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MEASURE
A CARBON IMPACT METHODOLOGY IN LINE WITH A 2 DEGREE SCENARIO

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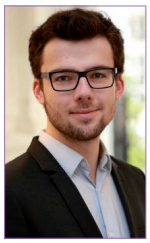

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Today, high expectations surround the measurement of carbon impact. Voluntary initiatives and – little by little – legislation push institutional investors to consider the impact that financial portfolios have on the climate and energy transition. However, current methods (of carbon footprint measurement) are not adequate to determine an investment portfolio's contribution to these issues. Current approaches, which do not take a life-cycle vision of carbon footprinting, have the particular flaw of not accounting for emissions related to companies' products and services. The impact of these products and services on the climate is, however, crucial in many sectors – whether positively in the case of renewable energy and energy efficiency solutions, or negatively in the case of fossil fuels.

Following this observation, Mirova and Carbone 4 decided to create a partnership dedicated to developing a new methodology capable of providing a carbon measurement that is aligned with the issues of energy transition: Carbon Impact Analytics (CIA).

Methodological principles

The CIA methodology focuses primarily on three indicators:

- A measure of emissions 'induced' by a company's activity from a life-cycle approach, taking into account direct emissions as well as emissions from product suppliers;
- A measure of the emissions which are 'avoided' due to efficiency efforts or deployment of 'low-carbon' solutions;
- An overall evaluation that takes into account, in addition to carbon measurement, further information on the company's evolution and the type of capital or R&D expenditures.

For these evaluations, the methodology employs a bottom-up approach in which each company is examined individually according to an evaluation framework adapted to each sector. Particular scrutiny is devoted to companies with a significant climate impact: energy producers, carbon-intensive sectors (industry, construction, transport), and providers of low-carbon equipment and solutions. Evaluations are then aggregated at the portfolio level while addressing instances of double-counting.

An indicator, and then what?

By adopting a life-cycle vision that accounts for both induced and avoided emissions, the CIA methodology is a reliable tool for measuring the contribution of investments to the issues surrounding the energy transition. Once the diagnostics are made public, financial players will face increasing pressure to improve their carbon performance. Accordingly, in the long term this measure can influence greater action in low-carbon investment strategies.

1 | Why develop a new carbon methodology?

Recent initiatives such as the Montreal Carbon Pledge and the Portfolio Decarbonisation Coalition show investors' increasing interest in the production of a carbon[1] report on investment portfolios. In France this interest, while first voluntary, has now – for the first time anywhere – been made a requirement: '[*As of the financial year ending in December 2016,] investment companies [...] shall mention in their annual report and make available to their investors information regarding the measures taken to contribute to the energy and ecological transition. [...] Exposure to climate risks,* ***in particular the measurement of greenhouse gas emissions related to the assets held [...] and the contribution to meeting the objective of limiting global warming*** *[...]*'[2] are among the items to be made available.

The existing methodologies focus primarily on direct emissions (scope 1 + 2) and rarely consider indirect emissions (scope 3), in particular emissions related to the use of products sold. There are essentially two reasons behind these methodological choices. The first is that calculating emissions in a life-cycle approach creates issues of double-counting. The same tonne of carbon is attributed to several different companies and is therefore counted more than once. Addressing these instances of double-counting involves complex analysis and allocation choices. The other issue is that companies often have limited transparency regarding carbon, thus requiring estimations when information is lacking.

Methodologies that focus primarily on direct emissions quickly reach their limits and can even result in a misleading assessment. Consider the following example: a first portfolio, primarily made up of companies in the service sector, will probably have a low carbon footprint even when indirect emissions are taken into account. A second portfolio, primarily made up of companies in the energy sector that offer innovative products with significant environmental added value, will have a significant carbon footprint, higher than that of the first portfolio.

