.1 FINANCING A LOW-CARBON ECONOMY

Since the first IPCC report in 1990, scientific research has continued to support the importance of reacting to anthropogenic climate change and its potentially vast and adverse impacts, both societal and environmental. The need for a transition to a low-carbon economy has become increasingly evident and agreed upon by business leaders, political executives, and the general population. Achieving a rapid and successful transition, however, relies on a great need for "green" infrastructures, a reduction of current energy consumption, development of energy efficient solutions, and a radical change of the energy mix, especially through decreasing fossil fuel dependence in favour of low-carbon energy sources.

The financial industry can see these challenges from three perspectives: the economic case, the financial case, and the moral case. From an economic point of view, climate change will have major consequences on companies. From a strictly financial perspective, potential regulation of carbon threatens the value of portfolios. From a moral viewpoint, as economic actors and stakeholders in society, the financial industry has a responsibility to do its best to meet the challenge of climate change. All three contribute to a global motivation capable of inducing concrete action.

Even if the financing of a low-carbon economy remains insufficient, various financial players have already implemented strategies to face this issue. To illustrate, the International Climate Summit, which took place on September 23, 2014, led to two initiatives:

- The Montreal Carbon Pledge gathers more than 50 signatories as of June 2015, who commit to measure and publicly disclose the carbon footprint of their investment portfolios annually.
- The Portfolio Decarbonisation Coalition goes one step further: a coalition of institutional investors has committed to decarbonising US$100 billion in equity investments by December 2015. The first measure will be to disclose the carbon footprint of their portfolios, for which the Montreal Carbon Pledge will be a platform.

Implementing these strategies implies the need for carbon footprint assessments, as well as another set of indicators as explained below.

1.2 CARBON FOOTPRINT ASSESSMENT

1.2.1.1.1 CARBON FOOTPRINT: A COMPLEX SUBJECT

Measuring the carbon footprint of a portfolio is a complex issue; it can imply different scopes of analysis and / or different timeframes, as mapped in the figure below:

Carbon Impact Analytics has been developed with the aim of deepening the analysis offered by existing methodologies and answering to the following needs of asset managers:

- Measure greenhouse gas (GHG) emissions induced by investments on the complete scope of underlying firms' impact
- Measure how underlying firms are contributing to and / or compatible with decreasing worldwide carbon emissions
- Evaluate how the carbon impact of underlying firms will evolve in the coming years
- Enable reporting on the carbon impact of portfolios and piloting of investment strategy

1.2.1.1.2 A DEEPENED MEASURE OF INDUCED EMISSIONS

In order to have a complete and comparable picture of induced emissions by underlying firms, it is necessary to measure both direct and indirect emissions of these firms throughout their whole supply chain, as illustrated by scopes 1, 2 and 3 (both upstream and downstream) shown in the picture below.

Carbon footprint

Scope 1 : direct emissions   ● Scope 2 : indirect emissions   ● Scope 3 : indirect emissions
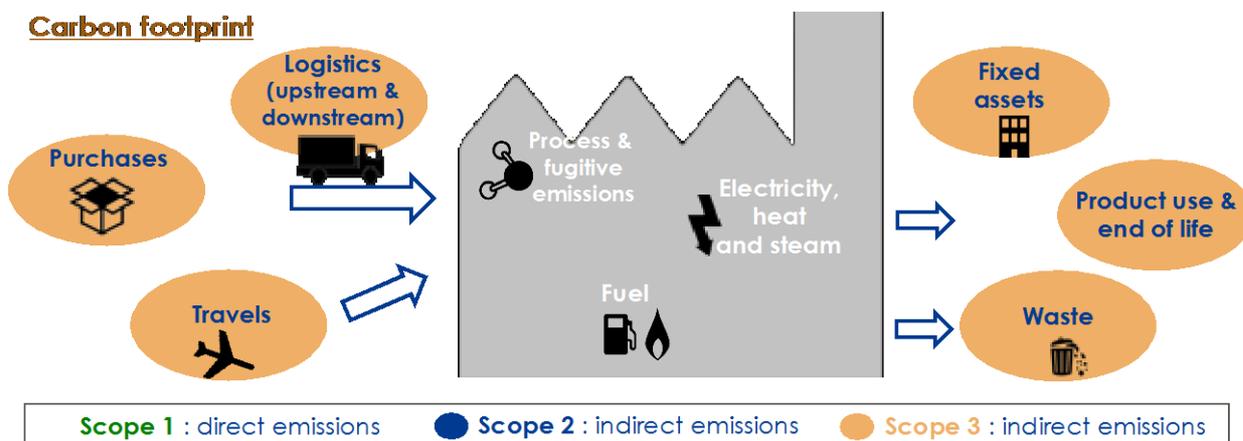
For most firms, the majority (typically 80%) of greenhouse gas emissions are indirect emissions, attributable to purchases and eventual use of products sold. As a result, limiting the assessment of carbon emissions generated by a portfolio to scopes 1 and 2 often leads to misleading conclusions in understanding an activity's true dependence on fossil fuels.

When looking solely at scope 1 and 2 emissions, the impact of an oil company, for example, would be reduced to the carbon issued during oil extraction and refining. Similarly narrowing the scope of carbon impact for a producer of insulating material for refurbishment, for instance, will not account for the product's lifetime reduction of GHG emissions. Such methodologies, too limited in scope, lead to the conclusion that the highest risk in a low carbon world lies with specific carbon-intensive sectors, cement makers for example, while some other sectors – such as media and banks – are inherently compatible with a low carbon world. Real leverage seems possible in sectors responsible for releasing significant carbon emissions, which represents an opportunity for the climate transition.

To be consistent with financing a low-carbon economy, it is necessary to take into account induced emissions on the whole scope of impact of underlying firms, including scope 1, scope 2, and scope 3 emissions, both downstream and upstream.

1.2.1.1.3 A MEASURE OF EMISSION SAVINGS, REDUCED EMISSIONS AND REDUCED EMISSIONS

To evaluate the alignment of an investment portfolio with the low-carbon transition, an additional indicator is necessary, complementary to the carbon footprint. A firm in a highly carbon intensive sector could contribute significantly to decreasing emissions, perhaps by creating a disruptive product or process. The additional indicator should therefore generate understanding of how an underlying firm is disrupting its sector, either through more efficient processes or through carbon-efficient products or services.

The largest share of CO_2 emissions mitigation will come from today's most GHG-intensive sectors: buildings, transport, industry, and power, as shown in the following chart from the IEA[1]:

Global CO2 reductions between 6DS and 2DS by sector
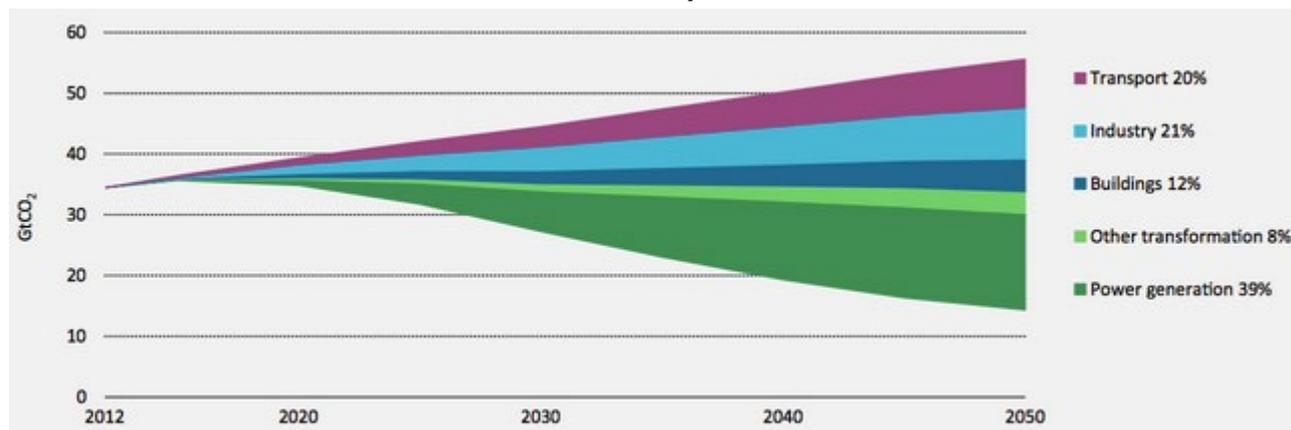
Figure 1.8, ETP 2015, IEA. Key point: Reduction efforts are needed on both the supply and end-use sides; focusing on only one does not deliver the 2DS.

Consequently, in addition to the absolute figure of induced or emissions savings, the extent to which a firm reduces GHG emissions relative to total GHG emitted is very important; this ratio measures the carbon performance of the firm.

1.2.1.1.4 A FORWARD-LOOKING ANALYSIS AND A OVERALL RATING TO ASSESS THE CONTRIBUTION TO THE ENERGY TRANSITION

Carbon emissions measures only give an present viewpoint of a firm's carbon impact, whereas financial analysis requires a more forward-looking evaluation of carbon impact. Such an evaluation includes an analysis of investments and R&D expenditures that will contribute to decrease carbon emissions, as well as an analysis of the firm's positioning and strategy regarding the low-carbon transition. The targets of emission reduction must also be taken into account. A progress indicator would allow analysts to project how induced and emission savings of the firm will evolve in the coming years.

