



Challenges and tools for incorporating climate themes into investment strategies - Deep dive into carbon footprinting

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Challenges and tools for incorporating climate themes into investment strategies - Deep dive into carbon footprinting

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- 2015 was a **turning point in terms of collective awareness of climate issues**, leading the **financial sector** to ask two questions: **What should its role be faced with the collective responsibility for financing the energy transition and combatting climate change?**; and **How to control climate-related financial risks?**
- **Supranational and national regulators** are mobilising, with the goal of harmonising and standardising climate data, but are also emphasising materiality more clearly than ever before. **France** seems to be at the forefront in this respect with its much-vaunted '**Article 173**' based on the belief that '**transparency is the prelude to action**'.
- While many avenues have still to be explored, the goal of this report is to: 1/ understand the emerging regulation; 2/ **offer a framework, avenues and tools** for integrating climate issues into investment and financing strategies; and 3/ shed light on the methodologies chosen, in particular as regards carbon footprinting on the basis of an **in-depth, qualitative and quantitative analysis of the methodologies relating to carbon data available on the market**.
- We propose to tackle the incorporation of climate issues into financing and investment strategies based on the **following three objectives**: 1/ **Risk**: Managing the exposure of assets under management to the risks stemming from climate change; 2/ **Impact**: Reducing their impact (2°C compatibility); 3/ **Contribution**: Contributing to the financing of the energy transition.
- **Portfolio carbon footprinting is a fairly good reporting tool**. Carbon data looks to be an interesting tool for addressing the 'impact' objectives, but of very partial use for measuring the 'contribution'. Conversely, from the 'risk' standpoint, it obscures several dimensions and partially addresses its regulatory aspect. What is more, **carbon footprinting is in our view a useful tool initially for portfolio divestment or decarbonisation approaches, but it is inadequate for redirecting assets towards low-carbon solutions**.
- Given these observations and the long list of carbon data imperfections, but also, and more importantly, the climate issues that carbon footprinting does not address, other models are needed to supplement this approach. Lots of proposals have been put forward but they are often still immature or discretionary. There are many goals, **aimed at introducing: a more forward-looking dimension (stranded assets, potential emissions, 2°C compatibility, exposure to physical risks), a more qualitative dimension (climate strategy, climate risk management), a more 'climate benefit' dimension (avoided emissions, green share) and more discrimination (brown share)**.

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Distribution of this report in the United States. See important disclosures at the end of this report.

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Executive Summary

“The horizon for monetary policy extends out to two to three years. For financial stability it is a bit longer, but typically only to the outer boundaries of the credit cycle – about a decade. In other words, once climate change becomes a defining issue for financial stability, it may already be too late.”

Mark Carney, Governor of the Bank of England and Chairman of the FSB - October 2015

As we showed in our previous publications¹, 2015 was a critical year for enhancing collective awareness of climate issues on the part of governments and actors in the economy and international finance as well as civil society.

There is now a range of signals powerful enough to prompt investors and the financial sector in the broad sense to ask two questions:

- What should its role be faced with the collective responsibility for financing the energy transition and combating climate change?
- How can it control the financial risks relating to the consequences of climate change and the transition, even as manifest changes in certain economic fundamentals are likely to redefine the operational (and risk) environments of a number of sectors of activity / projects that it finances?

Faced with these issues, the sector can no longer afford not to revisit its portfolio management and risk analysis processes and asset allocation rules in the light of this change of paradigm.

Mobilisation on climate issues has gathered momentum gradually under the impetus of the work and lobbying of a few true believers (companies, regulators, investors, etc.) and **today it is stronger than ever**. Fifteen G20 countries have introduced climate-related reporting obligations for listed companies. Numerous ESG reporting framework initiatives have sprung up over the years. The approaches obviously vary, with the result that it is at times difficult to interpret the data and often impossible to make comparisons.

Supranational regulators are now mobilising, looking to harmonise and standardise climate data, but also emphasising materiality more clearly than ever before. The FSB, tasked by the G20 with working on the question of the integration of climate risk into financial sector practices, has identified the question of climate data (reporting by emitters but also data users) as the core issue. It has launched the **Task Force on Climate-related Financial Disclosures (TCFD)**. The TCFD's job is to define a solid reporting framework for physical, legal and transition risks related to climate change for financial and non-financial companies.

Cf. Natixis Global Markets Research, SRI report: “COP 21: Time to convert the try” (October 2015) and SRI Flash, “COP 21: a historical agreement calling for action” (December 2015)

On the back of the success of the COP 21 conference and the momentum stemming from the fact that it hosted and chaired the event, France is at the forefront of these issues, being the first country to have introduced a **legally-binding requirement** for private sector players (companies, banks, investors), via certain provisions in the much-vaunted ‘**Article 173**’ of the Energy Transition law, to produce **specific reporting on how they take account of ESG issues, the measurement of financial risks relating to the effects of climate change**, but also, for investors, **their contribution to the financing of the energy transition and the achievement of the 2°C target**. In addition, France is the only country to have launched an ‘**energy and ecological transition for climate label**’ (TEEC) aimed at **identifying funds that comply with criteria relating to their direct or indirect contribution to the financing of the energy and ecological transition** and can attest to ‘the quality and transparency of their environmental characteristics’.

Based on a conviction that ‘**transparency is the prelude to action**’, we welcome the initiative **taken by France, as it creates genuine momentum in the French financial community beyond just SRI investors**. From this standpoint, in this report we examine in detail the content of Article 173 and the TEEC label, the contours of which are still open to interpretation, and attempt to provide some avenues to explore from the compliance viewpoint.

Besides these tangible regulations in France, regulatory momentum extends well beyond France alone. As such, the lessons of this initial French experience will be useful to international investors.

What is more, while regulations are, and will remain, a decisive driver of action, they are not the only one. **The need to adapt to the fundamental shifts triggered by climate change** (from both a risk and investment opportunity standpoint) is just as powerful a driver for the integration of climate issues into investment strategies. Based on this observation, **this report proposes a framework for investors to consider the avenues and tools at their disposal.**

From carbon footprinting to divestment, including engagement, determination of green vs. brown shares, the calculation of avoided emissions, assessment of climate risk management, assessment of transparency, exposure to fossil energies & stranded assets, physical risks, the forward-looking notion of potential emissions and compatibility with a 2°C scenario, etc., the question of ‘**the impact of investments**’ as well as ‘**the impact on investment**’ has now been **raised and is being asked increasingly clearly by asset managers, and above all, by asset owners.**

Given the diversity of the approaches and the mixed nature of the tools, it is crucial to **clarify the objective being pursued** so as to **choose the right tools**.

We therefore propose to tackle the incorporation of climate issues into investment strategies according to the following three objectives:

- ‘**Risk**’: Manage the exposure of assets under management to climate change-related risks.
- ‘**Impact**’: Reduce the climate impact of assets under management (with a view to the international emission reduction target).
- ‘**Contribution**’: Contribute to the financing of the energy transition.

These three objectives are the guiding theme for our approach and constitute the prism through which all the strategies and tools available to investors may be assessed.

Moreover, we believe that they will **evolve over time and according to how they are used**, moving ‘the cursor’ for action along the following continuum:

- **An ex-post approach / based on ‘observation’:** meet a regulatory obligation, implement client reporting. Which ultimately, via follow-up and prior monitoring, may enable the definition of quantified objectives.
- **An ex-ante / ‘proactive’ approach:** Adapt or create management processes targeting one or the other of the three ‘risk, impact or transition’ objectives.

With these foundations in place, the question arises of what tools are to be used to build processes for incorporating climate issues into investment strategies. These tools are uneven in terms of their maturity and availability.

There is a first obvious conclusion: the magic formula probably lies in a combination of approaches and tools. No tool, taken separately, can meet our three portfolio management targets.

Carbon footprinting is clearly, as of today, one of the favoured tools to tackle the question of the incorporation of climate issues. A simple, (partly) quantified snapshot, it is considered to be one of the most finalised and widely available tools to date (the first carbon data providers launched their activities in the middle of the 2000s).

However, before undertaking portfolio carbon footprinting, a number of questions need to be addressed and choices made ...

- What is to be done with the carbon data?
- To what extent does it inform our three objectives?
- What carbon ‘scopes’ should I cover with my carbon footprint? What types of data are available?
- Are the estimated and reported data reliable?
- What carbon indicators should be used at the scale of an issuer? a portfolio?
- What asset classes can I use this data on?
- Is double counting a problem?

Faced with these questions, we chose to devote our work to carbon footprinting to give investors everything they need to make their choice.

We sought to **provide the most exhaustive response possible**, based on repeated exchanges of information **with the eleven main carbon data providers**, to which we sent a qualitative questionnaire on their methodologies. They provided us with a common set of quantitative data (estimated data stemming from their different models for a sample of 20 companies for which reported data existed) enabling us to conduct quantitative tests that yielded a wealth of information.

Clearly, from then on, the devil is in the detail. And this report can be read on several levels, depending on how technical or expert an interpretation we are after...

The aim is to understand what is and is not suited to carbon footprinting, but also to understand the data that is available to us or that we choose to use (how it is built, its biases and, above all, the ways it can be used).

As far as data availability is concerned, **the equity and bonds of listed companies are the two asset classes for which there is most information supplied by carbon data providers**, with **carbon data** for private equity, infrastructure and real estate assets, when available, provided as a bespoke service. Conspicuous by its absence, carbon emission data for sovereign bonds is only available from one provider alone, but we should soon begin to see a growing number of methodologies.

The quality and reliability of data are clearly among the long-standing issues raised when it comes to carbon footprinting. In actual fact, the importance of data quality and reliability varies considerably depending on how the data is to be used. And it is with this in mind, i.e. the way in which the data is ultimately to be used, that we can draw a number of conclusions:

A first general (and rather unsurprising) conclusion springs to mind: reported data, once its most obvious irregularities have been removed, is still the best data out there for Scopes 1 & 2 when it comes to taking a stock-picking approach.

If the data is not reported, it needs to be estimated. Estimation models can be divided into **four big families** (EIO-LCA, regression models, sector averages & medians and bottom-up models, which we describe in detail), and we have noticed that most **data providers use several types of models** (depending on the availability of the data, the relevance of the model for the sector to which the company concerned belongs, and / or the scope they seek to model). And although we can easily list the **intrinsic limitations of each family of models**, the **adjustments that need to be made will vary from one carbon data provider to another. So before selecting a data provider, the user needs to establish how the carbon data will be used so as to gauge the limitations inherent to each model depending on the objectives pursued, while taking into consideration the adjustments made (or not).**

For Scopes 1 and 2:

- **We reckon that models based on reported data are the most suitable.**
- If the aim is to use forecasts in a stock-picking approach, we will **opt for models based on granular sector classifications** (closest to the notion of business activity) and / or based on the carbon profiles of companies in order to calculate the emission factors.
- For greater realism, we will **also opt for models that break down a diversified company's sales by business line** (so as to apply a different emission factor to each business line).
- It is difficult to draw conclusions about **purely bottom-up models**, as we have not had access to these methodologies in detail. However, we do find them appealing in principle as they aim to resemble a company's operational reality as closely as possible.
- Within the limits of the representativeness of our sample of quantitative data, we were able to draw the following conclusions from a series of simple statistical tests carried out on Scopes 1 & 2:
 - **The data points estimated** by the different models for a same company **are highly dispersed**, indicating a **low degree of consensus between data providers**.
 - **An analysis of the differentials between the estimated data established by different models on the one hand, and data reported on our sample of stocks on the other, suggests that the prolongation of data reported for the previous year is among the most reliable modelling methods** (but, by definition, it requires reporting from the previous year!), followed by regression models

and bottom-up models. “Sector average” models, in general, show the greatest variance vs. reported data.

- When we **calculate the sum of the estimated data vs. the sum of the reported data**, we can see that **differentials diminish as the number of companies increases**, with estimation errors cancelling one other out. **So when it comes to monitoring a portfolio’s and/or sector’s carbon footprint, the issue of data quality becomes less crucial than when differentiating between companies.**

For Scope 3:

- **Estimated data established by EIO-LCA models are the only data that provide orders of magnitude for Scope 3 upstream and downstream emissions.** Given the lack of precise reported Scope 3 data, this model is the only possible option for an investor wishing to incorporate Scope 3 data (which is preferable in any approach based on impact and contribution) throughout a portfolio. However, **in the case of certain specific sectors, bottom-up modelling based on physical indicators is preferable for Scope 3 downstream emissions.**
- **Setting aside these considerations regarding the data itself, the user also needs to think about the use of “absolute” data vs. “normalised” data. This can be examined at the issuer level or at the portfolio level.**
- **At the issuer level**, absolute emissions are the indicator that most closely resemble reality in terms of climate impact and that make it possible to monitor this impact (from a long-term management perspective). However, if the data are not normalised, then it is not possible to draw comparisons between issuers or assess the efficiency of an industrial process and any changes.