Let's look at another example: in the case where scope 3 indirect emissions are not taken into account, an aeroplane manufacturer or an oil producer would have a carbon footprint significantly lower than that of an airline that uses aeroplanes and burns kerosene. Yet each of these players has a key role to carry out in limiting the final carbon footprint: improving fuel upstream, optimising the aeroplane's fuel consumption in the design stage, optimising routes downstream, etc.
These simple examples show that relying exclusively on a company's direct carbon footprint is not recommended for investors, whether the objective is to measure the efficacy of a strategy implemented upstream or to play a role in strategic decision-making like that involved in portfolio composition.

1. The word 'carbon' is, in fact, a misnomer that designates all greenhouse gases, expressed in 'carbon equivalent' or CO_2eq.
2. Article L533-22-1 of the French Monetary and Financial Code in effect on 31/12/2016, amended by article 173 of the law on energy transition for green growth.

Focus: emission scopes

Emission scopes, as defined in the Greenhouse Gas (GHG) Protocol (the main tool for standardising carbon accounting in companies), make it possible to consider a company's GHG emissions in terms of a simple distinction: are the emissions those for which the company is directly responsible, or rather emissions elsewhere (upstream or downstream) in the value chain of the company's products or services?
The emission scopes are defined as follows:

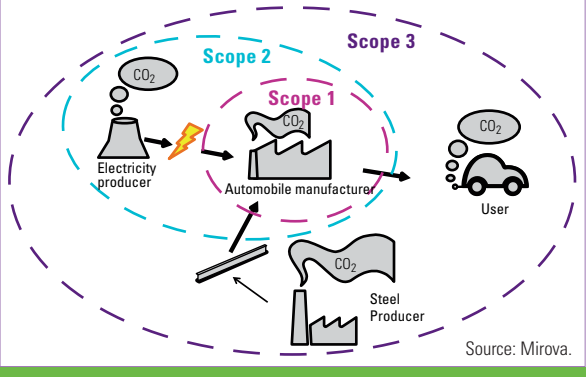
Scope 1: All GHG emissions, in particular related to combustion in engines belonging to the company, to the production of chemical products by internal processes, etc.

Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.

Scope 3 upstream: Other indirect emissions, such as those related to the extraction and production or purchase of fuels or any other emission that occurs during the life cycle of input products for the company.

Scope 3 downstream: All emissions that appear in the life cycle of outputs, i.e. the goods or services sold.

Figure 1. Diagram representing emission scopes for an automobile manufacturer



How to go further

Active contribution to the energy transition – and thus to limiting global warming – involves a precise analysis of the sectors that are highly exposed to climate issues: oil, gas, electricity producers, heavy industry, transport, construction, etc. There is no 'perfect' indicator that, by itself, makes it possible to measure the contribution of an investment portfolio – and, by extension, of an investor – to the energy transition. However, a measurement of a company's relative performance must necessarily take a life-cycle approach to the company's products (scopes 1, 2 and 3), and give an indication of potential emissions that are avoided by using 'green' technologies. Lastly, a company and its contribution to energy transition cannot be assessed only on quantitative indicators. Some climate change issues are not (yet) reflected in numbers. Thus two companies that are completely identical in their tangible assets may make very different strategic decisions that are determinant in their future climate impact. Investments and R&D choices effectively provide information on the company's future. Yet these investments, which are strategic company information, are rarely available with details on the technologies involved. The pertinence and future impact of these strategies are therefore qualitative estimates.

From this, it is clear that *'the contribution to meeting the objective of limiting global warming'* which institutional investors will have the regulatory obligation to disclose in France from 2016 onward cannot be limited to current carbon footprint measurements.

Drawing on this, Mirova formed a partnership with the consulting firm Carbone 4, which specialises in providing support for companies' strategic climate concerns, in order to develop a new methodology to address responsible investment issues and requirements. The CIA methodology favours a company-by-company assessment in order to establish an objective evaluation of companies' impact on energy transition. Beyond merely measuring the carbon footprint, the objective here is to assess the contribution – positive or neutral – of a company with regard to the climate objective. So as not to fall into the trap of sector and/or geographical averages, which have a tendency to 'smooth out' performances, each company must be examined in depth so that it can be objectively compared to its peers.