Finally, a overall rating is needed for each company, to assess its impact on climate change and contribution in GHG emissions reduction, taking into account induced emissions, emission savings and the forward-looking analysis.

1.2.1.1.5 A METHODOLOGY THAT ENABLES BOTH TO REPORT AND TO PILOT INVESTMENT STRATEGY

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[1] ETP 2015, IEA

On one hand, asset managers and owners need easy-to-read and easy-to-understand indicators, fit for use in external communications. They need indicators which allow them to honour their engagements, most notably those to the Montreal Carbon Pledge and the Portfolio Decarbonisation Coalition.

On the other hand, asset managers and owners who want to reduce carbon risks and capture low-carbon opportunities also require indicators to guide their investment choices using carbon impact criteria.

2 CARBON IMPACT ANALYTICS CORE PRINCIPLES AND RESULTS

Carbon Impact Analytics is:

- a guidance tool to manage the carbon impact of investment portfolios
- a calculation tool to measure and report on the carbon impact of portfolios

It provides asset managers with a methodology to assess the carbon impact (positive or negative) of their portfolios and to assess how their portfolios contribute to the low-carbon economy transition.

This version of Carbon Impact Analytics is directly applicable to portfolios of listed companies' stocks and bonds, green bonds and sovereign bonds.

2.1 KEY INDICATORS OF CARBON IMPACT ANALYTICS

Carbon Impact Analytics focuses on the following set of indicators:

Investment decision support indicators and reporting indicators
At company level
• Induced emissions and emissions savings at company level • CIR : Carbon Impact Ratio
• Forward-looking qualitative rating • Transparency and quality of reporting
• Global assessment of the contribution to climate change
At portfolio level
• Charts of sectorial distribution of induced and emissions savings
• Total induced and emissions savings at portfolio level
• Distribution of qualitative ratings in each sector and in the portfolio

This set of indicators provides a comprehensive overview of:
1. carbon risks
2. contribution to the low carbon transition
3. the future carbon impact trend

2.1.1   Induced emissions

Induced emissions are emissions actually emitted by a firm within the relevant scope for the assessment (typically, it is comprised of all emissions tabulated over all three scopes, not just scopes 1 and 2). Induced emissions are annual emissions due to the activity of the company over one year and include both direct and indirect emissions.

Conceptually, induced emissions are similar to what is commonly called the *carbon footprint*.

2.1.2   Emissions savings

Emissions savings are those not actually emitted by the activities of the firm or its products sold, within the same scope as induced emissions. When applicable, it is measured as compared to a reference case (when the reference case is less favourable) or is due to improvement in operations' carbon intensity. This is illustrated in the figure below:
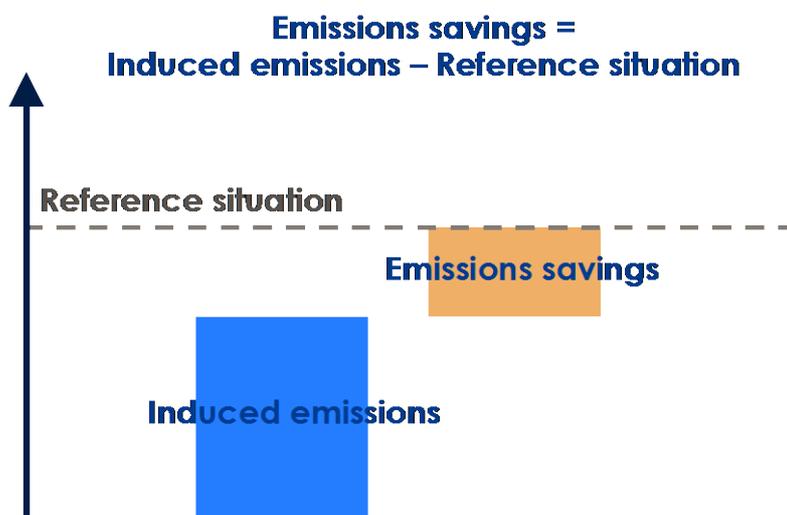
The calculation of emissions savings is defined on a case-by-case basis for each sub-sector (see sectoral guidance for details on reference scenarios). Emissions savings are annual emissions due to the activity of the company over one year.

The "emissions savings" concept is widely used to measure the carbon impact of project finance, and directly derived from the methodologies that were used in the Clean Development Mechanisms of the Kyoto Protocol. In particular, all major International Financial Institutions are reporting their carbon impact thanks to a measure of carbon emissions savings.

Emissions savings vs. induced emissions

Emissions savings are "virtual" emissions: emissions which would exist unless the company had actively made an effort to decrease them. Induced emissions already take this decrease into account as compared to the reference scenario. Therefore, subtracting emissions savings from induced would entail double-counting of these "negative emissions".

As a result, emissions savings cannot be subtracted from induced emissions.

2.1.3   Carbon Impact Ratio

The carbon impact ratio is the ratio of emissions savings to induced emissions. It is an easy-to-read indicator of the carbon impact of a company, and enables comparison between the carbon impact of a company and the impacts of its sectorial peers.

$$\text{Carbon impact ratio of a company} = \frac{\text{Emission savings (tCO}_2\text{e)}}{\text{Induced emissions (tCO}_2\text{e)}}$$

In particular, the carbon impact ratio enables the identification of companies which have significantly improved the carbon-efficiency of their operations, as well as companies that sell products and solutions leading to GHG emissions reduction over their lifetime.

When this ratio is zero, it means that a given company has no emissions savings whatsoever. If the ratio equals ten, it indicates that the company's emissions savings in the global economy represent ten times the emissions induced by the activity of the company (on scopes 1, 2, and 3). The Carbon Impact Ratio of a company will increase if emissions savings increase or if induced emissions decrease.

The Carbon Impact Ratio therefore represents the capacity of an actor to reduce GHG emissions as compared to the emissions generated by its activity and products. Furthermore, the Carbon Impact Ratio is an easy-to-read indicator of the carbon

performance of a company, and enables comparison between the carbon impact of a company and that of its sectorial peers.

2.1.4 Qualitative indicator of forward-looking trend

Evaluating the forward-looking trend of induced and emissions savings requires analysis of investments and R&D expenditures which will contribute to decreasing carbon emissions in the future, as well as analysis of the firm's positioning and strategy regarding the low-carbon transition. Given that the vast majority of firms do not directly report on the share of their investments and R&D expenditures that contribute to decreasing GHG emissions, this metric is obtained through a qualitative indicator.

2.1.5 A overall rating to assess the contribution to the energy transition

Finally, a overall rating is provided for each company. This rating seeks to assess the company's impact on climate change and its contribution to reduced GHG emissions, while taking into account induced emissions, emissions savings and the forward-looking analysis.

2.2 LOW-CARBON "BOTTOM-UP" APPROACH

The methodology is based on a bottom-up approach, with a methodology specifically tailored to evaluate the carbon impact of companies within each sector of activity. As a result, the method takes into account both the carbon stakes of each sector and the activity data – physical and financial – made public by companies.

The chosen approach allows for differentiation between companies in the same business sector, and enables the recognition of companies' efforts in integrating climate and energy related issues in their strategic decisions and reporting.

Finally, Carbon Impact Analytics can be applied to stocks and bonds of any listed company, even those that do not report their carbon footprint; the methodology is based in the economic and climate data disclosed by companies. In order to make the methodology applicable to as many organisations as possible, an extensive review was conducted prior to shaping the calculation principles, covering the published data and calculated indicators by companies from each business sector. As a result, Carbon Impact Analytics does not rely solely on the carbon reporting of firms. This is a major advantage of the methodology, as carbon reporting does not yet cover all listed companies, and computational methodologies tend to diverge significantly between sectors. Carbon Impact Analytics has been designed to facilitate dialog with companies in order to help

improve their reporting (and, consequently, the quality of CIA analysis) over time. It is partly for this reason that the methodology relies on activity data that is often disclosed by companies, but CIA methodology could also be directly implemented by companies who would then disclose their induced and emissions savings.
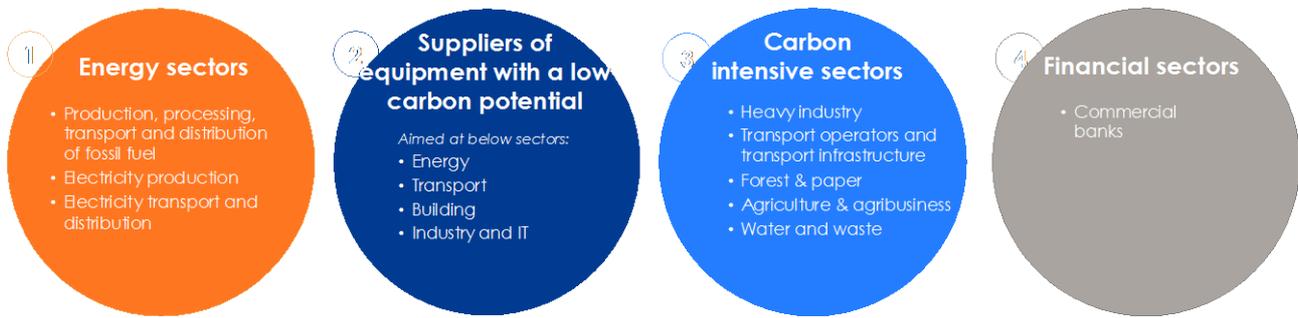
2.3 SECTORIAL DIFFERENTIATION

The level of "carbon challenge" varies depending on the characteristics of each economic sector. Being aligned with the low-carbon transition, for instance, does not necessarily require the same efforts to be made by an energy producer, a cement manufacturer, or a company which creates highly energy efficient motors. Moreover, carbon issues affect some sectors far more than others. Consequently, Carbon Impact Analytics has created sector-specific calculation principles.