Normalisation will make it possible to draw comparisons between companies and is a proxy for a company’s operating performance (the notion of efficiency). However, these figures become sensitive to the variability of denominators which, themselves, have no link to climate issues and/or operational progress. So, if the data is available and relevant, we will opt for intensity levels with physical indicators rather than the denominator, even though these are necessarily on a sector-wide / business-wide level and therefore do not really make it possible to draw intra-sector comparisons...

- **At portfolio level, the issue is a different one. A number of indicators are available on an aggregate basis with different purposes in mind:**
- **Is it a question of measuring (and, why not, changing) a portfolio’s exposure to the carbon risk and the carbon efficiency of issuers included in the portfolio?** In this case, we reckon **the portfolio’s weighted average carbon intensity** is the most relevant indicator in that it is immune to the notion of asset class and is only interested in the portfolio’s efficiency, not the number of euros invested. This is a **rather risk-focused approach**, in keeping with the spirit of the TCFD and with one of the pillars of Article 173, but much less so with the spirit of the TEEC label, which seeks to measure the investor’s contribution (positive in this case), via their assets, to the energy and ecological transition.
- **Is it a question of measuring (and, why not, controlling and diminishing) the amount of carbon for which the assets or euros invested are “responsible”?** The notion of “ownership” thus becomes crucial again and we are once again dealing with the Enterprise Value vs. Market Capitalisation debate (with their market effects and volatility disconnected from operational issues and even more so from carbon issues). For Equity, we reckon that the following aggregates – “Total portfolio emissions” or “Total financed emissions” - are the most relevant in that they do not lose sight of the notion of “absolute”, which is essential if we are looking to establish responsibility (as

opposed to reasoning in terms of intensity). For Fixed Income or diversified portfolios, we can think of nothing better than to reason in terms of Enterprise Value intensity, although we still find it puzzling.

As regards the asset management objective sought, portfolio carbon footprinting is a rather good reporting tool as envisaged under French regulations, even though it does not cover all aspects: risks, impact and contribution.

To sum up, going back to our three objectives, **carbon data appears to be an interesting tool to address the 'impact' objective** (to measure and potentially optimise the impact of investments) **but only very partially useful in measuring 'contribution'** (it makes it possible to identify the most dynamic companies and partly to help set "2°C-compatible" targets). **However, with respect to the 'risk' objective, carbon data is only really useful in providing information about regulatory risk and much less so when it comes to physical and transition risks.**

Meanwhile, carbon footprinting is a useful tool to begin with when looking at divesting or decarbonising a portfolio, but it is inadequate as a standalone stock picking tool, when redirecting assets to low-carbon solutions (green solution providers) or when measuring positive contributions to the energy transition.

Given all of the above and the long list of imperfections found in carbon data, but especially the climate issues that this method fails to cover, we are sticking with our three objectives approach but it needs to be supplemented with others. Lots of approaches have indeed been proposed, but their methodologies are often still too immature or discretionary. There are many objectives, aimed at introducing:

- A more forward-looking dimension (stranded assets, potential emissions, 2°C compatibility, exposure to physical risks).
- A more qualitative dimension (climate strategy, climate risk management).
- A more 'climate benefit' dimension (emissions avoided, green share).
- More discrimination (brown share).

But each of these approaches requires as thorough an analysis as that offered in this report on carbon footprinting...

Understand emerging regulations

Help investors and more specifically those that do not specialise in ESG (Environment Social Governance) themes understand and comply with article 173 and the building of products compatible with the French TEEC (Energy and ecological transition for the climate) label



Identify available tools to address them

Devise an objective, accessible and educational mapping of already or potentially available tools to factor in and take stock of the extent to which climate challenges are taken into account in asset management, focusing in detail on carbon footprinting, which is the most mature tool at this stage.



Enlighten choices

Reflect on methodological challenges and their consequences on strategies targeted by investors

Part 1: The momentum is there...

1. The climate emergency
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3. ... but still a lot of trial and error and scope for interpretation
4. Regulators are tackling the issue
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Part 2: Focus : Carbon Footprinting – Entry into “action” mode

1. What questions should be asked?
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7. Qualitative and quantitative deciphering of the estimation models
8. What carbon indicator to use at the issuer’s level?
9. How to measure a portfolio’s carbon performance?

Conclusion: Beyond Carbon Footprinting – Some focus areas

1. Available indicators and suitability with targets set
2. Focus 1: What about avoided emissions ?
3. Focus 2: Green vs. Brown Shares
4. Focus 3: Climate stress tests / climate impairment tests?
5. Example: a composite approach - The NXS COP index’s climate filter
6. Example: Infrastructures – a labelling approach : the SuRe® standard

Appendices

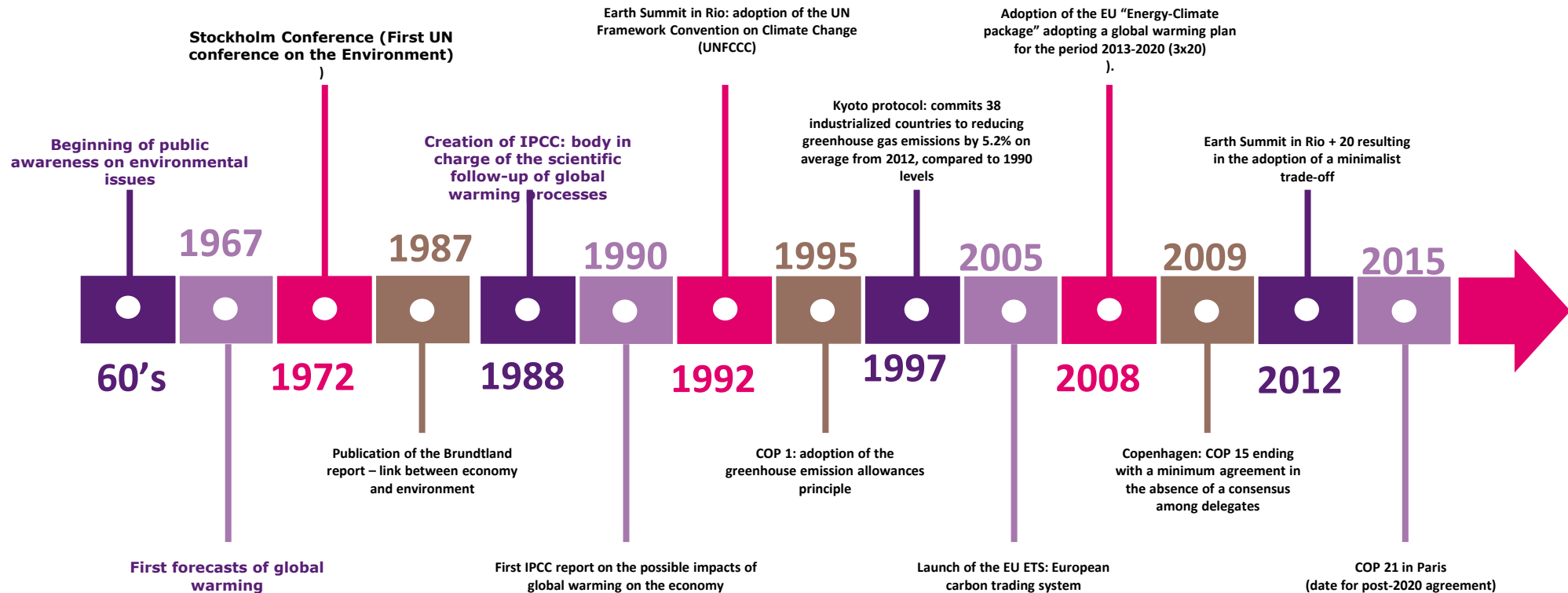
Part 1

The momentum is there...

1

The climate emergency

Climate: a struggle dating over 40 years



Observation: immediate action

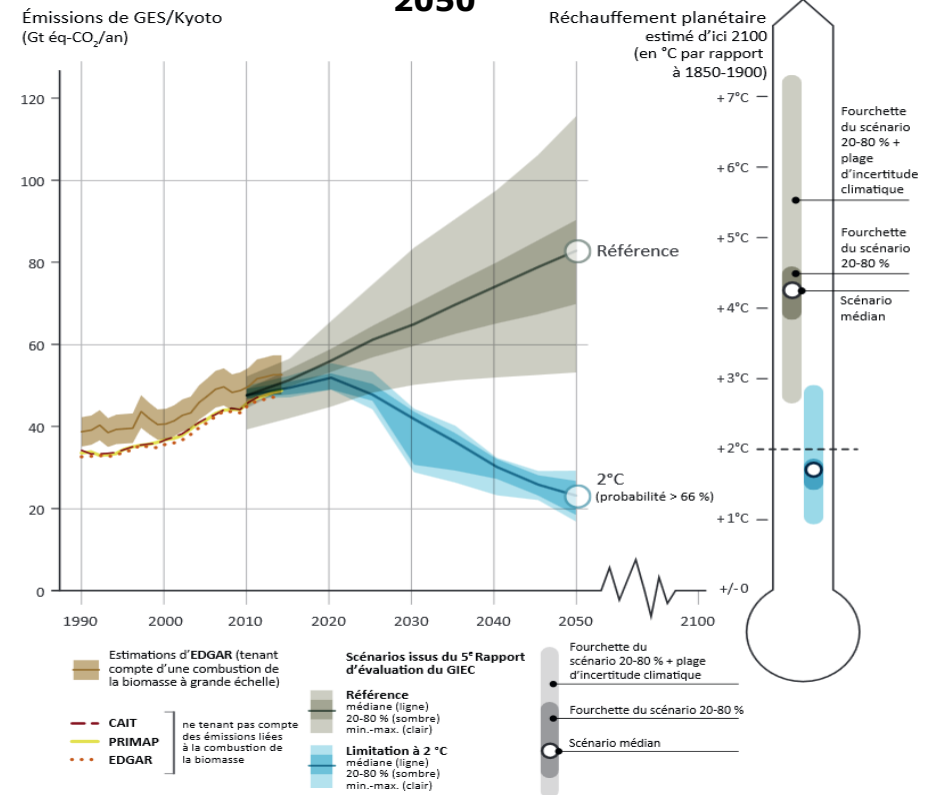
Without further efforts, the **United Nations Environment Programme (UNEP)**, based on IPCC* work, estimates that the level of emissions is on a path towards global warming of between 3 and 7°C by 2100 (compared to 1850-1900 averages).

At this pace, its **consequences** (global warming, biodiversity losses, particle pollution, resource depletion) would be out of control and heavily impact our economies. The confidence level of IPCC scientists on the **anthropogenic causes of global warming stands at 95%**.

The **Stern report** (2006) estimates the loss of global GDP in 2050 at 5% at least compared to 2005.

Beyond the economic cost, some costs (social, political, biodiversity) cannot be modelled based on our current knowledge.

Historic GHG emission levels and forecasts out to 2050



Source: Natixis Global Markets Research SRI & UNEP– 2015 Emissions Gap Report. p2.

* IPCC: leading international body for the assessment of climate change established by the United Nations .

Where do priorities for action lie?

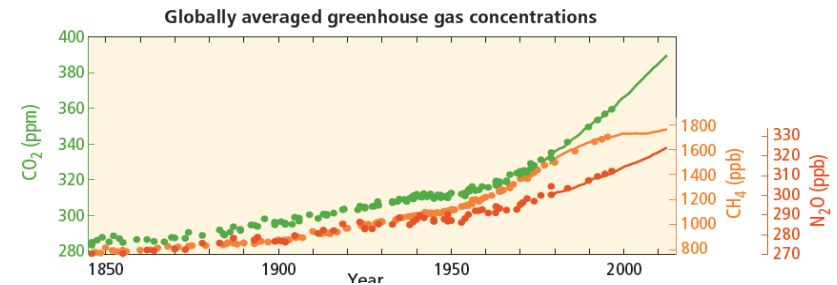
A phenomenon at the heart of climate change: **the increasing concentration of greenhouse gases (GHG)** in the atmosphere.

The population growth and unprecedented economic development we have experienced for over a century have resulted in a concentration of greenhouse gases (CO₂, methane (CH₄), nitrous oxide (N₂O)) that has been unequalled in 800,000 years. They raise the question of the **limits, at least for the next generations** of: renewal and/or depletion of natural resources; capacity of ecosystems to absorb the increasing pollution without major disruption.