2 | Presentation of the main indicators

In order to measure a company's performance with regard to the energy transition, the CIA methodology draws on various complementary indicators. Firstly, it considers the quantitative indicators on the company's induced and avoided emissions, making it possible to establish the company's position with regard to its peers and assess its contribution to the objective of decarbonising the economy. Secondly, it considers the qualitative indicators that enable the assessment of the company's evolution over time and its ability to achieve optimal or satisfactory performance in the coming years, which is an essential point in investment choices.

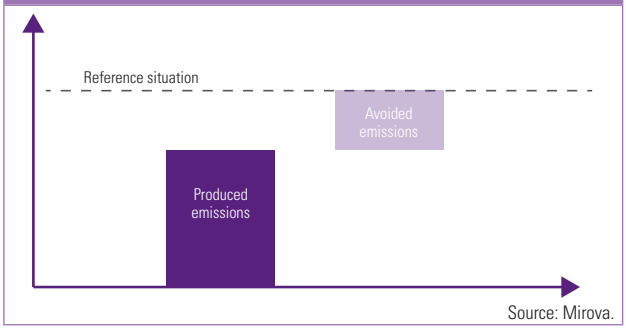
2|1 Induced emissions

The emissions induced by the company are calculated across its entire reach, thus also including scope 3 when this is relevant. Scope 1 and 2 emissions are often drawn from data furnished by the companies, which now provide comparable evaluations as they are based on the same standards. When direct emissions and/or electricity consumption are not provided, the methodology estimates the emissions using activity data. By contrast, the methodology bases its calculations for scope 3 primarily on activity data with emission factors applied. The data are thus more uniform across companies, and can be compared without concern for what choices were made regarding how to present their data (scope used, calculation method, etc.).

2|2 Avoided emissions

The scope used for the calculation of avoided emissions is the same as that for induced emissions. The objective here is to quantify the emissions that a company did not induce in comparison to a reference. The sectoral nature of the CIA method means that this reference can vary substantially. A company with avoided emissions is therefore a company that uses more efficient processes and products than the reference.

Figure 2. Representation of avoided emissions in relation to induced emissions and reference situation



The concept of avoided emissions is already widespread in project finance for the measurement of carbon impact, and is directly derived from methodologies that were used in the Kyoto Protocol's Clean Development Mechanisms.

Avoided emissions are virtual emissions: they would have existed without the efforts made by the company to decrease them. Induced emissions already account for this decrease with respect to the reference scenario. There is therefore no point to subtracting the avoided emissions from the induced emissions, as this would count these 'negative emissions' twice.

2|3 Carbon Impact Ratio

This is the ratio of the avoided emissions to the induced emissions. It is an easily understandable indicator of a company's carbon impact, allowing easy comparison between peers within a same sector.

$$\textit{A company's Carbon Impact Ratio} = \frac{\textit{Avoided emissions } (tCO_2eq)}{\textit{Produced emissions } (tCO_2eq)}$$

If the ratio is zero, it means the company has no avoided emissions. A ratio of ten signifies that the company's products made it possible to avoid the emission of ten times the quantity of GHG needed to manufacture, distribute and use the product, **as compared to the subsector reference product.**

2|4 Qualitative indicator

As a complement to this quantitative analysis, the methodology also provides a qualitative indicator evaluating the trend in induced and avoided emissions. This estimation involves an analysis of capital and R&D investments that will contribute to a decrease – or increase – in the company's GHG emissions, as well as its positioning and strategy with regard to the energy transition. As reporting is relatively incomplete on the topic of investments, particularly when it comes to distinguishing them by sector, the first version of the methodology will strive to provide a qualitative estimation of the future impact of the company's strategy.