First, the methodology divides sectors into two categories, largely based on the importance of the energy and climate transition in their business:

- A detailed analysis is performed for all companies with "high stakes" in the energy and climate transition (energy, building, transport, etc.), including assessment of their induced and emissions savings, carbon impact ratio, and a qualitative rating.

- A simplified analysis is performed for companies in "low-stakes" sectors regarding the energy and climate transition (pharmaceuticals, tertiary sectors etc.), which represent a low share in global GHG emissions. For these companies, the methodology focuses on scope 1+2 emissions reported by companies. Scope 3 emissions, which are rarely published by companies and are calculated on disparate perimeters, are not taken into account.

Next, the main sources of induced and emissions savings are identified for all "high stakes" sectors." "High stakes" sectors are grouped into four main categories, each of which is an aggregate of similar sub-sectors. These four categories then present very specific challenges regarding the energy and climate transition:

- **Energy sectors:** the most pertinent challenge of energy companies is to diversify their energy mix, favouring more low-carbon sources, and reduction of direct emissions.
- **Suppliers of equipment with a low-carbon potential:** the challenge of these companies is to innovate, and to make these innovations available on the market.
- **Carbon intensive sectors:** the challenge of these companies is to reach "climate operational performance" by implementing energy-efficient and low-carbon solutions.
- **Financial sector:** the challenge of these companies is to reallocate the capital from carbon intensive assets to assets contributing to the low carbon transition.

① Energy sectors
- Production, processing, transport and distribution of fossil fuel
- Electricity production
- Electricity transport and distribution

② Suppliers of equipment with a low carbon potential
Aimed at below sectors:
- Energy
- Transport
- Building
- Industry and IT

③ Carbon intensive sectors
- Heavy industry
- Transport operators and transport infrastructure
- Forest & paper
- Agriculture & agribusiness
- Water and waste

④ Financial sectors
- Commercial banks

For each of four sectors, Carbon Impact Analytics methodology first defines which scopes are relevant, in terms of both emissions and levers of action. Financed and emissions savings are therefore computed on a specific perimeter for each sector, with potential inclusion of emissions related to internal, upstream and downstream activities (scopes 1, 2 and 3).

The selection of "high stakes" sectors depends largely on their overall share of global emissions, as well as an awareness of their activity's impact on GHG emissions (indirect impacts, in particular). This list of sectors is likely to evolve in future versions.

2.3.1   Sectorial classification

The following represents how sectors are classified into the 3 relevant calculation categories:

"High stakes" categories regarding the low-carbon transition	Sectors	Sub-sectors
Category 1: Energy sector	**Fossil fuels**	Oil, gas and coal industry
	Electricity	Electricity industry
Category 2: Providers of efficient solutions	**Buildings**	Buildings: construction of new buildings and suppliers of energy efficient equipment (hvac, insulation, etc.)
	Energy	Energy : suppliers of equipment and solutions for the energy sector (electricity and fossil)

	Transport	Transport: suppliers of energy efficient transport equipment and construction of transport infrastructure	
	Industry	Industry and IT: suppliers of energy efficient equipment and solutions	
Category 3: Energy and greenhouse gas intensive sectors	**Heavy industry**	Cement and clinker production Steel production Aluminium production Plastics production Chemicals production Glass production Sugar production	
	Forest & paper	Forest and wood products Paper production	
	Transport	Transport operators Transport infrastructure operators	
	Building	Buildings: real estate managers and owners	
	Agriculture	Agriculture, fisheries, food-processing and fertilizer industry	
Category 4: Financial sector	**Banks**	Commercial banks	

The three "high stakes" categories have been subdivided into sectors and sub-sectors *(see the table above)*, all of which have been identified as highly significant throughout the low-carbon transition.

As a result, the energy and climate challenges faced by each of these sub-sectors have been studied in detail. Within agriculture, for example, challenges will be largely related to methane (CH_4) and nitrous oxide (N_2O) emissions reduction, and for the building sector, a main focus will be extended promotion of more efficient heating and insulation. Adopting a sectorial approach brings an informed view to the energy transition's key issues.

Calculation principles are thus different for each sector, while core principles remain common.

As previously mentioned, industries facing lower stakes are not analysed in detail during this first level of the methodology, and are instead taken into account in the final aggregation at portfolio level. Because the issues are far less contextually significant for this set, only the scope 1 and 2 emissions are aggregated in the calculation of portfolio's induced emissions.

Unlike other sectorial classifications, the Carbon Impact Analytics does not require allocation of a firm or a group to a unique sub-sector. On the contrary, activities of a group are broken down into various activity segments, each corresponding to one CIA sub-sector.

2.3.2   Focus on significant sources of emissions

Major sources of emissions were identified for each sector and sub-sector, and Carbon Impact Analytics focuses on evaluating these emissions. Therefore, the calculation methodology is specific to each sector and accounts for its key attributes. Indirect upstream and downstream emissions are taken into account whenever they represent a significant share of emissions and represent mitigation opportunities for a sector, such as the emissions induced by deforestation in the wood and paper industries.

According to the same logic, major mitigation levers were identified for each of the sub-sectors covered in detail by CIA. The calculation methodology which underlies the quantification of emissions savings therefore also depends on the specifics of each sector.

3 CARBON IMPACT ANALYTICS FOR CORPORATE SECURITIES

The following section details how to implement Carbon Impact Analytics for asset managers and owners, focusing on corporates analyses. The analysis process is broken down into two main phases: the bottom-up analysis of underlying companies, carried out by Carbon4 Finance and the portfolio-level aggregation of results.

3.1 BOTTOM-UP COMPANY ANALYSIS

3.1.1   Step 1: Distribution of the company's activities between CIA sub-sectors

Since the majority of companies operate in more than one business sector, it is necessary to decide in which of the CIA sub-sectors the company is active. Therefore, the first step is to distribute each company's activities between the sub-sectors per the Carbon Impact Analytics sub-sectorial split. The analysis provides insight into both detailed activity reporting and group reporting in order to use the most precise activity data possible.

3.1.2   Step 2: Calculation of induced emissions and emissions savings for each activity of the firm

Induced emissions and emissions savings are then calculated for each activity of the company, depending on sectorial principles. For activities not included in the sub-sectors covered by Carbon Impact Analytics, the analysis requires collection of disclosed scope 1 and 2 emissions (or a proxy of the carbon footprint based on sectorial GHG intensities). For all activities included in the sub-sectors (i.e. typically 40 to 50% of assets in a portfolio) the analysis provides insight into detailed business and financial data in order to compute indicators specific to Carbon Impact Analytics.

3.1.3   Step 3: Aggregation of results at company level

- **AGGREGATION OF QUANTITATIVE INDICATORS**

The quantitative indicators are:

- absolute induced carbon emissions: the sum of all induced emissions by the different activities of the firm
- absolute carbon emissions savings: the sum of all emissions savings by the activities of the firm
- the Carbon Impact Ratio (CIR): the ratio of total emissions savings to total induced emissions

These quantitative indicators represent a company's carbon impact level throughout the previous year and are thus calculated at the company level.

3.1.4   Step 4: Qualitative assessment of future carbon impact trend of the company

The qualitative rating assesses the likely evolution of company's carbon impact over the coming years and is again evaluated at the company level, taking all activities into account.

The qualitative rating is based on the evaluation of:
- o The company's low-carbon capital expenditures and low-carbon research and development expenses (CAPEX and R&D)
- o The strategy and positioning of the firm regarding the low-carbon transition
- o The greenhouse gas emissions reduction targets of the firm

This evaluation is synthetized in a rating (++ to -- scale), under these guidelines:

- **Rating ++**: The company has integrated the fight against climate change as a key element of its strategy and has ambitious goals to address climate change. The share of sales in line with the challenges of climate change is likely increase in the coming years. The company's investments and R&D policy are aligned with the challenges of climate change. The greenhouse gas emissions reduction targets are really ambitious.
- **Rating +**: The company has integrated the fight against climate change as an important element of its strategy. The company integrates the challenges of the transition in its investments and R&D policy, without it representing the majority of these expenditures.
- **Rating -**: The company's strategy regarding climate change lacks ambition. The share of sales in line with the challenges of climate change is low and not expected to increase in the coming years. The challenges of the climate transition are a factor taken into account to a limited extent in investments and R&D policy of the company.
- **Rating --:** The company is carbon-intensive and has not integrated the climate change awareness as an important element of its strategy. The share of sales in line with the challenges of climate change is typically less than 5%, and there is no evidence that this share will increase in the future. The company has not incorporated the challenges of transition in its investments and R&D policy.