4 sectors are mainly responsible for global GHG emissions:

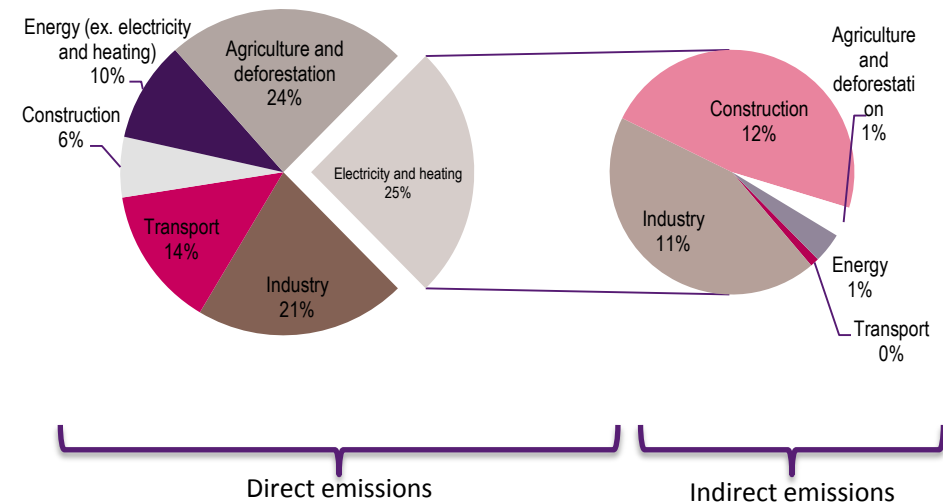
- **Energy:** electricity production, oil, gas, charcoal
- **Mobility:** road, rail, air, maritime transportation
- **Construction:** construction, renovation, maintenance
- **Industry:** heavy industry (steel, cement, chemicals, etc.) and other industries

The inevitable transition to a low-carbon economy imposes a new framework for assessing risk management and opportunities for these sectors



Source: GIEC (IPCC) – 5th Assessment Report – Synthesis Report – Summary for Policymakers. P3

GHG emissions by sector 2010 - 49 Gt CO₂ eq



Source: GIEC (IPCC) Climate Change 2014 : Mitigation of Climate Change p. 9

COP 21: time to convert the try

The climate agreement adopted in Paris on 12 December was widely acclaimed as a success by the various parties involved in the negotiations.

- **Binding**
As defined by international law (ratification process open as of 22.04.16)
- **Ambitious:**
 - Limiting global warming to **"well below 2°C"**, and even to **"below 1,5°C"** by the end of the century, i.e. a goal equivalent to a **GHG emissions reduction target of between 70 and 80% by 2050, and zero emissions in 2100.**
 - Trending towards **carbon neutrality**: "achieving a balance between the anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century"
- **Flexible: Monitoring, Reporting, Verification (MRV) mechanism**
 - Mitigation targets drawn up at national level
 - Revised up every five years

⇒ Challenge: a solid operational roll-out in the private sector

- **Somewhat disappointing ambitions on the financing component**
 - Developed countries legally obliged to financially assist developing countries but no quantified targets
 - \$100bn pa in (public/private) climate financing from developed countries as of 2020 appear in the non-binding part of the agreement
 - Threshold to be revised up in 2025
- **Carbon pricing confirmed**
 - The (non-binding) Decision part introduces the notion of carbon pricing
 - Art. 6 on the mechanisms for international cooperation for reduction, provides for part of the reduction being completed via concerted initiatives, via mechanisms open to private and public organisations.

For further information, see our previous reports



2

Issuers and investors: mobilisation is already underway...

Issuers Emergence of a low-carbon economy

Energy

Major power producers have to revise their model (e.g. EON, RWE)

Issuers

Increasing number of climate actions

Companies are increasingly taking the climate into account

- According to the CDP, in 2015, companies reported 8,335 projects/initiatives to lower their emissions in 2015 (versus 7,285 in 2011).
- The most common are:
 - Improving energy efficiency of building and manufacturing processes
 - Installation/construction of low-carbon energy generators
 - Behavioural changes (e.g. cycle-to-work schemes)

Growing incorporation of internal carbon pricing within companies:

- According to CDP, 1,000 companies have implemented or will implement an internal carbon price within the next two years.
 - In 2015, 435 companies said that they used an internal carbon price, compared with just 150 in 2014.
 - 582 are planning to do so.

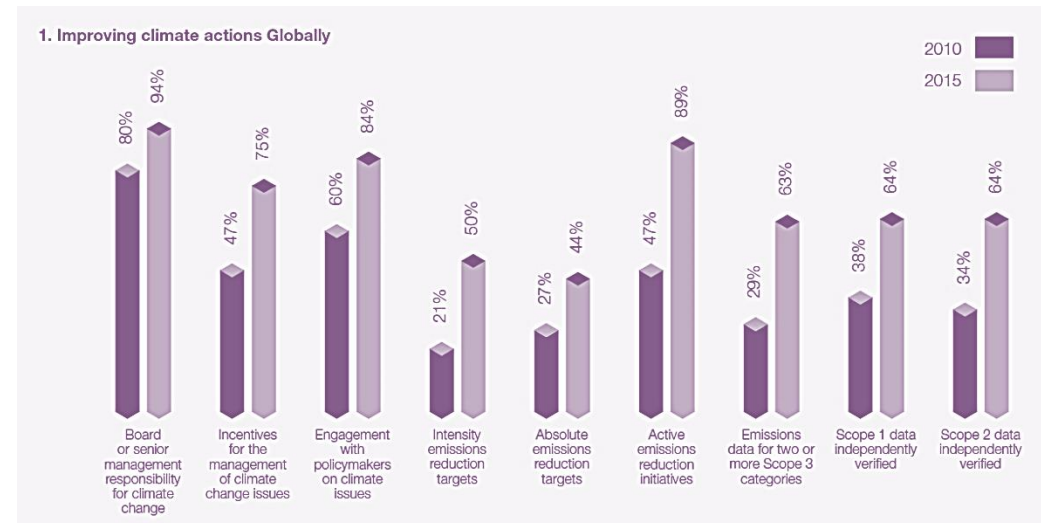
The UNEP estimates that collaboration initiatives existing between companies, cities and regions could deliver a 3 Gt reduction in CO₂eq in 2020.

- This represents a third of the gap that currently exists between government targets and a scenario avoiding dangerous climate change

The B20 (an event during the G20) will focus on “green” financing in 2016.

The B20 – a coalition of groups of companies from G20 economies – announced in February that the priority for its “growing task force” in 2016 would be to work on green financing.

- This announcement echoes the setting up of the Green Finance Study Group by the G20, co-chaired by the Bank of England and the Bank of China, with the UNEP as the secretariat.



Source: CDP, Global Climate Change Report 2015, p6.

Investors

Integration is part of their fiduciary responsibility

A strategic milestone has been reached. Taking the climate into account is a commercial challenge

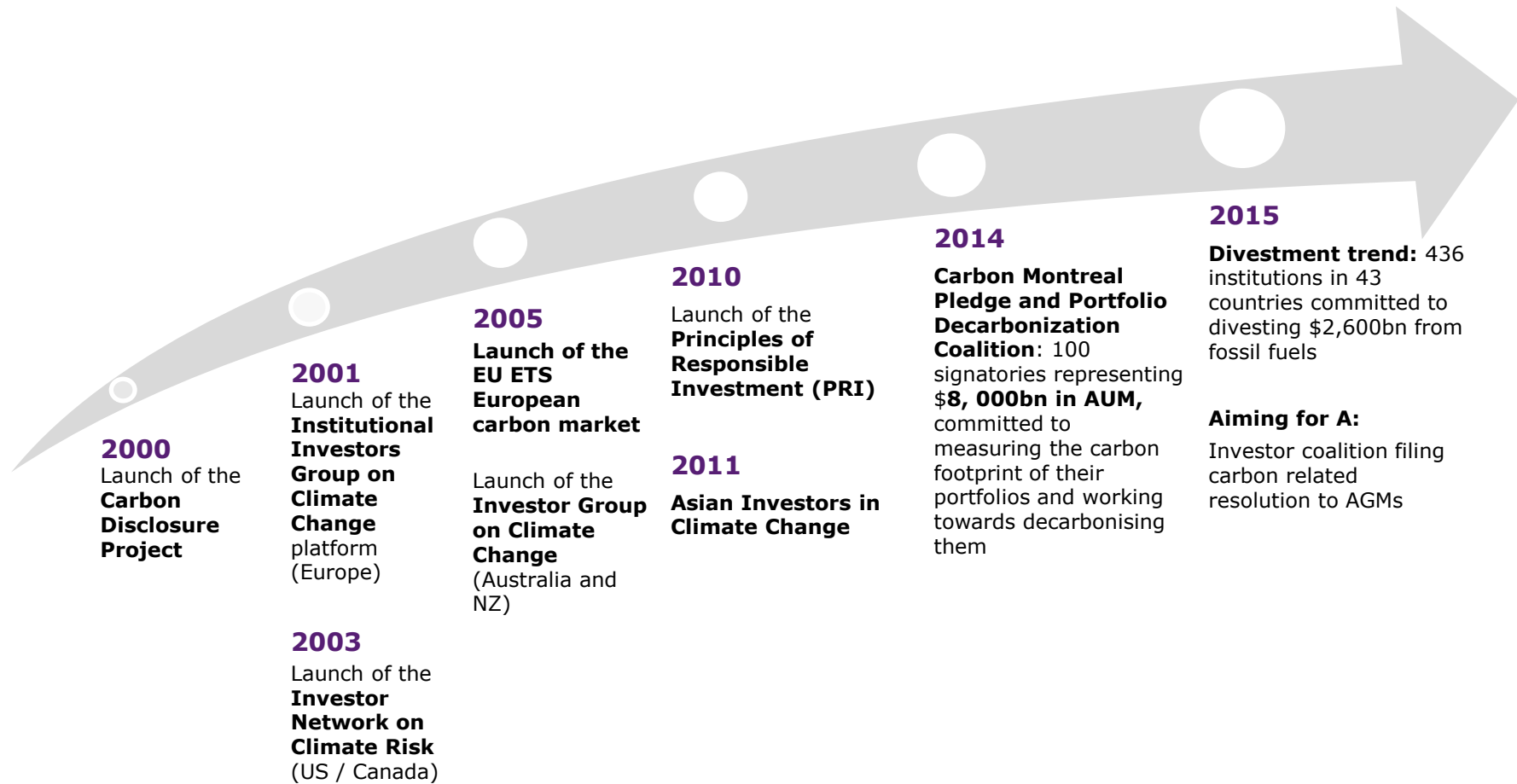
- **Pressure on asset owners, particularly public**
 - Increasingly incorporated into management tender invitations
 - Devising of fund labels, tax or regulatory incentives
 - A differentiating commercial challenge: first-mover premium
- **A risk analysis challenge**
 - Size of environmental liabilities
 - Stranded assets & reserves
 - Profitability challenges for fossil fuel and carbon-intensive sectors
 - Regulatory sanctions or scrapping of grants
- **Identification of lucrative segments for investment**
 - Growth stocks
 - Innovation & consumer trends
 - Public support
- **Regulatory incentives (cf. France)**

Reputation risk & risk of controversy

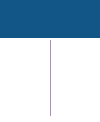
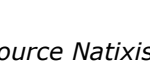
- **Far-reaching campaigns from influential NGOs: Go Fossil Free/Keep it in the Ground/Appel de Paris/Asset-Owner Disclosure Project**
- **Highly-visible international meetings: UN Climate Summit in 2014, Climate Finance Day (May 2015), COP 21**
- **Heading for the emergence of litigation risk?** (cf Client Earth and Asset Owners Disclosure Project jointly launched the Climate and Pensions Legal Initiative (CPLI))

Investors

Truly collective mobilisation



Main investor initiatives

	Initiatives	Members & goals
	TCFD – Taskforce on Climate related financial disclosure	Mandated by the FSB (Financial Stability Board) to develop a voluntary reporting framework on climate-related risks for companies and destined for investors, bankers, insurance companies and other financial stakeholders.
	Low Carbon Registry	Voluntary registry proposing a public low carbon & clean energy database A Global Investor Coalition on Climate Change initiative open to institutional investors (53 participants representing \$50bn)
	Global Investor Statement on Climate Change	Joint investor statement on their potential contribution to low-carbon and resilient investments and on how to optimise public leverage => 404 investors representing \$24,000bn in AuM
	IIGCC Initiative on EU Company Climate Lobbying	Coordinated letter from the IIGCC on behalf of 51 investors representing \$4,400bn in AuM calling for companies to report their position on climate challenges to which they are exposed and the alignment with their lobbying policy
	PRI Montreal Pledge	100+ investors pledged to report their carbon footprint (goals: define reduction targets and/or engagement strategies) => over \$10,000bn in AuM pledged from 120 investors
	Portfolio Decarbonization Coalition	Facilitated by CDP and the UNO. The goal is to trigger, document, present investors' decarbonisation measures (reducing carbon footprint, divestment, green investment) to governments => \$600bn in AuM pledged
	Fiduciary Duty & Climate Change disclosure	Lobbying of a group of companies and investors untied around a Climate Change Reporting framework, in the name of their fiduciary duty.
	Portfolio Carbon Initiative	Financial reporting and indicators approach
	Institutional Investors Group on Climate Change	120 members, 9 countries, \$13,000bn in AuM Collaborative platform aiming to show strong and consistent demand from investors to act in the face of climate change
	Aiming for A & similar initiatives	Coalition of investors aiming to submit climate-related resolutions to the vote at shareholder meetings: 14 companies in the energy sector have had to deal with shareholders' resolutions on their social and environmental policies.
	Carbon Asset Risk (Ceres)	Ceres Initiative aiming to throw light on the fossil fuel sector's stranded assets => IIGCC and Carbon Tracker partnership
	Climate Bond Initiative	Organisation working to mobilise a maximum of capital to finance climate solutions via the promotion of green bonds and the promotion of public policy standards and models in this regard.
	CDP Carbon Action	Investor Initiative aiming to speed up companies' actions to reduce GHG and improve their energy efficiency to deliver a satisfactory ROI => 304 investors, representing \$22tn in AuM, requesting that high carbon-emitting companies (1,300 companies in 2015) make commitments.