3| Calculation principles

3|1 Division into sectors around Energy Transition

Whether the objective is to measure a carbon footprint, quantify the GHG emissions that a company makes it possible to avoid, or qualify a company's strategy on energy transition, the methods, indicators and expertise vary based on the relevant economic sector. The granularity of the sector divisions used in finance is not suitable to a specific study of energy transition issues. The CIA method is therefore based on a new classification, covering the entire economy and built around the carbon issue. The first distinction is made between high-stakes companies with regard to the energy transition, and the others. The high-stakes companies are then distinguished according to three macro-categories, which differ according to their levers in energy transition:

- **Energy providers:** Their objective is to shift their energy mix towards less carbon-intensive sources and to reduce their direct emissions
- **Suppliers of low carbon-potential equipment:** Their objective is to innovate and to make these innovations accessible to the market
- **Carbon-intensive sectors:** Their objective is to implement energy efficiency solutions in order to achieve 'optimal climatic performance'

These macro-categories are broken down into sectors and subsectors.

Subsectors were broken down in this way because their respective issues regarding energy transition are each quite different. Agriculture needs to focus particularly on reducing its methane and nitrous oxide emissions, while the construction sector must focus on heating efficiency and insulation. The analyses, while the same across all sectors, are therefore distinct in terms of their calculation parameters, which are unique to each subsector.

The other sectors, which represent the rest of the economy, have a lower potential impact on the energy transition. The assessment of their climate impact can therefore be simplified using quicker estimations, due to this limited climate impact.

3|2 Quantitative indicator

For each of the CIA methodology's macro-sectors, the quantitative indicators depend on distinct parameters. For induced emissions, the main question is that of the scope of study. For avoided emissions, the issue is sensitive since

Figure 1. CIA methodology sector classification

Key categories	Sectors	Subsectors
Energy sector suppliers	Fossil fuels	Oil, gas and carbon industries
	Electricity	Electricity industry
Suppliers of low carbon-potential equipment		Suppliers of: Energy solutions for buildings: construction and equipment Energy solutions for industry and IT and communication Energy solutions for transport Energy solutions for electricity productioné
Carbon-intensive sectors	Heavy industry	Cement and clinker production Steel production Aluminium production Plastics production Chemical industry Glass production Sugar production
	Forest and paper	Wood and forest products Paper production
	Transport	Transport operators
	Construction	Buildings – Fleet managers and owners
	Agriculture	Agriculture, fishing, Agro-food and Fertilisers

the choice of reference forms the basis for all subsequent assessments. The choice of this reference varies depending on the relevant macro-category – sometimes even depending on the sector – as the objective is to evaluate companies according to ambitious criteria, which can vary depending on the issues inherent to each sector.

Figure 2. Energy suppliers

Calculation principles for produced emissions	Scopes 1 + 2 + 3, upstream and downstream (combustion of fuels produced or sold in the course of the year)
Calculation principles for avoided emissions	Only for electricity: Comparison of the carbon intensity of the electricity produced by the company with a reference scenario
Results of the analysis: produced emissions	The comparison of carbon intensities makes it possible to select low-carbon companies. In fossil energies in particular, companies with lower emissions are preferred.
Results of the analysis: avoided emissions	In the electric sector, the companies with avoided emissions have a lower carbon intensity per energy source than an ambitious reference

Figure 3. Suppliers of low carbon-potential equipment

Calculation principles for produced emissions	Scopes 1 + 2 + 3 downstream (due to the products and services sold by the company) The produced emissions account for future emissions due to the products sold in the course of the year (if they consume energy) over their entire life cycle
Calculation principles for avoided emissions	The emissions avoided due to efficient products sold in the course of the year are calculated over the life cycle of the products and in comparison with the products that were replaced
Results of the analysis: produced emissions	High-emission companies are those that sell products that consume energy during their life cycle (cars, buildings, etc.). Emissions alone are not enough to determine the carbon impact of companies in this category
Results of the analysis: avoided emissions	Carbon-efficient companies are those that have high Carbon Impact Ratios as well as significant avoided emissions in per euro revenue