In addition, the company's reporting quality and transparency is also evaluated to indicate the relative precision of the quantitative indicators and to open pathways for dialogue and engagement. This evaluation is not taken into account in the overall rating of the carbon performance of the company

3.1.5 Step 5: Overall rating of the carbon performance of the company

Finally, once the quantitative and qualitative indicators have been computed, Carbon Impact Analytics offers a overall rating of the firm's carbon performance. This overall rating is based on:

- an intrinsic evaluation of the carbon performance of the firm, consisting of the quantitative and qualitative assessments;
- an assessment of a firm's relative carbon performance, using performances of firms in the same business sector as the benchmark.

The overall rating is thus a qualitative measure which builds on the knowledge of companies' carbon performance by sector. It further enables asset managers to easily understand and assess the carbon performance of a particular firm and compare it to others'.

The overall rating is defined as follows:

- o **High contribution to the climate transition:** Companies who contribute extensively to global GHG emissions reduction, either through the low carbon intensity of their operations or through the efficiency of products and services they offer.
- o **Significant contribution to the climate transition:** Companies who contribute to reducing GHG emissions, either because a substantial part (but not the main part) of their products and services enables GHG emissions reduction, or through a moderate decrease in the carbon intensity of their operations.
- **Low contribution to the climate transition:** Companies whose products and operations present neither significant opportunities nor significant risks to the climate transition and/or companies for which the impact is not evaluated due to lack of knowledge.
- **Negative contribution to the climate transition:** Companies whose operations and/or products have a significant impact on climate change and whose investments to transform its current business model into a more sustainable one are absent or insufficient.
- **Incompatible with the climate transition:** Companies whose operations and/or products have a highly significant impact on climate change and current business model is incompatible with the climate transition.

Companies in the "low stakes" sectors are classified as "neutral":

- **Neutral contribution to the climate transition:** Companies whose products and operations present neither significant opportunities nor significant risks to the climate transition and/or companies for which the impact is not evaluated due to lack of knowledge.

3.2 PORTFOLIO ANALYSIS

Once the analysis has been conducted for each underlying company included in the portfolio, indicators can be aggregated to obtain key results at the portfolio level.

3.2.1 Aggregation principles

▪ **AGGREGATION PRINCIPLES FOR QUANTITATIVE INDICATORS**

This paragraph details how Carbon Impact Analytics aggregates companies' results to provide quantitative portfolio-level indicators.

Eliminating carbon emissions double-counting

Double-counting of emissions takes place when the same ton of GHG emissions is counted more than once within a portfolio, typically due to compilation of indirect induced and emissions savings within the same value chain. For example, GHG emitted by a truck's fuel combustion is taken into account as a direct emission for the company operating the truck, as an indirect emission for the company producing the fuel, and as an indirect emission for the company that manufactured the truck. In this example, if all 3 companies are included in the portfolio (the freight company, the truck manufacturer and the energy supplier), induced emissions coming from fuel combustion in the truck's engine will be taken into account three times. Addressing double-counting is therefore a crucial issue in the Carbon Impact Analytics methodology.

Double-counting tends to occur between three categories of actors in the value chain:

- energy suppliers (the oil company providing fuel in the above example)
- energy and carbon intensive companies (the company operating the truck in the above example)
- companies providing equipment and solutions (the truck manufacturer in the above example)

Therefore, the Carbon Impact Analytics methodology reprocesses total figures of GHG emissions by allocating one third of the emissions of each category (see figure below). Both induced emissions and emissions savings are treated reprocessed in this fashion, thereby eliminating most double-counting at the portfolio level.

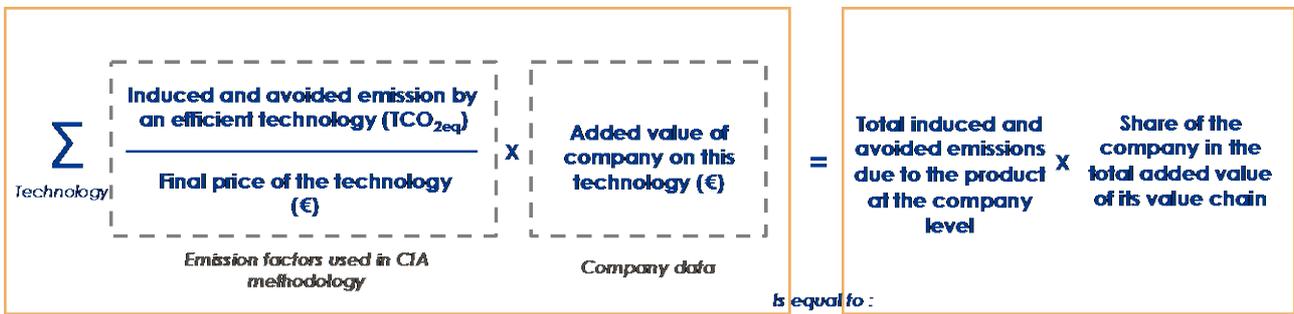The following figure describes how CIA resolves the issue of double-counting:
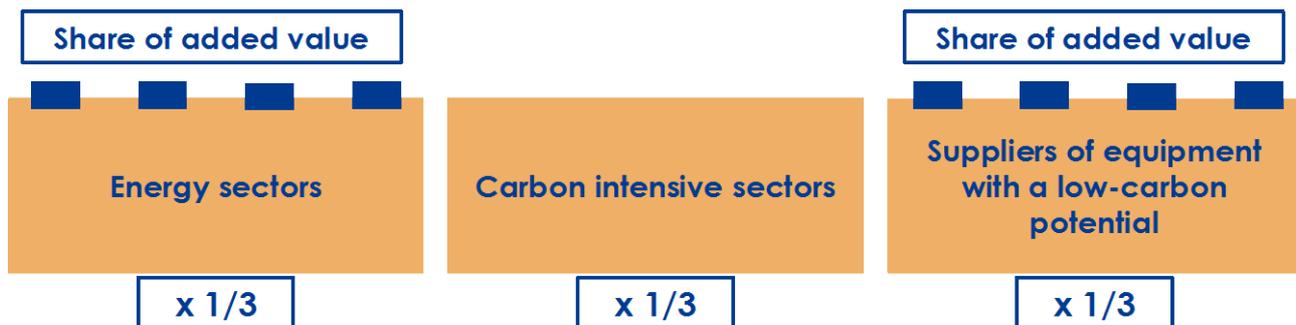
Double-counting can also appear within the categories of actors identified above, but the methodology is designed to further limit double-counting by allocating indirect emissions to actors within the same value chain.
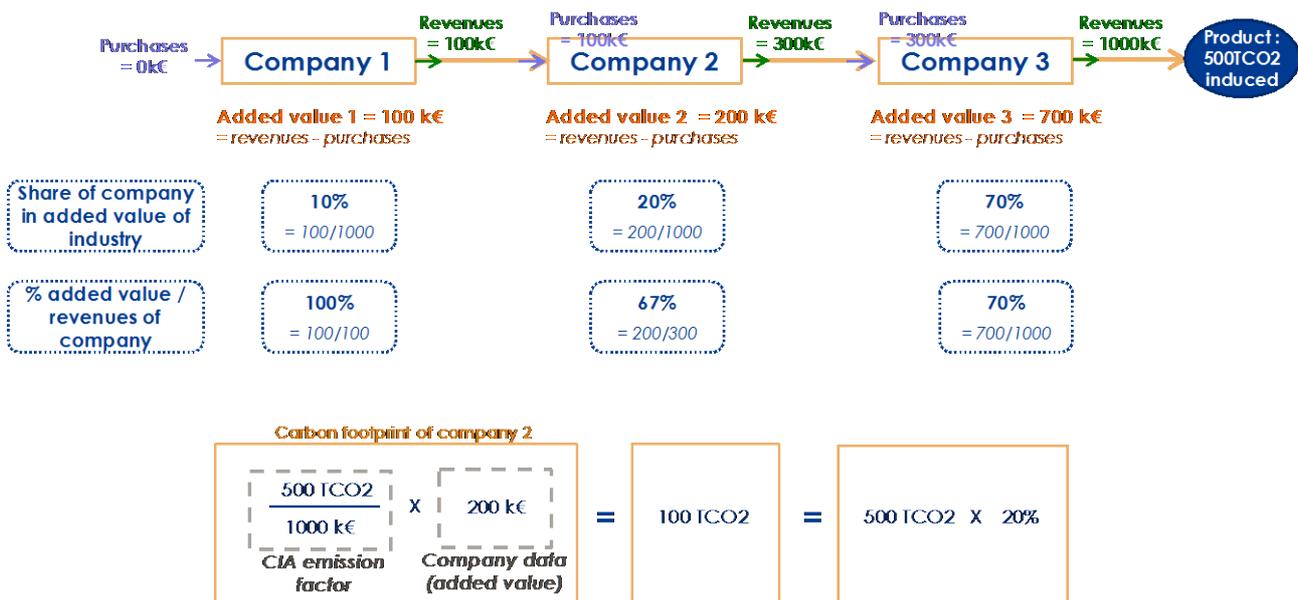
For instance, in the category "suppliers of equipment with a low-carbon potential", double-counting can readily occur between various suppliers who all contribute to the production of a single, efficient piece of equipment (suppliers within the same value chain, each producing a different part of the final product). Double-counting will occur if the total of all upstream, scope 3 emissions due to product use are tabulated for each company.