Asset owners – insurance companies & pension funds are leading action

Public commitments of the Top 10 European insurers

Institution	Country	AuM (EUR bn)	Divestment	Green investments commitments
Top 10 European Insurers				
AXA	France	612	EUR 500m from coal assets	EUR 1 bn by end 2015 EUR 3 bn by 2020
Aegon	Pays-Bas	454		EUR 3 bn (investments in wind farms, solar energy, affordable housing, geothermal and sustainable timber)
Allianz	Allemagne	402	*	EUR 500 m by end 2015 (clean energy investments) EUR 2.4 bn renewable AuM
Generali	Italie	393	*	500 (climatically-responsible bond)
CNP	France	331	*	560 (renewable energies, clean tech and other green investments and green bonds)
Aviva	UK	326	Divesting from fossil fuel	USD 3,9bn by 2020 (Investments in renewables and energy efficiency)
Prudential	UK	305	*	Massive renewable investor
CASA	France	266	*	Invest EUR 2bn in green bonds by 2017
ING	Pays-Bas	200	*	*
Zurich	Suisse	158	*	Invest EUR 1bn & USD 1bn in green bonds by 2020

Investor	Country	Type	Amount	Timeline
Allianz SE	Europe	Insurance company	€500 m	In 2015
APG AM	Netherlands	Asset manager	€2 bn every year	2016 - 2018
Aviva Plc	United Kingdom	Insurance company	£500 m every year (€708 m)	2015 - 2020
Axa	France	Insurance company	€3 bn	2015 - 2020
European Investment Bank	Europe	Public financial institution	25% of lending portfolio (€19.1 bn in 2014)	Every year
Bill and Melinda Gates Foundation	USA	Foundation	€1.8 bn	2015 - 2020
CalSTRS	USA	Pension fund	\$3.7 bn (€3.34 bn)	2019
Government Pension Fund Global	Norway	Pension fund	NOK50 bn (€5.5 bn)	-
Caisse des Dépôts Group	France	Public financial institution	€15 bn	2014 - 2017
PFZW	Netherlands	Pension fund	€16 bn	2015 - 2019
PKA A/S	Denmark	Pension fund	€1.5 bn	In 2015
Zurich Insurance Group	Swiss	Insurance company	€1.8 bn	In 2015

A number of other players are taking action:

CDC, Zurich, FRR, ERAFP, Norwegian fund, bcIMC, OTHP; CDPQ, PSEU, CalSTRS, CalPERS, AP4, AP2, Rockefeller Family fund, NY State pension fund, Blackrock, etc.

Green bonds: many investors are making commitments...

Public commitments toward green bonds New assets? Arbitrages?

- ✓ **Barclays Bank Treasury** - \$1.6bn invested at end-2015 – Another \$1bn committed in 2016
- ✓ **Actiam (ex-SNS)**: \$1bn by end-2015 – Over \$900m invested
- ✓ **California State Treasury** - \$1,1bn by end-2015
- ✓ **Zurich Financials**: \$1bn (mandated to Blackrock) + €1bn in direct AuM (\$800m invested in 2015)
- ✓ **KfW**: setting up of an investment portfolio of €1bn in green bonds
- ✓ **Deutsche Bank (Treasury)**: announced investment of €1bn in a portfolio of "high-quality liquid assets in Green bond format as part of its liquidity reserve investment" **CASA (Treasury)**: \$1bn committed
- ✓ **HSBC (Treasury)**: \$1bn committed - \$350m already invested
- ✓ **Bangladesh Central Bank**: appetite for investing some of its currency reserves in green bonds
- ✓ **Aviva Investors**: committed to expand its portfolio in 2015
- ✓ **AP2 and AP4** have voiced strong commitments and substantial allocation to green bonds . AP2 will dedicate 1% of its total AuM to green bonds.

Launch of dedicated green bond funds

- ✓ **Mirova** Green bond – Global (June 2015)
- ✓ **Erste** Responsible Bond Global Impact (May 2015)
- ✓ **SEB** Green Bond Fund (June 2015)
- ✓ **Columbia Threadneedle** Social Bond Fund
- ✓ **State Street** Global Advisors (launch announced)
- ✓ **AXA IM** (November 2015)
- ✓ **Allianz GI** (November 2015)
- ✓ **Humanis** Green bond fund (September 2015)
- ✓ **NN IP** (ex ING) (January 2016)
- ✓ **Amundi** (December 2015)
- ✓ **Blackrock** (January 2016): Sustainable bond ETF
- ✓ **AIM** (Alternative Investment Management- Mars 2016)
- ✓ **Foresight Group**: EUR 200m green bond (direct infra debt) (Apr 2016)
- ✓ Expected from: Legal & General, Pimco?

See our research on Green bonds for more in-depth analysis



3 ... but still a lot of trial and error and scope for interpretation

A joint effort...

- 25 signatories
- \$3,200bn in AuM
- 50% signatories have set themselves formal decarbonisation targets on investments worth \$600bn

... built up around 4 major strategies...

- Reducing portfolios' carbon footprint
- Raising investment in low-carbon infrastructures
- Divesting capital from certain sectors or companies
- Engagement strategies

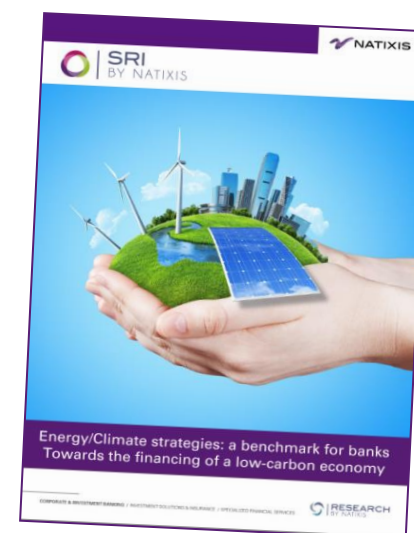
... But commitments vary widely

- **Focus/differing degrees of granularity**
 - sectors
 - businesses
 - issuers
- **Scope of reporting**
 - Scopes 1+2;
 - Scopes 1+2+3 downstream;
 - Scopes 1+2+3.
- **Impacts sought**
- **Target deadlines**
- **Performance monitoring indicators**
 - Potential emissions tied to (proven) fossil fuel reserves
 - Absolute emissions
 - Changes in emissions
 - Scores for carbon emission management
 - Issuers' E&S score
 - Carbon performance of a portfolio vs. benchmark index
 - Total investment in low-carbon strategies
 - Impact indicators

Low participation rate from big banks

	Montréal Carbon Pledge	Portfolio Decarbonisation Coalition	Global Investor Statement on Climate Change	Carbon Asset Risk	CDSB Fiduciary Duty Statement	Climate Bonds Initiative	IIGCC Initiative on EU Company Climate Lobbying	Investor Expectations on Corporate Climate Lobbying	CDP Carbon Action
BBVA									BBVA
Banco Santander									Banco Santander, Santander Brasil AM
Bank of America				Bank of America M					Bank of America Merrill Lynch
Barclays						Barclays Plc.			Barclays Plc.
BNP Paribas	BNP Paribas Investment Partners	BNP Paribas Investment Partners	BNP Paribas Investment Partners		BNP Paribas		BNP Paribas Investment Partners		BNP Paribas Investment Partners
Citigroup				Citigroup					
Credit Agricole	Amundi		Amundi		Amundi Asset Management		Amundi Asset Management		Credit Agricole
Credit Suisse						Credit Suisse			Credit Suisse
Deutsche Bank							Deutsche Asset Management		Deutsche AM Investmentgesellschaft mbH, Deutsche Bank, Deutsche Postbank
Goldman Sachs									Goldman Sachs AM, Goldman Sachs Group Inc.
HSBC	HSBC GAM					HSBC Holdings Plc.			HSBC Global Asset Management (Deutschland) GmbH, HSBC Holdings plc, HSBC INKA Internationale Kapitalanlagegesellschaft mbH
ING								NN Investment Partners	ING Group N.V.
Intesa SanPaolo									
JPMorgan									JPMorgan Chase & Co.
Morgan Stanley				Morgan Stanley					Morgan Stanley
Nordea	Nordea		Nordea Asset Management				Nordea	Nordea	Nordea Asset Management
RBS									RBS
Societe Generale									SG
UBS							UBS Asset Management		UBS AG, UBS Global Asset Management
Unicredit			Pioneer Investments			UniCredit SpA.			Pioneer Investments, UniCredit SpA.

See also our dedicated report



4

Regulators are tackling the issue

Regulators

Climate reporting: expectations vary widely

15 of the G20 countries require some climate-related reporting

15	G20 countries have a mandatory corporate climate change reporting scheme
15	schemes require reporting of direct GHG emissions (scope 1)
6	schemes require reporting of emissions related to consumption of purchased energy (scope 2)
0	schemes require reporting of indirect emissions (scope 3)
4	schemes encourage reporting of indirect emissions
9	schemes encourage reporting of information other than GHG emissions (e.g. risks, strategy)
15	schemes apply to companies within national boundaries
2	schemes also apply beyond national boundaries
12	schemes require verification of information
12	schemes provide penalties for non-compliance
14	schemes specify methods of GHG emissions calculation
12	schemes provide reporting guidance

International Transparency, the final hurdle to taking action

Regulatory momentum mostly being driven by the financial sector

Speech by Mark Carney, governor of the Bank of England and Chairman of the FSB (Financial Stability Board), about the “tragedy of the horizon” (Sept. 2015)

- **An initial typology of climate-related risks**
 - Physical risks
 - Transition risks
 - Legal risks
- **A clear reference to the “carbon budget” and to the notion of “stranded assets”**

Speech by François Villeroy de Galhau, governor of the Banque de France (Nov. 2015)

- **The financial sector’s exposure to climate risks & stranded assets**
- **Article 173 & carbon stress tests**