Figure 4. Carbon-intensive sectors

Calculation principles for induced emissions	Scopes 1 + 2 + 3
Calculation principles for avoided emissions	Decrease in the company's carbon intensity over the past five years (carbon intensity per unit of volume produced or managed) and, in certain cases, comparison with a reference scenario
Results of the analysis: induced emissions	The companies with the lowest induced emissions are the top performers N.B.: The carbon intensities of the activities of different companies can be compared within the same subsector. However, operational differences (vertical integration, subcontracting) can also explain variations in intensity.
Results of the analysis: avoided emissions	Those companies which have most significantly reduced their carbon intensity over the previous 5 years achieve the highest carbon impact ratios.

3I3 Qualitative indicator

This evaluation is based on the estimation of the two indicators on a scale from - - to ++.

Concerning strategy and positioning with regard to low-carbon transition

➜ **++** : The company incorporates combating climate change as a key point in its strategy, its induced emissions are low and/or it has significantly reduced its emissions per product unit sold, and it has ambitious reduction goals. The share of sales in line with climate change objectives is greater than 50% with a trend towards growth in the medium term.

➜ **+** : The company incorporates combating climate change as an important point in its strategy and it

reduced its emissions per product unit sold and/or has ambitious reduction goals. The share of sales in line with climate change objectives falls between 20% and 50% with a trend towards growth in the medium term.

- **-** : The company has high levels of induced emissions, but has reduced them or has set objectives for reducing them. However, these reductions are unambitious or do not seem entirely credible. The share of sales in line with climate change objectives falls between 5% and 20%, with expected stability in the medium term.

- **--** : The company is carbon-intensive and has not incorporated climate change as an important factor in its strategy. The share of sales in line with climate change objectives is less than 5%, and there is no indication that this will increase in the medium term.

Concerning investment and R&D spending:

- **++** : The company's investment and R&D policy are in line with the struggle against climate change. The share of investments and R&D spending related to energy transition is greater than 50%.

- **+** : Although climate change objectives are included in the company's investment and R&D policy, these do not represent the majority of spending. They generally account for between 20% and 50% of expenditures.

- **-** : Climate change objectives are taken into account to a limited extent in the company's investment and R&D policy. They generally represent only 5% to 20% of spending.

- **--** : The company has not included climate objectives in its investment and R&D policy. They generally therefore represent less than 5% of spending.

The overall qualitative rating is then determined based on the two qualitative ratings mentioned above. The evaluation obtained by this method is supplemented with an evaluation of quality and the company's transparency in order to pave the way for dialogue and engagement.

4 | Aggregation of results

4.1 Company

When a company is being analysed, its sectors of activity are reviewed first. The company is thus 'distributed' between the subsectors of the CIA methodology, with each subsector requiring different activity data (whether this be physical or financial).

These data make it possible to calculate the quantitative indicators for each of the company's CIA subsectors: induced emissions, avoided emissions and emissions reported by the company.

The analysis then involves producing the quantitative indicators for the whole company:

- Induced emissions: sum of emissions induced in each of the company's sectors of activity;

- Avoided emissions: sum of emissions avoided in each of the company's sectors of activity;

- Carbon Impact Ratio: ratio of the sum of avoided emissions to the sum of induced emissions.

Lastly, the methodology provides an overall rating of the company's carbon performance. This rating is determined by an evaluation committee on the basis of two criteria:

- The company's results for the methodology's quantitative and qualitative indicators, which provide an overview of the intrinsic carbon performance;

- The comparison of this performance with the performances of other companies in the same subsector.

The overall rating is the result of a careful assessment that contextualises a company's carbon performance within its sector, and therefore can assist the fund manager in making decisions.

4.2 Portfolio

The aggregation of the assessments, both quantitative and qualitative, at the portfolio level presents numerous methodological problems that we will address in this section. From eliminating double-counting to aggregating qualitative ratings, as well as attributing emissions to the investor in order to total them, each issue requires a precise methodology in order to obtain relevant results.