To avoid this second set of double-counting, Carbon Impact Analytics considers the summation of all induced emissions and emissions savings that were accrued in creating the final product to be proportional to the added value of the company in the final product's creation. So, the total induced emissions and emissions savings due to sold products (quantified at the company level) is multiplied by the share of the company in the total value added throughout the value chain.

However, the value added by a company in its value chain is rarely known, so Carbon Impact Analytics implements the calculation directly at the company level and designs custom emission factors. Then, multiplying total induced emissions by the company's share in total added value becomes equivalent to multiplying total emissions induced by 1 € of the final product by the added value of the company (the company's revenues minus its purchases). The same rule applies to emissions savings.

∑ *Technology i*

$$\frac{\text{Induced and avoided emission by an efficient technology (TCO}_{2eq}\text{)}}{\text{Final price of the technology (€)}} \times \text{Added value of company on this technology (€)} = \text{Total induced and avoided emissions due to the product at the company level} \times \text{Share of the company in the total added value of its value chain}$$

Emission factors used in CIA methodology — *Company data*

Is equal to :

An example is given in the figure below:

Purchases = 0k€ → **Company 1** → Revenues = 100k€ | Purchases = 100k€ → **Company 2** → Revenues = 300k€ | Purchases = 300k€ → **Company 3** → Revenues = 1000k€ → **Product : 500TCO2 induced**

Added value 1 = 100 k€ = revenues − purchases | Added value 2 = 200 k€ = revenues − purchases | Added value 3 = 700 k€ = revenues − purchases

Share of company in added value of industry: 10% = 100/1000 | 20% = 200/1000 | 70% = 700/1000

% added value / revenues of company: 100% = 100/100 | 67% = 200/300 | 70% = 700/1000

Carbon footprint of company 2

$$\frac{500\ TCO2}{1000\ k€} \times 200\ k€ = 100\ TCO2 = 500\ TCO2 \times 20\%$$

CIA emission factor — Company data (added value)

This methodology allows for measuring the relative weights of each company in the whole value-added chain associated with a final product.

Using the aforementioned principles, the Carbon Impact Analytics methodology avoids the majority of prevalent double-counting problems. In addition, the reprocessing of induced emissions and emissions savings separately provides valuable insight, especially since the results are undistorted and highly comparable.

Aggregation of results at portfolio level

After taking action to limit double-counting, the figures for induced and avoided carbon emissions are summed up separately according to their weight in the portfolio:

- Step 1: Calculation of the carbon emissions (induced emissions and emissions savings separately) per euro of enterprise value for each underlying company in a portfolio

Carbon intensity per euro of Enterprise Value:

In order to avoid double-counting of a firm's emissions between its stocks and corporate debt, the carbon intensity of a firm is computed on the Enterprise Value of the firm, instead of solely on the market capitalisation. Thus, total emissions of the firm are allocated proportionally between its equity and its debt, and one euro of equity has the same carbon intensity as one euro of debt.

The Enterprise Value used to calculate the carbon intensity is the average Enterprise Value of the firm on the reporting period. It is calculated as: market capitalisation + preferred stocks + (interests bearing) short-term and long-term debt – cash and cash-equivalents.

Note: Other aggregation rules can be implemented depending on the portfolio that is analysed. For instance, for long-term investors, carbon emissions can be aggregated based on acquisition values.

- Step 2: Multiplication of the exposure of the portfolio to this underlying company (in million euros)

$$\frac{\text{Reprocessed emissions (tCO2e)}}{\text{Enterprise value (M€)}} \quad x \quad \text{Portfolio exposure (M€)} \quad = \text{Emissions to add up (tCO2e)}$$

- Step 3: Summation of all underlying companies' emissions at portfolio level, induced emissions on one side and emissions savings on the other (again, induced emissions and emissions savings are not to be added together)

▪ **AGGREGATION PRINCIPLE FOR THE FORWARD-LOOKING QUALITATIVE INDICATOR**

Portfolio-level aggregation of the forward-looking qualitative indicator consists primarily of the distribution of the underlying companies' qualitative indicator scores. It provides the percent of portfolio values which should see their carbon intensity decrease in the coming years (thus have forward-looking ratings of + or ++), as well as those for which the opposite is true.

Forward-looking rating	Weight in the portfolio
A	10 %
B	55 %
C	30 %
D	5 %

Example of a distribution of forward-looking indicator in a portfolio

▪ **AGGREGATION PRINCIPLE FOR THE OVERALL RATING**

At the firm level, the overall rating is a qualitative synthesis of all indicators previously analysed (induced emissions and emissions savings, Carbon Impact Ratio and qualitative forward-looking indicator). It provides an evaluation of the overall carbon performance of a firm. At the portfolio level, it is necessary to evaluate the carbon performance of the portfolio, so two particular representations of the ratings are of greatest interest for asset managers:

- A global carbon performance rating of the portfolio, calculated based on the overall ratings of financial securities in the portfolio;
- A distribution of overall ratings of underlying companies in the portfolio (weighted share of overall ratings of companies).

3.2.2   2°C alignment of portfolios

In the Paris Agreement of 2015, 196 countries agreed to hold the increase in global average temperature to "well below 2 degrees C above pre-industrial levels." According to the IPCC 5th Assessment Report, the risks of "severe, pervasive, and irreversible impacts" increase as temperatures rise. A business-as-usual warming of 3,5°C, for example, would lead to "…severe and widespread impacts on unique and threatened systems, substantial species extinction, large risks to global and regional food security, and the combination of high temperature and humidity compromising normal human activities…".

Carbon Impact Analytics provides conclusions on the alignment of a portfolio or index with a climate change trajectory. This **alignment is a convention based on a scale of average overall ratings of underlying firms**. In other words, this step defines if the portfolio represents an economy consistent with an increase of 2, 3, 4, 5 or 6 degrees of temperature at the end of the century. Carbon Impact Analytics' temperature alignment in based on a benchmarking approach, with two benchmark designed as followed:
- a *business as usual* benchmark;
- a *2°C aligned* benchmark.

The *business as usual* represent the actual economy, that is still increasing the world greenhouse gas emissions. The most representative climate scenario for the business as usual economy is the Intergovernmental Panel on Climate Change (IPCC) RCP 6.0 scenario, it projects a temperature increase of 3.5°C by the end of the century. It is benchmarked by entirety of the CIA universe - 2000 companies - which is used as a proxy for world emissions.

The *2°C aligned* benchmark is derivative from the CIA universe, with the same sectoral allocation and a best in class approach on the overall rating of the constituents. For each sector, the companies selected are the ones with the highest overall rating scores. The selection is made as follow:

Best score of the sector	Eligible companies' scores for the 2 degrees benchmark	Example of sector
A	A and B	Electricity production
B	B and C	Cement
C	C	Oil & Gas
D	Not eligible	Mining

The selection results in a very performant portfolio in terms of climate performance.

The overall ratings of these two benchmarks enable to set up a sigmoid curve that will be used to assess the alignment of a portfolio, using the overall rating of the high stakes constituents of the portfolio.