International mobilisation

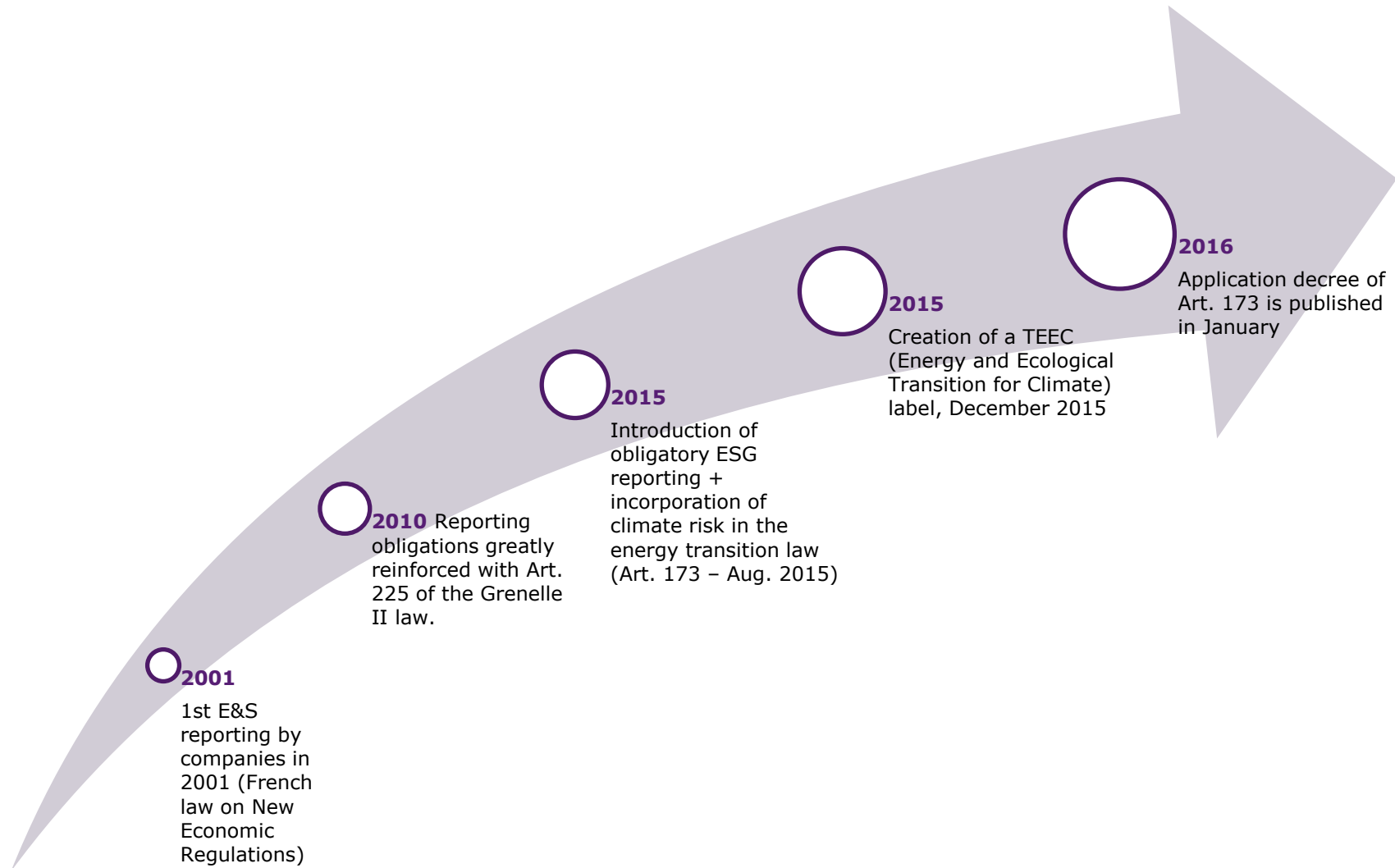
- **G20 – an active climate stakeholder at the COP 21 process is bringing the financial sector on board**
 - April 2015: the G20 finance ministers and central bank governors ask the **FSB (Financial Stability Board) to work on the issue of incorporating climate risk into the financial sector’s practices**, with a mandate to establish a reporting framework for companies and participants in the financial sector
 - ⇒ November 2015: **Proposal for the FSB to set up a TaskForce**
- **World Bank / IMF & UNEP Inquiry: “The Financial System We Need”: lobbying for ESG to be incorporated into public policy, financial regulations, accounting standards & rating agencies**
- **SSE – Sustainable Stock Exchange – an international initiative bringing together lots of stock exchanges that are thinking about the role they could assume in improving the ESG transparency (and performances) of companies (when they list on their respective stock exchanges)**

- **December 2015: the G20 launches the “Task Force on Climate-related Financial Disclosures” (TCFD)**
 - **Aims to establish guidelines for companies to report climate risk information so that the financial industry takes it into consideration more effectively**
 - **Composition revealed in late January:**
 - Preparers and users of financial information
 - Financial and non-financial companies
 - **Targets and scopes defined**
 - Define what constitutes solid financial reporting of physical, legal and transition risks relating to climate change
 - Financial and non-financial companies
 - **The recommendations made by UNEP-Fi to the TCFD:**
 - 1 – Include the financial sector’s climate reporting in the task force’s mandate
 - 2 – Distinguish approaches, obligations and indicators required for reporting depending on whether the party concerned is a: company / participant in the real economy / institutional investor / other financial agent
 - 3 – Distinguish between climate risk targets and climate performance targets (and include performance in the task force’s mandate)
 - 4 – Argue in favour of integrated reporting by including accounting standards experts and auditors in the task force
 - 5 – There is a need to factor in a forward-looking vision and variations in the financial sector’s climate exposure (risks & opportunities)
 - 6 – There is a need to incorporate the Paris Agreement’s impact on corporate valuations into accounting standards
 - **April 2016: publication of the TCFD’s first report specifying the scope and key objectives submitted for consultation**
 - A market-based approach distinguishing between short, medium and long-term risks and systematically looking for materiality
 - An approach aimed at standardisation and at the capacity to be forward-looking, quantitative and qualitative
 - Objectives: information that is comparable, reliable, clear, effective
 - A focus on financial risks, including physical and non-physical climate-related risks, transition risk and legal risk
 - A focus on issuers of public securities, listed companies and key financial-sector participants;
 - Attention given to setting up effective risk management mechanisms
- ⇒ **The FSB’s original purpose is to improve awareness of the level of risk posed by climate change to the financial system’s systemic stability**
- ⇒ A very good overview of the key fundamentals of climate reporting and the big challenges that need to be overcome
- ⇒ How are sectors expected to adapt (cf. what is expected especially of fossil fuel companies)?
- ⇒ An exclusive focus on reporting: what role does finance have to play in steering the transition?

5

France: climate regulations ahead of their time?

A regulatory framework is emerging



Energy transition law for green growth (LTE – 18/08/15) - Article 173 under the microscope

Measures for companies:

- For listed companies, the chairman of the board publishes in a report attached to the annual report the **financial risks linked to climate change effects and the measures that the company is taking to reduce them by implementing a low-carbon strategy in all aspects of its activity** (amended Art. L225-37 of the Code de Commerce)
- A separate report (for listed companies and certain unlisted companies) must include information about how the company is taking into consideration the social and environmental consequences of its activity, including **“the consequences in terms of climate change of its activity and of the use of the goods and services it produces”**. A decree sets out how such information must be presented (amended Art. L225-102-1).

Applicable as of YE 31.12.16

Measures for banks (climate stress tests)

- Credit institutions and finance companies implement mechanisms, strategies and procedures that are controlled internally on a regular basis and enable them to detect, measure and manage the risks to which they are or might be exposed as a result of their activities (Art. L511-41-1 of the Code de Commerce).
- Art. 173 of the LTE adds that this report must include **“the risk of excessive leverage and the risks brought to light by stress tests that are carried out on a regular basis.”**
- Art. 173, V. B mentions that the government will have to submit to Parliament, by 31.12.16, a report on the implementation of a scenario of regular stress tests that are representative of the risks associated with climate change.

The specific content of these climate stress tests for banks still appears to be under discussion

Measures for fund managers

- **Who?:** “insurance companies, mutual insurance companies, pension funds, asset managers, CDC, supplementary pension providers, supplementary pension providers for temporary state and public authority employees, public institution managing the public scheme for mandatory supplementary pensions, national pension fund for local authority employees.”
- **What?** The report and information must mention:
 - 1/ **“the way in which** criteria relating to compliance with Environmental, Social and Governance targets are **incorporated** into their investment policy”
 - 2/ **“the measures taken to contribute to the energy and ecological transition”**
 - 3/ **“the exercise of voting rights** attached to financial instruments resulting from these choice”.

A decree determines how this information must be presented (cf. following slides)

- **A focus on climate:** the article specifies that “taking into account exposure to climate risks, especially the measurement of GHG emissions associated with the assets held, as well as the contribution to complying with the international target of limiting global warming and achieving energy transition targets” were among the information required to take environmental targets into consideration

Applicable as of YE 31.12.16

Implications of the application decree for fund managers

Objective:

- Introduces new transparency and reporting obligations as regards the incorporation of ESG factors for institutional investors, especially climate risks

Size threshold:

- Entities with assets under management of less than €500m and / or belonging to a group whose total consolidated balance sheet amounts to less than €500m can limit their reporting to general information about the entity.

Approach:

- Adopt an incentive-based approach to encourage investors to take such issues on board, by helping them to develop tools and approaches

“Comply or explain”:

- According to Article 1, §II. paragraph 4° of the decree, an entity can opt to supply only some of the information described in the decree provided it can justify its decision (comply or explain). So there is a way out for fund managers that want to commit only “minimally”.

Timetable

- The first disclosures are expected with the full-year annual reports for the year beginning 01.01.16 and up to 30.06.17 at the latest.
- The public authorities will provide an update on implementation on 31.12.18

Structure:

- Paragraph I: field of application
- Paragraphs II and III: information to provide and explanations required regarding the choices made

Implications of the application decree for fund managers

1. General transparency:

- **Basically the decree expands on existing provisions from the decree implementing Art. 224 of the Grenelle law.**
- **The entity must publish:**
 - A general presentation of how it takes ESG criteria into account in its investment and risk management policies;
 - The way in which it informs end clients of how the ESG criteria were taken into account;
 - The % share of assets under management to which it applies this policy;
 - Its potential adherence to any charters, codes or other initiatives, as well as any labels obtained with respect to the integration of ESG criteria;
 - A general description when the entity implements a risk management policy, internal procedures to identify risks associated with ESG criteria and the entity's exposure to these risks.

2. Building ESG criteria into investment policies

- **With respect to ESG-related information itself, and the way it is integrated into investment policies, the text does provide for some flexibility, such that the criteria may be adapted to suit the specific nature of each entity**
- **The fund manager can make specific distinctions depending on its lines of business, asset classes, portfolios, issuers (or whatever category is relevant), but must provide justification for them.**
- **The company can provide "grouped" information for a group of funds with the same characteristics. The following information must be provided:**
 - A description of the ESG criteria applied, notably in terms of addressing climate change-related risks;
 - A description of the general information used to decide whether ESG targets are being met, such as ratings, financial and non-financial data, annual reports, internal and external analyses, and all other types of relevant information;
 - A description of the methodology used and the results of the analysis. These descriptions can include, when appropriate, the main underlying hypotheses and their compatibility with the international objective to limit global warming, and explanations about the appropriateness of the method and scope applied.
 - A description of the means of incorporating this analysis into the entity's investment policy and, notably, the changes implemented as a result of the analysis and their field of application: disposals, changes in risk management processes, strategies for, and changes in, engagement policies (both in terms of issuers and delegated managers working under an investment management mandate), voting policies and a review of how well these policies have been implemented.
- **We note that regulators place a lot of emphasis on voting and on engagement in their approach to managing climate change risks**

NB: Details about the "static" or "dynamic" aspect and the significance threshold applied have disappeared from the final text. So have details concerning the description of climate scenarios and the time horizon considered, including at least one scenario compatible with the international objective for limiting global warming.

Implications of the application decree for fund managers

3. Focus on environment / climate aspects

Selection of environmental criteria:

- Indicate that they take account of exposure to climate-related risks (physical consequences and / or transition-related risks)
- Indicate that they can demonstrate a contribution to the fight against global warming as well as to the energy and ecological transition

The methodologies used (according to their relevance in terms of the activity being analysed and the nature of the assets under consideration) may concern:

- i) **the consequences of extreme climate-related events and changing weather patterns;**
- ii) changes in the **availability of natural resources** and their development in compliance with climate change targets;
- iii) **investments in the development of fossil reserves, and those consistent with a low-carbon strategy;**
- iv) information concerning the **implementation of public policy in line with the international target for curbing global warming;**
- v) the **measurement of current and/or future greenhouse gas emissions related to the issuers (securities) included in the investment portfolio.**

In this case, entities will be obliged to specify the general characteristics of the **analytical methodology** used, the **“scope” of issuers’ emissions**, the way in which it gives rise to a **risk analysis** and the **denominator used to calculate the intensity**, as well as a definition of the **weightings used in aggregating carbon intensities**;

- vi) **measuring and stating the AuM invested in funds focusing on sectors contributing to the energy and ecological transition;**
- vii) pointing out any factors enabling the relevant assessment of the entity’s **exposure to risks** relating to climate change and its **contribution to the international target** to curb global warming

Integration of the results of the analysis in the investment policy:

- The information incorporated will have to describe how the entity **uses its analysis to contribute to the international goal of limiting global warming and to achieve the energy transition objectives**
- Reporting must provide a “dynamic” view: the entity shall provide indicative targets (set for itself depending on its activities and the nature of its investments), as well as measures taken to achieve the targets, commenting on the achievement and/or failure to achieve the targets.
- Note that the legislator reserves the right to define **“a benchmark typology”** for these targets in the future

The TEEC (Energy and Ecological Transition for Climate) label – 1/5

Objective:

Help to finance the energy transition by earmarking a portion of savings to it.

Labelled funds “**respect criteria relating to their direct or indirect contribution to the financing of the energy and ecological transition**” and can attest to “**the quality and transparency of their environmental characteristics**”

Method:

Labelling is voluntary but with a **reference framework**, and **governance** is highly **prescriptive**.

Governance:

All of the criteria to be respected are recorded in a “reference framework” published by decree (to date, the final decrees have not been published), defining **1/ exclusions 2/ “green” activities**

This reference framework is set to change depending on revisions made by the Label Committee (around 20 people, state, investors, civil society, qualified persons), sitting with the Ecology, Sustainable Development and Energy Ministry.