4.2.1.1 Eliminating double-counting

Double-counting is not a problem at the company level, since it is only the company's impact that matters. Two companies in the same sector can thus be compared without recalculating emissions, as the higher-performing company will necessarily have a lower overall carbon intensity. The problem appears when attempting to add the emissions of multiple companies that operate within the same value chains. The emissions from one are invariably also included in the emissions from another, and it is therefore impossible to assert a quantity of 'induced' or 'avoided' carbon at the portfolio level. Whatever the quantitative indicator observed (induced emissions or avoided emissions), the risk of double-counting is the same: one tonne of CO_2, induced or avoided, might be counted multiple times within the same value chain. Take the example of a lorry (truck): emissions related to fuel combustion are counted as direct emissions attributed to the freight company operating the lorry, and as indirect emissions to the automobile manufacturer and oil producer. In short, if these three companies are present in the same investment portfolio, the tonnes of GHG emitted by said lorry will be counted three times. Rules for allocating these emissions are therefore necessary in order to distribute them across the different players responsible for them. The first three independent categories that can be highlighted are the macro-categories of the CIA methodology:

- Energy suppliers (the oil producer in our example);
- Historically carbon-intensive companies (our freight company);
- Companies that supply solutions and equipment (automobile manufacturers)

The methodology thus distributes emissions in equal shares among these three categories, making it possible to eliminate most instances of double-counting.

41212 Aggregation of quantitative results

One universal issue is that of attributing a financial asset holder to a share of the underlying company's carbon footprint. Thus the methodologies that only cover stocks distribute emissions only among a company's stockholders, while the methodologies that also include bond (or, more often, mixed) portfolios use the share of the enterprise value[3] held in the portfolio.

Once instances of double-counting have been addressed, the induced and avoided emissions can be calculated at the portfolio level. To do this, investors must first determine what portion of a company's induced and avoided emissions can be attributed to them. As the methodology applies to both stocks and bonds, this is achieved by determining what proportion of the enterprise value is held in the portfolio. In order to complete the aggregation, the next step is to calculate the carbon intensity per euro of enterprise value for each company in the portfolio.[4] To summarise, the quantitative indicators at the portfolio level are calculated in three steps:

1) Calculation of the company's carbon intensity expressed in tCO_2 eq/euro of Enterprise Value

2) Multiplication by the portfolio's exposure to this company, in millions of euros

$$\frac{Reprocessed\ (tCO_2eq)}{Enterprise\ Value\ (€M)} * Portfolio\ exposure\ (€M) = Emission\ to\ add\ (tCO_2eq)$$

3) Addition of the induced emissions across the entire portfolio, and the same for the avoided emissions

41213 Overall qualitative rating

The qualitative rating on the portfolio level is obtained using the distribution of the evaluations of the underlying companies. The result is a proportion of portfolio securities that are expected to decrease in carbon intensity in the near future (having been evaluated as + or ++), as well as a proportion of securities with the opposite trend.

Figure 5. Sample distribution of a portfolio's qualitative ratings

Qualitative rating	Weight in the portfolio
++	10 %
+	55 %
-	30 %
--	5 %

The investor also has access to an overall qualitative rating, which is equivalent to the weighted mean of the overall ratings of each underlying company.

5 | From measuring impact to redirecting investment

We have described a methodology with the purpose of estimating an investment portfolio's impact on energy transition. By considering carbon, a transverse indicator of the climate issue, this methodology makes it possible to determine a portfolio's contribution to the objective of decarbonising the economy, as well as whether or not it tends to be aligned with this objective. These measures, which are communication components, should above all be parameters for investment decisions, as a complement to traditional financial indicators. Redirecting investments towards renewable energy and the energy efficiency recommended to limit the rise in the Earth's surface temperature to 2°C need to be backed up by tangible indicators that enable investors to make the right choices.

3. Defined as the sum of the company's market capitalisation and financial debt.
4. Based on the hypothesis that GHG emissions are equally distributed across the company's stocks and bonds.

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