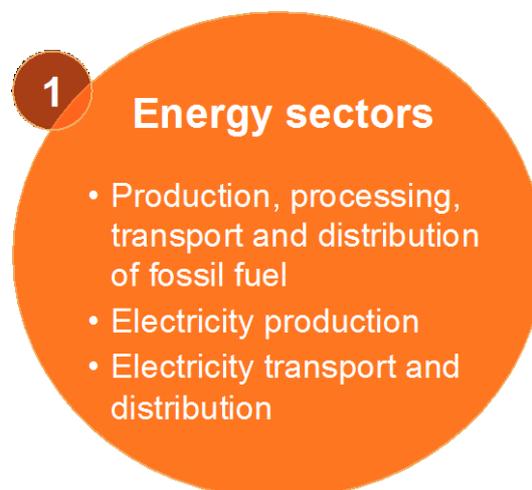
Portfolio Climate Scenario Alignment
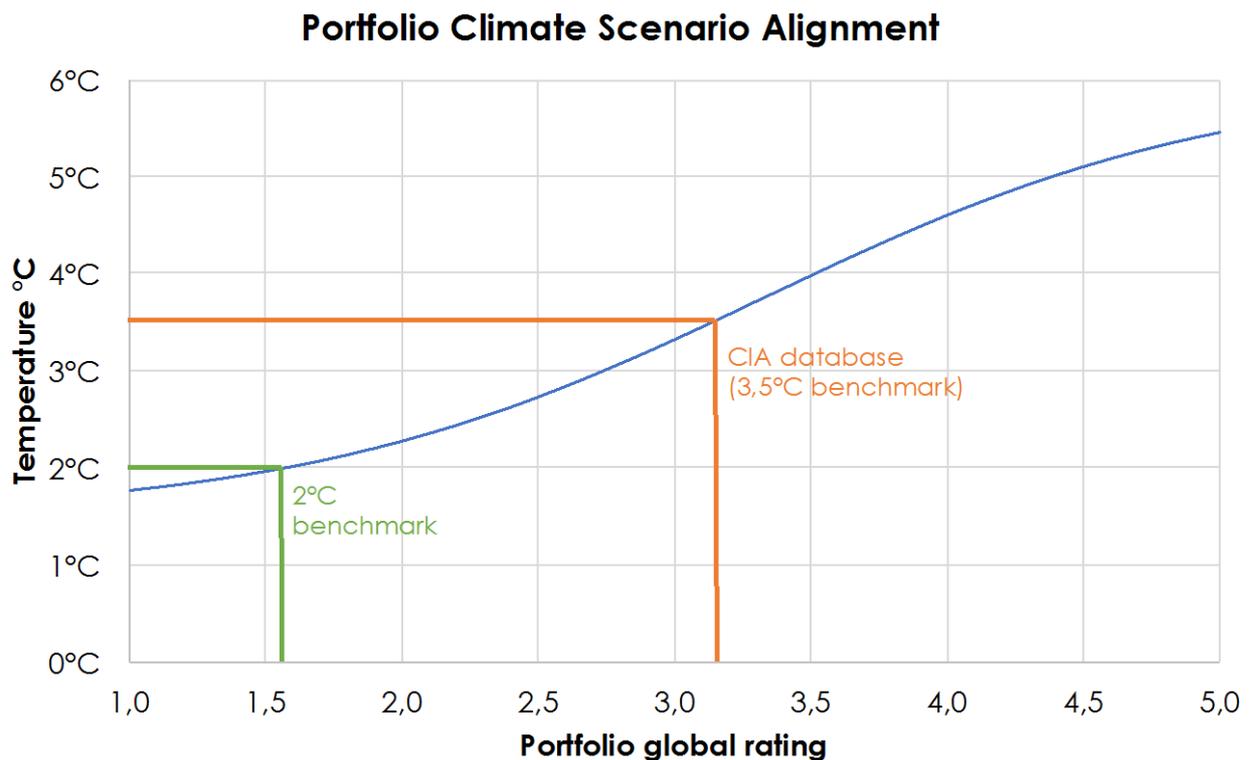
Other methodologies are usually based on a 2°C approach but the « 2°C-portfolio check » is only possible for a few sectors (usually power, fossil and road transport portfolios), not a fully diversified portfolio. Indeed, all 2°C scenarios (and in particular IEA's 2DS ETP scenario) are built on the idea that each sector could reach alignment with a 2°C trajectory through a few technologies. This would be the electric vehicle for the automobile industry, for example. However, this assumption is detached from the reality and practices of companies, because the process of achieving low-carbon products requires multiple technologies. Following the example of the automobile industry, levers for producing low-carbon vehicles will be the shift in energy combustion, but also the materials used, the weight of the car, the energy efficiency in manufacturing plants, etc. Moreover, companies cannot be resumed to one technology. This is why Carbon Impact Analytics' 2°C scenario approach was based on sectorial modules wherever possible (power and transport for example) but not for the portfolio's global trajectory alignment.

3.3 QUANTIFICATION OF INDUCED EMISSIONS AND EMISSIONS SAVINGS: METHODOLOGICAL PRINCIPLES

The following paragraphs detail the computational principles for each of the three activity categories (energy sector, carbon-intensive sectors, and suppliers of equipment with a low-carbon potential).

3.3.1 Energy sectors

1

Energy sectors

- Production, processing, transport and distribution of fossil fuel
- Electricity production
- Electricity transport and distribution

	Category 1: Energy sectors
Calculation principles for induced carbon emissions	Scopes 1 + 2 + 3, upstream and downstream (combustion of the fuel produced and/or sold during the year)
Calculation principles for avoided carbon emissions	For electricity only: Comparison of the carbon intensity of electricity produced by the company with a reference scenario
Results analysis: induced emissions	Comparison of the carbon intensity enables selection of companies with a low-carbon energy mix. In particular, in the fossil-fuel sector, companies with lower induced emissions are preferred to companies with high induced emissions
Results analysis: emissions savings	In the electricity sector, companies with emissions savings already have a production mix by fuel source less carbon intensive than IEA target at 2025 in the 2DS scenario

Three main sources of emissions are significant when assessing the carbon impact of an energy producing company:

- Emissions induced by its activity (oil extraction and refining for an oil company, for example) (scope 1 and 2)

- For electricity, emissions due to upstream activities along the value chain (such as the production of the windmill or the extraction of fossil fuels burned to produce electricity) (scope 3 upstream);

- For fossil fuels, emissions related to the combustion of fossil fuel produced (scope 3 downstream).

Calculation of scope 1 and 2 induced emissions is based on disclosed data whenever available, if this data is considered reliable. If scope 1 and 2 reporting is not available (or not reliable), production volumes are used instead to calculate emissions. Scope 3 emissions are usually calculated by Carbone 4 and are based on production volumes.

In the electricity sector, emissions savings are calculated as the difference between the actual carbon intensity of the company's production (emissions per kWh of electricity produced and/or sold) and a "low-carbon electricity intensity" in line with a 2° climate scenario, multiplied by the total annual electricity production volume *(see boxed text below)*.

Carbon intensity of electricity generation in a 2° scenario

Electricity generation is one of the few business areas where 2° scenario downscaling is reliable and adequately detailed enough to allow a comparison of business activities with a 2° scenario benchmark. Therefore the reference for the computation of emissions savings on the electricity generation sector has been set on a 2° scenario, specifically the IEA 2DS scenario in 2025 (as described in the *Energy Technology Perspectives 2014* (ETP 2014) report).

Refer to appendices for detailed computational principles for each sub-sector of the Energy category.

3.3.2   Suppliers of equipment with a low-carbon potential

2 **Suppliers of equipment with a low carbon potential**

Aimed at below sectors:
- Energy
- Transport
- Building
- Industry and IT

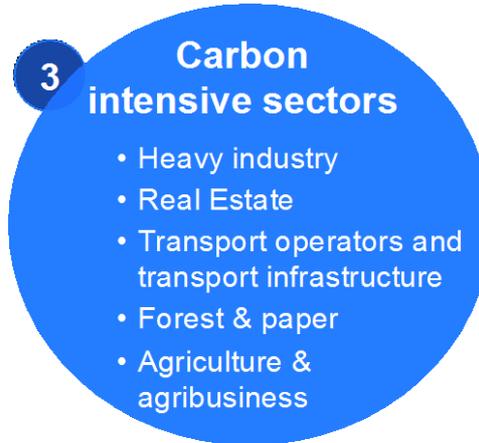|	Category 2: Suppliers of equipment with a low-carbon potential
Calculation principles for induced carbon emissions	Scopes 1 + 2 + 3 downstream (due to products and services sold by the company) Induced emissions take into account future emissions due to products sold during the year (if they consume energy), taken into account over the whole lifetime of products
Calculation principles for avoided carbon emissions	Emissions avoided thanks to efficient products sold during the year, taken into account over the lifetime of products and compared to the products that will be replaced
Results analysis: induced emissions	Companies with high induced emissions are companies which sell products which will consume energy over their lifetime (cars, buildings, etc.). High induced emissions are not as such sufficient to assess the carbon impact of companies in this category
Results analysis: emissions savings	"Carbon efficient" companies have high carbon impact ratios, as well as important emissions savings per euro of turnover

This category includes companies that manufacture efficient products for the energy, transport, building and industry sectors. The major source of emissions in this category is not the GHG emissions due to operations (scopes 1, 2 and 3 upstream), but GHG emissions due to products sold during the year. As such, the analysis focuses on measuring induced emissions and emissions savings due to products sold. In the case of a company producing insulating materials for buildings, the methodology enables estimation of emissions avoided over the insulating material's lifetime due to the renovation of existing buildings. For a car manufacturer, induced emissions take into account a lifetime of fuel consumption by cars sold during the year, but a certain share of a car manufacturer's sales will also lead to emissions savings, as the sales served to replace older, less fuel efficient cars.

Calculation of induced emissions is mainly derived from the turnover generated by efficient products and solutions. This necessitates estimating the share of a company's turnover which is due to efficient products. For certain cases (building construction, car manufacturing, etc.), it is possible to estimate induced emissions based on volumes produced during the year (number of cars, square meters of buildings built) and the energy performance data available for these products.