Certification procedure:

A fund manager wishing to label one of its funds chooses a labelling organisation. The labelling organisation evaluates and controls the fund’s compliance or non-compliance with the label’s requirements.

* **Initial on-site audit + interviews with the fund management teams**

→ Certification delivered for a one-year period

* **Follow-up audits (which may lead to corrective measures if areas of non-compliance are detected)**

Eligible assets:

Funds falling under the UCITS directive; alternative investment funds (AIF) without substantial leverage, i.e. investment funds with general fields of interest; employee savings funds.

Geographical constraints: the assets of these funds must consist of securities / receivables of issuers 75% of which have their head office in the EU (except for bond funds, for which this geographical constraint is lifted).

Timetable

- The first labelling organisations were selected on 2 March: they are EY and Novethic.
- The first labels are expected to be handed out in spring 2016

Central to the decree: “green” activities and “exclusions”

The TEEC label’s nomenclature draws its inspiration from the CBI’s (Oct. 15), with a few adjustments:

- Activities excluded by TEEC (fuel-efficient vehicles)
- Specific descriptions (photovoltaic solar power, thermodynamic solar power plant, wind farms)
- Eligibility of categories currently not included by CBI (“more work required”)
- A “Services” category was added to the “Energy”, “Buildings” and “Industry” sectors
- Same nomenclature adopted (cf. appendices)

Strict exclusions (€0 of authorised sales):

- **exploration-production** and **exploitation of fossil fuels**
- the **nuclear** industry as a whole

Partial exclusions:

- **distribution / transport companies and producers of equipment** and services, to the extent that more than **33% of their sales are generated from clients in strictly excluded sectors.**
- companies that generate **more than 33%** of their sales from **storage centres and landfills without greenhouse gas capture systems**
- companies that generate more than 33% of their sales from **incineration without energy recovery**
- companies that generate more than 33% of their sales in energy efficiency for **non-renewable energy sources** and energy savings linked to the **optimisation of extraction, transport and production of electricity from fossil fuels**
- **Forest exploitation and peatland farming**

The TEEC (Energy and Ecological Transition for Climate) label – 3/5

Pillar 1: Environmental and financial targets governing asset selection

These targets must be **described clearly in the marketing material** produced for investors, specifying the **impacts targeted** by taking environmental criteria on board and the **associated financial targets** if relevant.

Mapping the “green share”

- The fund manager must report the share of sales contributing to the energy transition (“**green share**”) on a line-by-line basis for each existing and newly created portfolios
- It must describe the methodology and the way in which it influences its investment policy

Methodology for private equity funds fully or partially invested in unlisted securities

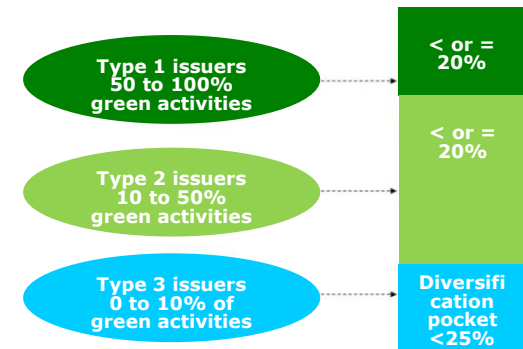
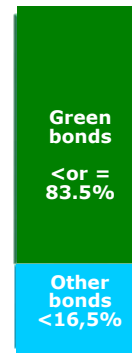
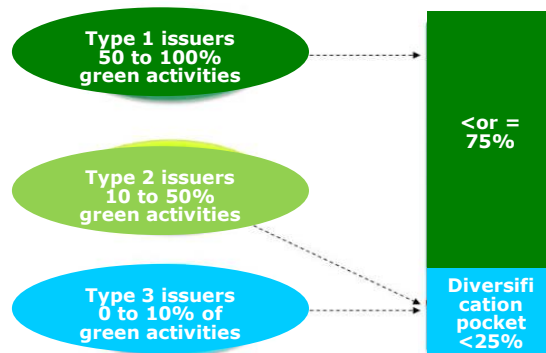
- 75% of the fund's total assets must have more than 50% of sales contributing to the energy transition.
- The source of information used to calculate this percentage must be indicated

Methodology for bond funds

- The percentage of assets invested in green bonds must be over 83.5%.
- The reference framework describes as green bonds any bond that respects the Green Bonds Principles and 90%-finances projects falling under the category in the appendix (cf. next slide)

Methodology for all other funds invested in listed securities: structured into 3 categories

- **Pocket 1:** at least 20% of total assets must be invested in companies more than half of whose sales contribute to the energy transition. (This minimum percentage does not seem very demanding to us).
- **** Pocket 3 (diversification):** 25% (or less) of the fund may be invested in companies more than 10% of whose sales contribute to the energy transition or in other types of receivables.
- ***** Pocket 2:** its size, varying according to categories 1 and 3, may be invested in companies between 10% and 50% of whose sales contribute to the energy transition.
- Once again, the asset manager must specify the source of information used to respond to the three categories above.



Source: Reference framework of the TEEC Label – Ministry of Ecology, Sustainable Development and Energy

Pillar 2: Incorporation of ESG criteria in the construction and life of the portfolio

Exclusions for “ethical” reasons

- Issuers that contravene the Convention on anti-personnel mines (Ottawa, 1997)
- Issuers that contravene the Convention on cluster bombs (Oslo 2008)

Active monitoring of ESG controversies

... stating:

- the frequency
- the ex-ante and ex-post mechanisms relating to a controversy

... publishing:

- the list of excluded companies following a proven, severe and repeated controversy
- the exclusion period
- and / or (where applicable), the companies underweighted because of controversies

The TEEC (Energy and Ecological Transition for Climate) label – 4/5

Pillar 3: Evidence to be provided on the fund's positive impacts on the EET

Measuring the real contribution of its investments to:

- the energy transition
- the fight against climate change

For each indicator provided, the fund must state:

- Its coverage in terms of the number of issuers and assets under management;
- Its scope;
- Its calculation method (indicating any changes in the method or scope from one year to another);
- Any difficulties encountered in establishing the indicator and the reasons for which any complementary indicator(s) is/are proposed;
- An analysis of its variation over the past three years (however, within the first two years of a fund being labelled, indicators may apply to just year “n” in the first year and then in years “n” and “n-1” in the second year)

Reporting in 4 areas: the fund must describe its performance by producing at least 1 of the indicators proposed below

Reporting domain	Objective	Metrics proposed
Climate Change	Measure GHG emissions of investments or Ensure that the portfolio composition is 2°C compatible	- Scope 1 and 2 emissions + first level suppliers and products sold (CO2 t eq or other applicable GHG, yearly) normalised proportionally to sales (CO2 teq / €m of sales) - Avoided CO2 (in t / year) - 2°C compatibility climate performance metric
Water	Reduce water consumption and maintain its quality level	- Total water consumption equals to the total volume of withdrawn water minus the total discharges (liquids and steams). It is also the water used as raw material in products or conditioning and production processes. The results of this analysis can be normalised proportionally to one unit of activity - Volume of water reused from collected and treated wastewater, normalised by unit of activity
Natural Resources	Preserve natural resources	- Natural resources (included critical ones) consumed (t/€m of sales) - Share of renewables in energy mix - Recycling-based raw materials production
Biodiversity	Preserve ecosystems' biodiversity	- % of issuers reporting their spending in biodiversity preservation / number of companies in the portfolio - Average issuers' spending for biodiversity preservation, normalised by sales

Note that carbon footprinting has made a comeback

Certification by a third party

Fund managers must also provide (where applicable) proof of assurance or verification by a third-party organisation of the indicators produced, as well as a comparison between these indicators and any benchmarks if they exist.

Brief comparison of Art. 173 / TEEC Label

	TEEC Label	Art. 173 (measures for fund managers)
Approach	A prescriptive approach (but certification is voluntary)	Incentive-based approach + Comply or Explain (Art1. §II. paragraph 4) Flexibility in choosing which information to report depending on the asset classes in question
Objective	Contribute to financing the energy transition	Improve the information available on the incorporation into investment policies of criteria relating to compliance with ESG objectives and resources allocated to the energy transition
Information required	Green share (and construction of funds accordingly) Monitoring of ESG controversies (e.g. mines & cluster bombs) Evidence of impacts, with an external process for verifying the indicators reported - Climate change (measuring emissions or compatibility with the 2°C target) - Water: reducing consumption and maintaining quality - Natural resources: preserving natural resources - Biodiversity: preserving biodiversity Complying with strict or partial sectorial exclusions	How ESG criteria are incorporated into investment policies Resources allocated to the energy and ecological transition: dynamic approach required Exercise of voting rights attached to financial instruments
Climate focus	The keystone of the label consists of: the nomenclature of the reference framework defining eligible activities Energy (solar, wind, bioenergy, hydraulic, geothermal, other, distribution and management, storage, CCS, services) Building (green buildings, energy efficiency, energy capture systems, services) Waste management / pollution control: circular economy leading to energy and GHG savings, technologies and products, CCS, landfill gas capture) Industry (energy efficiency products, energy efficiency systems and processes, cogeneration, regeneration, etc., heat recovery, reduction in GHG not linked to energy production, eco-efficient manufacturing processes, services) Transport: rail freight and transport, urban rail transport, EV, hybrid vehicles, alternative fuel vehicles, bus rapid transit, bicycle transport, biofuels, aviation biofuels, logistics) ICT: data centres run on renewable energies, low-carbon infrastructures, products and technologies running from a smart grid, substitution technologies Agriculture and forests: agriculture, forest activities that emit less carbon and in relation with forest sequestration, agriculture with low GHG emissions, carbon sequestration and climate resilience Adaptation: to water, adaptation of infrastructures. strict or partial sectorial exclusions	The decree emphasises environmental factors when specifying the type of reporting required: "E" criteria dealing with the risks posed by climate change - Physical risk - Transition risk - Contribution to mitigation and the transition Methodologies / Results: specify the underlying hypotheses and their compatibility with the international objective to limit global warming. Cover (among the following): - Extreme weather events - Availability of natural resources - Investments in fossil fuels - Implementation of public policies relating to the international target of limiting global warming - The portfolio's current or future GHG emissions - Investments in TEEC theme-based funds (linked to the TEEC label) - Any other relevant information Explanation of the impact on investment policy - Disposals - Integration into risk management processes - Engagement policies - Voting policies - An overview of measures implemented
Who?	Any fund manager wanting to label a fund - Funds falling under the UCITS directive; - Alternative investment funds (AIF) without substantial leverage, i.e. investment funds with general fields of interest; - Employee savings funds.	"Insurance companies, mutual insurance companies, pension funds, asset managers, CDC, supplementary pension providers, supplementary pension providers for temporary state and public authority employees, public institution managing the public scheme for mandatory supplementary pensions, national pension fund for local authority employees. " Fewer requirements for entities with AuM < €500m
When?	The Energy Ministry is in the process of selecting labelling organisations First labels expected in spring 2016 (April /May) if there are no administrative delays	1st reporting for 2016 30.06.17 at the latest 1st overview by the public authorities in 2018

6

How to incorporate climate issues into an investment strategy?

A typology of climate-related risks for the financial sector appears to be emerging

Category	Definition	Taxonomy	Type of assets concerned
Physical risks	Exposure to the physical consequences of climate change	1. Operational risks (stock-outs in the supply chain, operational setbacks, deterioration in working conditions) 2. Risks to assets (short and/or long term) 3. Risks of an increase in costs (insurance, energy consumption)	Equity / Fixed Income Equity / Fixed Income / Infra / Real Estate Equity / Fixed Income / / Real Estate
Transition risk	Exposure to the consequences of climate change that comes with the emergence of a low-carbon economy	1. Regulatory developments / disruption 2. Fiscal developments / disruption 3. Technological developments / disruption	Equity / Fixed Income / Infra / Real Estate Equity / Fixed Income Equity / Fixed Income / Real estate / Infra
Legal risk	Exposure to a multiplication of legal proceedings launched against fund managers for inadequately taking transition risks and physical risks into consideration	1. Companies (executives / board members*) accused of inadequate integration / transparency as far as climate risks are concerned 2. Asset managers accused (fiduciary duty)	Equity / Fixed Income Equity / Fixed Income / / Real Estate

Setting risk aside, “Climate” can also be incorporated with three objectives in mind

Three objectives, each with its own nuances...