Emissions savings are usually calculated by comparing emissions of existing products to emissions of "efficient" products over their lifetime, with an estimation of what fraction of products sold will replace existing products. For instance, if a company manufactures efficient motors, emissions savings are calculated as the difference between future GHG emissions of an energy-efficient motor and an existing motor, multiplied by the share of sales which serve to replace existing motors.

Refer to appendices for detailed calculation principles for each sub-sector of this category.

3.3.3 Carbon intensive sectors

Carbon intensive sectors

3

- Heavy industry
- Real Estate
- Transport operators and transport infrastructure
- Forest & paper
- Agriculture & agribusiness

	Category 3: Carbon intensive sectors
Calculation principles for induced carbon emissions	Scopes 1 + 2 + 3 (operational, when relevant)
Calculation principles for avoided carbon emissions	Decrease in the GHG-intensity of the company for the past 5 years (GHG intensity per unit of volume produced or managed) + In some cases, comparison with a reference situation
Results analysis: induced emissions	Companies with the lowest induced emissions are the companies with the most « carbon-efficient » operations. Note: The carbon intensity of business activities of several companies within the same sub-sector can be compared in some cases. However, operational differences (vertical integration, outsourcing) can also explain discrepancies between carbon intensities.
Results analysis: emissions savings	Companies with the highest Carbon Impact Ratio (emissions savings / induced emissions) are the ones which have reduced the most their carbon intensity over the past five years.

In energy and GHG-intensive sectors, the most daunting challenge through the transition is to reduce the carbon intensity of processes. As a result, induced emissions and emissions savings mainly cover scopes 1 and 2, as well as operational scope 3 when relevant.

Calculation of induced emissions is based on disclosed data for scopes 1, 2 and 3 whenever available, or, by default, on production volumes (in tonnes, m², km travelled, etc.). In the

absence of production volumes, emissions are estimated based on the company's turnover (converted by Carbone 4 using their usual ratios). When the available emissions reporting seems to be of high quality, scope 1 and 2 emissions are used as reported, while scope 3 is calculated by Carbone 4.

Emissions savings are calculated as the decrease of GHG-intensity of the activity over the past five years (per unit of volume produced or managed), multiplied by the production volume in the last reported year.

In some cases, emissions savings can be calculated by comparing the company's emissions to a reference situation, but this is only practised when the item sold is a low carbon product considered substitutable with a carbon intensive product. This technique must be applied carefully; for instance, the methodology does not consider low-carbon and high-carbon steel products to be substitutable, as they are likely to have significantly different physical properties. So, in practise, this analysis is done for only a few sectors in this first version of the methodology:

- Low carbon passenger and freight transport operators: per the methodology, these operators offer a service which enables substitution to high carbon transport services
- Wood products : wood products enable substitution for other energy sources used in the residential and tertiary sector (100% of the wood fuel produced, as well as some other wood-based products ultimately used as fuel at end-of-life)
- Organic fertilizers : organic fertilizers are capable of substituting for mineral fertilizers
- Biofuels: biofuels are substitutable with fossil fuels fossil fuels

Refer to appendices for detailed calculation principles for each sub-sector of this category.

4 CARBON IMPACT ANALYTICS FOR GREEN BONDS

The following section details how to implement Carbon Impact Analytics for asset managers and owners, focusing on **green bond securities**. The analysis process is broken down into two main phases: the bottom-up analysis of underlying companies, carried out by Carbon4 Finance and the portfolio-level aggregation of results.

4.1 BOTTOM-UP GREEN BONDS ANALYSIS

4.1.1 Step 1: Project type classification

The green bonds' methodology is based on project analysis: every project financed by the green bond is analysed, and then results are consolidated at the bond level. Thus, the first step consists in identifying all the projects and classifying them by type or sector.

4.1.2 Step 2: Calculation of induced emissions and emissions savings for each project

Induced emissions and emissions savings are then calculated for each project that has been considered as "high stakes", depending on sectorial principles. High stakes sectors for projects include:
- Energy (ex: renewable energy generation, T&D…)
- Transportation (ex: public transportation infrastructure…)
- Building (ex: building refurbishment, efficient construction)
- Industry (ex: energy efficiency)

The calculation is based on physical data provided in the issuer's reporting. If the data are not available, for instance during the first year of the green bond, sectorial ratios are used in order to estimate the emissions based on the amounts invested in each different sector.

For activities not included in the sub-sectors covered by the Green Bonds methodology, the corporate or sovereign methodology is used.

4.1.3 Step 3: Aggregation of results at the bond level

- AGGREGATION OF QUANTITATIVE INDICATORS

The quantitative indicators are:

- absolute induced carbon emissions: the sum of all induced emissions by the different projects
- absolute emissions savings: the sum of all emissions savings by the different projects

- the Carbon Impact Ratio (CIR): the ratio of total emissions savings to total induced emissions

4.1.4   Step 4: Qualitative assessment of the transparency

The qualitative rating assesses the transparency of the issuer regarding the use of proceeds of the bond.

The qualitative rating is based on the evaluation of the quality and quantity of the data provided by the issuer in the reporting.
This evaluation is summarized as a rating (on a scale from ++ to --), under these guidelines:

- **Not evaluated**: The issuer has not yet published a report because the Green Bond is less than one year old.
- **Rating 1**: The issuer has published a clear and detailed report on the various funded projects. Induced emissions and emissions savings were calculated using an easily proven and robust methodology. There is no controversial green bond funded project.
- **Rating 2**: The issuer has published an annual report with project information on how to calculate the induced emissions and emissions savings. Either the issuer did not use a specific methodology in order to calculate the emissions or the methodology used is not sufficiently explicit to validate it.
- **Rating 3:** The issuer has not published a report, but has disclosed information on most of the projects.
- **Rating 4:** The issuer has published a report, but the information on each of the funded projects is incomplete.
- **Rating 5:** The issuer has not published any reporting.

4.1.5   Step 5: Overall rating of the carbon performance of the green bond

Finally, once the quantitative and qualitative indicators have been computed, Carbon Impact Analytics offers an overall rating of the green bond's carbon performance, based on the carbon impact ratio.

The overall rating is thus a qualitative measurement, which builds on the knowledge of companies' carbon performance by sector. It further enables asset managers to easily understand and assess the carbon performance of a particular bond and compare it to others'.

The same rating typology is used for green bonds as for corporates, allowing multi asset classes portfolios to be assessed.

4.2 PORTFOLIO ANALYSIS

Once the analysis has been conducted for each underlying green bond included in the portfolio, indicators can be aggregated to obtain key results at the portfolio level.

4.2.1 Aggregation principles

▪ **AGGREGATION PRINCIPLES FOR QUANTITATIVE INDICATORS**

This paragraph details how Carbon Impact Analytics aggregates green bonds' results in order to provide quantitative portfolio-level indicators.

Eliminating carbon emissions double-counting

Double-counting of emissions takes place when the same ton of GHG emissions is counted more than once within a portfolio, typically due to the compilation of indirect induced emissions and emissions savings within the same value chain. This is why emissions have to be allocated to the green bond. Our methodology provides a double allocation:

- Allocation of the project emissions to the issuer, with the added value of the issuer divided by the revenue of the project.
- Allocation of the issuer portion to the green bond itself, with the share of the green bond portion allocated to the project divided by the total value of the project (for the issuer).
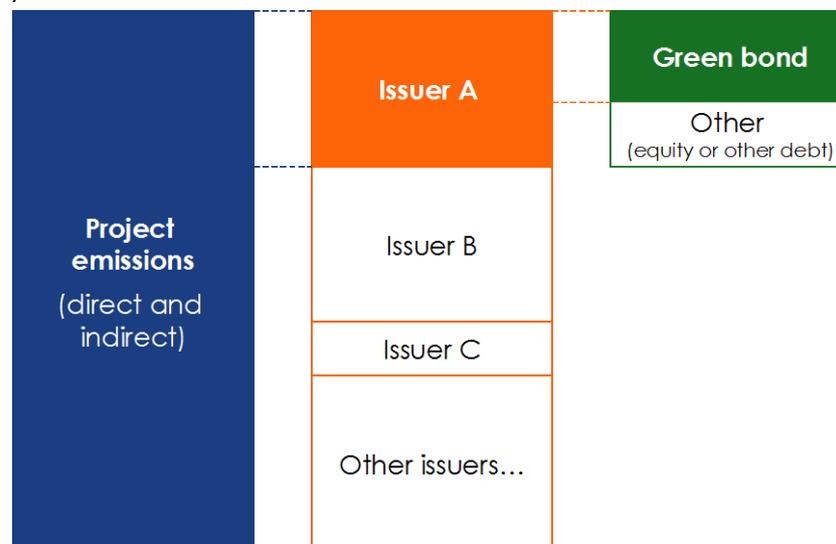
Aggregation of results at portfolio level

After limiting double-counting, the figures for induced and avoided carbon emissions are summed up separately taking into account their respective weightings in the portfolio:

- Step 1: Calculation of the carbon emissions (induced emissions and emissions savings separately) per euro of green bond

The reprocessed emissions are allocated to the overall green bond.

- Step 2: Multiplication of the exposure of the portfolio to the green bond (in million euros)

$$\frac{\text{Reprocessed emissions (tCO2e)}}{\text{Green bond size (M€)}} \times \text{Portfolio exposure (M€)} = \text{Emissions to add up (tCO2e)}$$

- Step 3: Sum of all underlying green bonds' emissions at portfolio level, induced emissions on one side and emissions savings on the other (again, induced emissions and emissions savings are not to be added together)

- **AGGREGATION PRINCIPLE FOR THE OVERALL RATING**

At the bond level, the overall rating is a qualitative summary of the Carbon Impact Ratio. It provides an evaluation of the overall carbon performance of the underlying projects. At the portfolio level, it is necessary to evaluate the carbon performance of the portfolio. Therefore, two particular representations of the ratings are of greatest interest for asset managers:

- A global carbon performance rating of the portfolio, calculated based on the overall ratings of financial securities in the portfolio;
- A distribution of overall ratings of underlying green bonds in the portfolio (weighted share of overall ratings of companies).
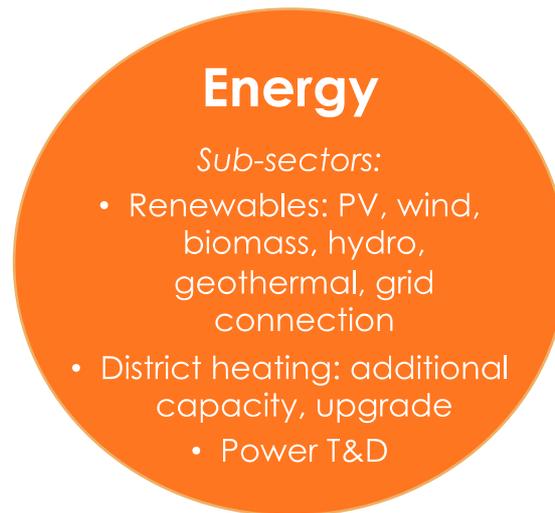
4.2.2 2°C alignment of green bonds portfolios

The 2°C alignment is calculated using the overall rating with the same approach as the corporates' one, see chapter 3.2.

4.3 QUANTIFICATION OF INDUCED EMISSIONS AND EMISSIONS SAVINGS: METHODOLOGICAL PRINCIPLES

The following paragraphs detail the computational principles for each of the four sectors: energy, transportation, building and industry.

4.3.1   Energy sector

Energy

Sub-sectors:
- Renewables: PV, wind, biomass, hydro, geothermal, grid connection
- District heating: additional capacity, upgrade
- Power T&D

	Category 1: Energy
Calculation principles for induced carbon emissions	Scopes 1 + 2 + 3 upstream
Calculation principles for avoided carbon emissions	Comparison of the carbon intensity of electricity or heat produced by the projects with a local reference scenario
Results analysis: induced emissions	Even renewables have a small GHG impact, but not the same for all sources.
Results analysis: emissions savings	The reference scenario is local: the more fossil fuel consumption will be avoided by the project, the more emissions savings are accounted.

The main sources of emissions are the emissions due to upstream activities along the value chain such as the production of a windmill (scope 3 upstream).
Emissions are calculated by Carbone 4 and are based on production volumes.

In the electricity sector, emissions savings are calculated as the difference between the actual carbon intensity of the project's production (emissions per kWh of electricity produced) and a reference electricity mix for the geographic zone.

4.3.2   Transport

Transport

Sub-sectors:
- Railway (subway, tram)
- Buses
- Electric vehicles
- Cycling paths

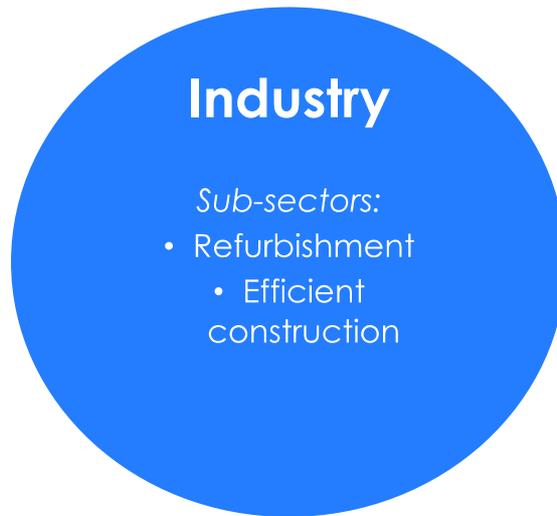|	Category 2: Transport
Calculation principles for induced carbon emissions	Emissions due to the construction and the use of the infrastructure.
Calculation principles for carbon emissions savings	Emissions avoided are the difference of the emissions of the project (induced emissions) and the emissions before the project
Results analysis: induced emissions	Induced emissions will shed light on carbon efficient transportation mode.
Results analysis: emissions savings	The emissions savings will quantify the relevance of a project in its own context.

4.3.3　Buildings

Buildings

Sub-sectors:
- Refurbishment
- Efficient construction

	Category 3: Buildings
Calculation principles for induced carbon emissions	Scopes 1 + 2 due to energy consumption
Calculation principles for carbon emissions savings	Emissions avoided thanks to efficient buildings replacing old less efficient buildings. Emissions avoided thanks to energy efficiency decreasing the energy consumption.
Results analysis: induced emissions	Buildings with low consumption will have a low carbon footprint.
Results analysis: emissions savings	Replacing and refurbishing old buildings will enable a decrease in building stock.

4.3.4 Industry

Industry

Sub-sectors:
- Refurbishment
  - Efficient construction

	Category 4: Industry
Calculation principles for induced carbon emissions	Scopes 1 + 2 + 3 (when relevant)
Calculation principles for carbon emissions savings	Emissions due to energy consumption savings

5 CARBON IMPACT ANALYTICS FOR SOVEREIGN BONDS

The following section details the Carbon Impact Analytics methodology for sovereign bonds.

The bias of Carbon Impact Analytics regarding sovereign bonds is that the whole country must be considered for the indicator to be calculated, based on two observations:

- regarding the contribution to the low carbon transition, the public actions objectives must be to foster the transition for the whole stakeholders of a country, including private sector and households;
- regarding the climate transition risks: a country can pay his debt only if its economy is sustainable, to be able to collect a share of the value created. Thus, the whole country must make the transition and not only the properties of the state.

5.1 BOTTOM-UP COUNTRY ANALYSIS

5.1.1.1.1 STEP 1: ASSESSING THE GREENHOUSE GAS EMISSIONS OF THE COUNTRIES

As mentioned above, the emissions to be accounted for regarding sovereign bonds are the emissions of the whole country. The source of this calculation is the United Nations Framework Convention on Climate Change (UNFCC) that provides detailed greenhouse gas figures for all countries mentioned in the Annex 1[2] of the Convention. For the other countries, the World Bank provide also the greenhouse gas for all countries of the world, but with a higher delay in time.

5.1.1.1.2 STEP 2: ASSESSING THE OVERALL RATING OF THE COUNTRIES

The overall rating of countries are based on three assessments:

The actual climate performance, using carbon intensity of the GDP (tCO_2/M€GDP)

The direct economic dependency on fossil fuel, using the World Bank indicators Oil, gas and coal rents (% of GDP)

The ambition of the country's emission reduction target, compared to IEA ETP scenarios (°C)

These three sub-ratings leeds to three scores, and the sum of these three scores enables to give a overall rating from A to E, A being the best score.

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[2] Parties include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

5.2 INFRA- AND SUPRA-NATIONAL SCALES

These methodological principles also apply at closer or wider scales, enabling assessing the climate impact of cities, regions and supranational issuers.

Supranational issuer data is calculated with the sum or weighted average data of the members of the issuer.

Local entities are assessed with local data when available, countries figures scaled with the population are used by default.

5.3 PORTFOLIO ANALYSIS

Once the analysis has been conducted for each underlying company included in the portfolio, indicators can be aggregated to obtain key results at the portfolio level.

5.3.1   Aggregation principles

- **AGGREGATION PRINCIPLES FOR QUANTITATIVE INDICATORS**

This paragraph details how Carbon Impact Analytics aggregates countries' results to provide quantitative portfolio-level indicators.

Eliminating carbon emissions double-counting

Consolidating a portfolio including sovereign bonds and corporate bonds can leed to double counting. For example, if a part of a company A's emissions takes place in a country 1, these emissions will be assessed in the company A's analysis, as well as the country 1's analysis. Carbon Impact Analytics allocates the emissions to the using the share of public sector in the GDP, remaining emissions being allocated to the private sectors.

Aggregation of results at portfolio level

Allocating the emissions of a country to a dedicated bond is not as easy as for corporates, as there is no equivalent to the "enterprise value". Carbon Impact Analytics models such a denominator by multiplying the investments in the different sectors by average lifetime of investments in these sectors.

- **AGGREGATION PRINCIPLE FOR THE OVERALL RATING**

As for corporates, the overall rating of a portfolio is the weighted average of the overall ratings of the constituents.

5.3.2   2°C alignment of Sovereign portfolios

The 2°C alignment is calculated from the overall rating with the same approach as the corporates' one, see chapter 3.2.