Exposure to risk

Demonstrate that fund management strategies aim to reduce the exposure of assets under management to climate change-related risks

Impact

Demonstrate that fund management strategies aim to reduce the climate impact of assets under management (and thus help to achieve the international target for reducing emissions)

Contribution to the transition

Demonstrate that fund management strategies contribute to the energy transition

Various strategies to achieve these objectives

	Assets concerned	Demonstrate that climate change-related risks are taken into account			Reduce the negative impact on the environment	Demonstrate a contribution to the energy transition
		Physical risks	Transition risks	Legal risk		
Divestment - Negative screening / exclusion (e.g. fossil fuels) - Terminate financing	Equity Fixed income Infra / Project finance		✓	✓	✓	
Engagement - Shareholder engagement - Shareholder activism	Equity	✓	✓	✓	✓	✓
Climate = a driver for investment decision-making during the investment process for the portfolio as a whole or line by line, via an approach that factors in:						
- "Green vs. brown share": - At portfolio level - At issuer level - Time t vs. forward-looking	Equity / Fixed income		✓		✓	✓
- Carbon footprint / decarbonisation - In absolute terms - vs. a standard benchmark - vs. a low-carbon benchmark - vs. a 2 °C trajectory benchmark	Equity / Fixed income Less common for other asset classes		✓	✓	✓	
- Pure green players & green projects	Equity / Fixed income Infra / Projects		✓			✓
- Climate resilience (exposure to physical risks & mitigation)	Infra / Projects Equity / Fixed income	✓		✓		
- "Green" impacts (CO2 avoided, impact indicators) - At portfolio level - At issuer level	Infra / Projects Equity / Fixed income				✓	✓
- Preparation for the transition (mix, regulation, innovation, improvements in operating efficiency, climate strategy, governance, R&D, etc.)	Equity / Fixed Income		✓	✓	✓	✓
- Potential emissions: forward-looking vision (capex – reserves, industrial strategy, climate strategy)	Equity / Fixed income (Energy sectors)		✓	✓	✓	✓ (from a carbon budget viewpoint)
- Exposure to fossil fuels & stranded assets	Equity / Fixed income (Energy sectors)		✓	✓	✓	
- Optimisation of exposure to financial climate / carbon risk (geography, pricing power, business model transformation, etc.) → incorporation into asset valuation models	Equity Fixed income Infra / Project finance	✓	✓	✓		

The momentum is there. But mobilisation is haphazard.

For an investor, there are several possible approaches corresponding to distinct tools and strategies. The key is to have a clear objective, even if it might change over time:

⇒ **Ex-post approach: monitoring & reporting – a snapshot at a given moment**

- ⇒ Compliance with regulatory obligations
- ⇒ Client reporting
- ⇒ Follow-up and monitoring before establishing quantified targets

⇒ **Ex-ante / proactive approach: adapt or create suitable management processes**

- ⇒ **Objective 1: minimise transition risk: minimise the financial carbon / climate risk**
- ⇒ **Objective 2: minimise the portfolio's climate impact: reduce the carbon footprint of assets**
- ⇒ **Objective 3: contribution to the energy transition (reallocation of savings)**
- ⇒ *Via stock-picking approaches or by top down portfolio optimization*

⇒ **“ Impact on investment vs. impact of investment ”**

While the express aim is to finance the economy's decarbonisation and the energy transition, we are convinced that the notion of impact should not be disregarded

And the most obvious absolute sources of carbon gains are to be found in energy-intensive and emission-intensive sectors...

So we call on investors to pay attention to the nuance between portfolios that are "non carbonised" vs. "decarbonised"

By decarbonised, we mean adopting a sectorial approach geared towards investing in sectors that by nature face "climate issues":

- ⇒ **In absolute terms carbonated sectors have the greatest potential for carbon gains across the economy and are thus central to the economy's decarbonisation**
- ⇒ **Sectors that provide low-carbon solutions - how to identify them?**
 - Traditional sector classifications (GICS, ICB, BICS) are not structured with this in mind...
 - FTSE does propose a classification with this in mind
 - Non-financial rating agencies are developing indicators to assess the "green / brown shares of business"
 - The Climate Bond Initiative proposes a useful "taxonomy" although it is difficult to apply to all asset classes because it is project-based and assumes access to highly granular information

⇒ **The "lock-in effect"** (i.e. the idea of extending the lifespan of carbonated assets by providing funds to upgrade them or adopting strategies aimed at extending their lifespans)?

Improving access to data

More reliable carbon data

- Improve reporting by issuers: external checks, emerging countries
- Fine-tune / standardise forecasting methodologies

Complementary information that is more standard

- Green / Brown shares
- Fossil fuel research
- Encourage issuers to improve how they report on the subject

Developing methodologies and metrics for measuring and monitoring risks, that are:

More operational

- Develop indicators to monitor portfolio performances over time
- Build up the track record needed to set targets

More holistic

- Incorporate an ESG analysis of how effectively climate risk is taken into consideration (climate scoring)
- Incorporate complementary information into the analysis (this might require a sector-wide approach)

Reconciling financial performance and decarbonisation

More research to uphold the investment case

- Determine the impact on short- and long-term performance
- Better understand the link between how well companies perform and the reduction in carbon emissions.

Develop products and solutions to guarantee a similar performance with a smaller carbon footprint

- The stakes are particularly high in the case of index tracking under tracking error constraint

Part Two

***Focus: Carbon Footprinting
Entry into 'action' mode***



What questions should be asked?

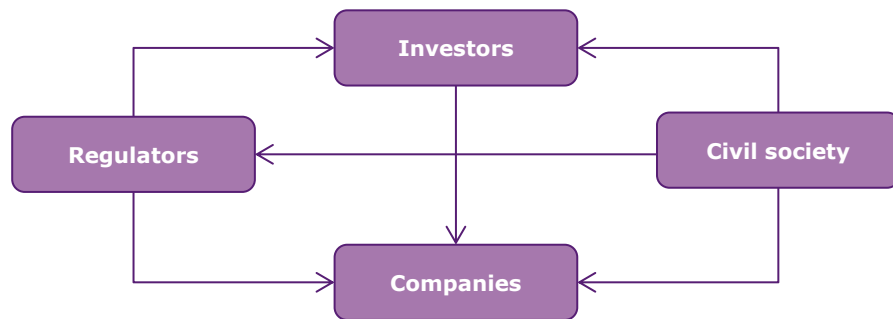
Why such a focus on carbon footprinting?

What are the methodological challenges?

The data providers & asset classes covered

Why such a focus on the part of investors?

The incentives are growing



- A simple, (partly) quantified tool to raise awareness, educate regarding these notions...
- An entry point to take into account climate & carbon challenges
- A tool to analyse the situation
- One of the tools for which the methodologies are the most sophisticated and available

Quantitative data is increasingly available via:

- **The launch of the CDP in 2003**

in 2015: 2,443 companies respond to the CDP of which 2,194 under Scope 1, 2,198 under Scope 2 and 1,721 under Scope 3.

- **First providers in**

- 2006 (Trucost)
- 2008 (Inrate)
- 2010 (South Pole)
- 2011 (MSCI)

- **A new wave of 'carbon' (& beyond) services in 2015**

- Carbone 4 methodology
- CDP estimation methodology
- Launch of Sustainalytics Carbon Solutions
- Launch of Vigeo Carbon
- Launch of Grizzly
- Launch of the Bloomberg service
- Launch of Oekom "Carbon Risk Rating" in partnership with South Pole

Nevertheless carbon footprinting is only an incomplete response to the goals of measuring exposure to climate risk and the contribution to the energy transition

Many questions to be considered before starting ...

What are the possible uses of my data?

Differentiated usage depending on the strategy (Risks, Contribution, Impact)

What assets can I report on?

Uneven availability depending on the providers

What scopes to report on?

Uneven availability depending on the providers
Match with climate strategies

What types of data am I going to work with?

Reported vs. estimated
Scale of sources depending on the providers
Traceability of sources

What is reported data worth?

Availability
Verification process by issuers
Quality assurance process by providers
Quantitative lessons

What is estimated data worth?

4 families of estimation models
Composite approaches per provider
Estimated data verification process
Focus per provider
Our quantitative approach
Deciphering the estimation models
Quantitative lessons

Which carbon indicators to use?

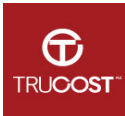
At the scale of an issuer / a portfolio line
At the scale of the portfolio
What about the allocation of 'Carbon' performance?

Is double counting a false problem?

Definition
Its importance should be differentiated depending on the strategies
How to avoid it: Carbone 4 proposal

What are the persistent challenges?

Providers covered

		Carbone 4 Carbone 4 is a consulting firm specialising in carbon strategy, created in 2007. Originally dedicated more to measuring carbon footprints for companies, Carbone 4 developed, in partnership with Mirova and MAIF, the Carbon Impact Analytics, or CIA, methodology, which makes it possible to both report the carbon impact of investments (induced or avoided emissions) and steer the investment strategy to limit exposure to carbon risks, and seize the opportunities offered by the transition. The estimation methodology was developed in-house, using a bottom-up model, and is heavily based on the expertise of Carbone 4 analysts in carbon footprinting. It should be noted that CIA also includes a large share of qualitative analysis, supplementing the carbon data.
		Trucost Trucost is one of the world's leading providers of carbon data (in terms of market share). The company has been active in the field since 2004, performing its first portfolio carbon footprinting in 2005, and more than 1,000 since then, with total AuM analysed of over \$18,000bn. The estimation methodology was developed in-house, based on a mix of the EEIO and LCA approaches, with extensive sub-sector granularity (531 sub-sectors). The company uses a hybrid model with adjustments thanks to statistical regressions and bottom-up analyses of companies by its analysts. In addition to carbon data, Trucost provides a number of indicators / analytical services 'beyond' carbon footprinting.
		Sustainalytics Sustainalytics is an extra-financial rating agency with international stature, formed from the merger in 2008 of several other agencies (SRI Company, Scoris, analistas Internacionales en Sostenibilidad, Jantzi Research, Responsible Research) with over 20 years' experience in extra-financial research. Its carbon data service, Sustainalytics Carbon Solutions, is a new research product, which supplements indicators relating to performance and the management of carbon challenges in Sustainalytics' ESG research department. Other services (Stranded Assets Research and High-Impact Fossil fuels) are also available. The evaluation methodology was developed in-house and is based on a model using statistical regressions between the reported data and variables such as market capitalisation, the number of employees or the 'environment' score defined by Sustainalytics on 40 sub-sectors, for Scopes 1 and 2.
		Oekom Oekom is an extra-financial rating agency created in 1993, covering issuers of equities and bonds (corporate, sovereign and supranational institutions). It is a partner to more than 120 asset managers and asset owners worldwide, representing a total volume of AuM of €600bn. Oekom Carbon Services is a new research product launched in September 2015. It mainly consists in providing a qualitative assessment of the carbon performance of companies via oekom Carbon Risk Rating, and of their exposure to fossil energies (Oekom Fossil Fuel Screening). The portfolio carbon risk analysis part (and the quantitative data) are provided thanks to a partnership with South Pole Group.
		South Pole Group South Pole is a consulting firm in environmental performance, created in 2006, offering a varied range of services for companies and investors, including portfolio carbon footprinting since 2010. To date, South Pole Carbon has audited around \$2,000bn in assets. The carbon data estimation model is based on regression analyses conducted on 200 sectors (the sector breakdown was developed in-house, according to their carbon profiles). 4 variables are tested (employees, revenues, costs of the products sold, geography), i.e. 800 sectors in all. A bottom-up approach is used for some sectors. South Pole also provides a set of indicators / services that go 'beyond' carbon footprinting.
		InRate Inrate is a Swiss extra-financial rating agency with 25 years' experience in responsible investing consulting services. The product offering has included 'climate change assessments' since 2008. The estimation model is based on the EIO-LCA method. A particular feature of Inrate's assessments is that it does not use reported carbon data (and therefore does not provide it when it is available), even though its model is regularly tested against the reported data.

Providers covered

    	CDP	CDP has particular status among carbon data providers, since CDP is an investor initiative created in 2013 with the aim of giving companies incentives to improve and standardise their reporting on environmental issues and carbon emissions. CDP sends a questionnaire each year to collect reported data from companies. While portfolio footprinting is not its core activity, CDP has performed carbon footprinting for some of its members in return for payment since 2012. CDP also produces scores on the 'Transparency' of companies regarding their carbon emissions, as well as companies' 'performances' in terms of the management of their carbon challenges. In 2015, 2,194 companies replied to CDP's questionnaire on climate change, to which should be added 1,738 companies via the Supply Chain project. Finally, at the end of 2015 CDP launched an open-source estimation method, which so far covers 1,300 companies, between 2009 and 2014. For the time being, it focuses on sectors that have the biggest emissions. It is based on regression analyses for Scopes 1 / 2. For Scope 3, it uses either regressions, or the EIO-LCA model.
	MSCI	MSCI ESG Research is an extra-financial rating agency that has been active on subjects relating to climate change since 2007, and which has since incorporated the expertise of other agencies such as Innovest, KLD, and IIRC. It has offered portfolio carbon analysis services since 2011 (Carbon Beta Portfolio Analytics), which were recently improved (May 2015) (Carbon Portfolio Analytics). As well as portfolio carbon footprinting, MSCI also offers tools to measure fossil fuel reserves owned and the potentially related emissions. One of the features of MSCI's approach is that it uses several estimation models according to a 'staircase' sequence, when reported data is not available, starting with 1/ the Company Specific Model (which extrapolates the data reported previously by the company); 2/ for utilities, a model based on physical factors (Company Production Model); 3/ then sector averages at the GICS 4 level (Industry Intensity model), fine-tuned by a reported carbon data database covering 2008 to 2013. 4/ Last, if none of these estimates can be performed, the EIO-LCA model is used with a SIC sector breakdown. Moreover, MSCI provides a set of supplementary indicators / services that go 'beyond' carbon reporting.
	Vigeo	Vigeo is an extra-financial rating agency created in 2002, and recognised in the ESG rating of companies and organisations. Its portfolio carbon footprinting service was launched in 2015, and includes – in addition to quantitative emission measurements – an 'Energy Transition Strategy' score for companies, which are scored differently based on 38 sub-sectors. Vigeo's carbon data estimation methodology uses regression models based on 3 variables (Market cap, number of employees, revenues) across 38 sub-sectors. A feature of Vigeo is that it introduced a 'discretionary' rule aimed at penalising companies that do not report data. Indeed, the estimation provided by the regression will classify the company in one of 4 issuer categories (ranked in ascending order according to the absolute volume of CO2eq emissions). A company that does not report data will then be allocated the emission volumes of the biggest emitter in its category.
	Bloomberg	A well-known provider of financial information, Bloomberg launched a dedicated ESG research service in 2009. It groups together two different tools. A 'basic' service, via ESG research (FA ESG <GO>) providing the data reported by companies – with the possibility for users to retrace the origin of the information, and a more sophisticated service (Portfolio Carbon Footprint Tool – PCFT), in which estimated data is available. The estimation model is based on a carbon intensity average (normalised by assets or revenue) for sector peer groups, with the possibility of choosing levels 1 to 3 of the ICB, BICS or GICS nomenclatures. Note that another Bloomberg tool (PORT) makes it possible to optimise the carbon performance of a portfolio (carbon gap vs. benchmark, explained by the relative gap – under- or over exposure to a sector; carbon gap relative to a selection of stocks). This tool does not give information on a 'stock by stock' basis.
	Grizzly	Grizzly Responsible Investment offers services and research in the fields of sustainable development, corporate social responsibility and responsible investment. Its core business is Research: quantitative analysis (rating and scoring companies), development of new indicators and estimation models (carbon, country, mixed ESG/finance), footprinting and customised benchmarks, the development and launch of SRI financial products (indexes, ETFs, baskets, certificates, etc.). Grizzly stands out by virtue of its sequenced 'staircase' use of several models for estimated data with 1/ an extension of reported data (if data was reported previously); 2/ modelling via emission factors applied to physical data when available (such as, for example: energy, cement, steel production, etc.); 3/ emission factors calculated using the IDWI method (Inverse Distance Weighted Interpolation); 4/ and 5/ two regression methods (from April 2016); 6/ emission factors based on ICB 4 medians.

Mapping of the assets covered by the providers

All asset classes may give rise to a relevant carbon footprinting calculation but for some the methodologies are still at a more embryonic stage and access to data is more limited.

	Equities	Corp. Bonds & Loans	Sov. Bonds	Private Equity	Infra. Debt	Real Estate
South Pole	Entire investible public equity domain 30,000+ stocks	All listed issuers + Non listed upon request	Yes. With Global Footprint Network	Bespoke service	Bespoke service (400 projects covered)	Bespoke
Oekom	See South Pole for quant. data + 3,700 stocks for qualitative assessment of Climate change performances	See South Pole	See South Pole	See South Pole	See South Pole	See South Pole
Sustainalytics	14,000 companies (S&P Global BMI)	14,000 companies (S&P Global BMI)		Yes. (Estimated)		
Trucost	10,000 stocks	300 entities	Potential future dev.	Bespoke service	Bespoke service.	Bespoke service.
Grizzly	10,000 stocks	Under dev.				
Bloomberg	10 000+ (model potentially applicable to all stocks)					300 REITS (ESG data)
Inrate	MSCI developed & Emerging markets	MSCI developed & Emerging markets	Potential future dev.			Only ESG data
MSCI	MSCI ACWI IM universe (ab. 8,500 companies) can be extended to 90% of the market value of Barclays Global Corporate Index.	MSCI ACWI IM universe (ab. 8,500 companies) can be extended to 90% of the market value of Barclays Global Corporate Index.	Under dev.			
Vigeo	2,300 companies (World excl. emerging) Will be extended to 4,300 issuers in 2016 (including emerging)	2,300 companies (World excl. emerging) Will be extended to 4,300 issuers in 2016 (including emerging)	Under dev.	Upon request.	Upon request.	Upon request.
Carbone 4	Stoxx 600 MSCI 450 SP 100	Stoxx 600 MSCI 450 SP 100	Potential future dev.	Upon request	Upon request	Future dev.
CDP	2,194 respondents to the Climate change programme + additional 1,738 non-zero disclosures through the Supply Chain programme + Open source estimation methodology for ~1,300 companies from energy-intensive industries	No	No	Yes Through the Supply Chain programme, CDP has an extensive data base of emissions from non listed companies. If public, then available for use.	No	No



What to do with carbon data?

Carbon data is particularly interesting as it provides signals to assess:

- **Statically:**
 - **Issuers'** liability in climate change (in absolute and relative terms)
 - Exposure to regulatory risk from the introduction of a carbon constraint (covering part of transition risk)
- **Dynamically**
 - The efforts made by companies' to reduce their impact on the climate issue (change over time)

As such, it can be used to opt for the following strategies by serving at least partially one or more of the three main management objectives envisaged:

- **Divestment from the sectors / issuers with the highest carbon intensity/volumes**
 - **Objective 1: Minimise transition risk**
 - **Objective 2: Minimise the climate impact of the portfolio**
 - **Objective 3: Contribute to the transition (reallocation of savings)**
- **Engagement with the issuers with the highest carbon intensity/volumes**
 - **Objective 1: Mitigate the risks (regulatory, etc.) to which the issuer is exposed**
 - **Objective 2: Contribute to reducing the issuer's impact**
- **Investment in issuers with the best reduction**
 - **Objectives 1: Minimise transition risk**
 - **Objective 2: Minimise the climate impact of the portfolio**
 - **Objective 3: Contribute to the transition (reallocation of savings to the most efficient players)**

Carbon data is an imperfect indicator of exposure to the **risks** relating to climate change

Disadvantages	Advantages
It provides no information on exposure to physical risks It gives no indicators on the risk of technological disruption	It can identify the sectors with the highest emissions and therefore - those most exposed to regulatory risk since they have the biggest impact (in absolute terms) on the climate It makes it possible, via surveillance and monitoring, to prepare for the emergence of legal risks

Carbon data is an interesting indicator to show the **attenuation of the impact** of investments on the climate

Disadvantages	Advantages
It does not reflect the cumulative impact of past emissions that the company may have been responsible for	It makes it possible to identify in a portfolio the sectors and assets that have the strongest climate impact, in absolute terms and in terms of intensity In terms of intensity, it makes it possible to set goals for progress and monitor the performance of issuers in a sector

Carbon data is an interesting indicator to show the **contribution** to the energy transition

Disadvantages	Advantages
It does not provide any information on the 'Green share' of companies' products and services ... and therefore is not a good indicator of timely market positioning on low carbon products and therefore the activity's avoided CO2 potential	It can identify the companies committed to reducing / projects undertaken to reduce their emissions - In absolute terms - In terms of intensity It is part of the information needed to set '2°C' compatible targets, as part of a carbon budget approach

Carbon data figures are however keenly awaited communication indicators

- highlighted in the wording of Art. 173
- expected to be a climate change 'impact metric' in the TEEC label

Carbon data provides no information on:

- **Future GHG emissions ('Impact' approach)**
 - Approximations are nevertheless possible "other things being equal".
- **A product positioning favouring the energy and ecological transition (green share) (Contribution approach)**
 - These offers are starting to appear (Trucost in particular).
- **A product positioning enabling GHG reductions in other sectors (Contribution approach)**
 - The definition of Scope 3 of the GHG protocol does not take this aspect into account.
- **Exposure to transition risk relating to technological disruption (Risk approach)**
 - Varies greatly depending on the sector and requires ad-hoc analysis.
- **The compatibility of investment choices with the 2°C objective (Contribution approach)**
 - Methodologies are starting to emerge
 - At the issuer level: cf. 'Sciences-based Target'.
 - At the portfolio level (particularly focusing on certain sectors), by certain providers.
- **Exposure to fossil energies (Risk approach; Impact approach)**
 - Ad-hoc tools are nevertheless available at certain providers
- **Exposure to physical risks (Risk approach)**
 - Particularly important in the infrastructure field with the notion of resilience
- **The "Climate" strategy (particularly vis-à-vis consistency with national and international public policies) (Contribution approach; Risk approach)**
 - Certain 'qualitative' offers from extra-financial research agencies may make up for this lack.
- **Other environmental impacts (natural resources, water, biodiversity, etc.) (Impact approach)**
 - The EIO-LCA models offer the possibility of carrying out this type of estimation however.
 - For some of these categories, separate compatibility projects are gradually being implemented (e.g. CDP's Water Disclosure project).
- **The notion of climate financial risk* (Risk approach)**
 - Litigation risk, impairment risk (cf. locked-in emissions), risk of changes in regulations, customer practice & sensitivity, etc., exposure risk (supply chain, geographical), risk of loss of resilience (cash available - cf. incremental costs vs. necessary technological investments - ability to relocate, pricing power), ability to invest.

** Based on the reasoning developed by Grizzly & 2°investing in the 'Carbon intensity <> Carbon risk exposure' report*



Which scopes to take into account?

Availability

Compatibility with the portfolio management 'climate objectives'

Reminder: 3 scopes to rule them all

At corporate level, the carbon challenge is measured and managed on the basis of the methodology defined by the GHG Protocol*

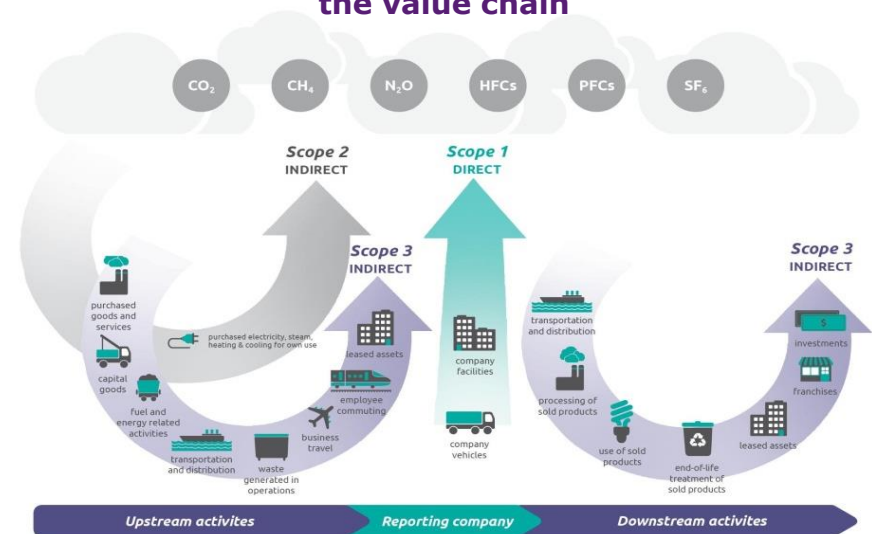
3 types of carbon emissions:

Scope 1: direct emissions, from sources held or controlled by the entity that reports.

Scope 2: indirect emissions linked to the consumption of electricity and to the heat or steam required to manufacture the product

Scope 3: other indirect emissions, linked to the supply chain (upstream) and the use of the products and services during their life cycle (downstream)

Schematic view of GHG Protocol Scopes through the value chain



Source: www.ghgprotocol.org

So far, carbon accounting tools are sufficiently reliable to generate accurate figures for Scope 1 and Scope 2. For Scope 3, models exist but this reporting remains incomplete and can't be compared between companies.

* GHG Protocol: the most commonly used carbon accounting methodology to quantify GHG emissions by companies and administrations www.ghgprotocol.org



In 2011 the GHG Protocol published a standard for calculating Scope 3 emissions (Scope 3 Standard) aimed at helping companies to measure the carbon emissions in their value chain (upstream) and when the goods and products sold are used (downstream)

This standard provides methods for calculating the emissions for 15 categories of Scope 3 emissions

!!!! → The number of categories included in the figures reported by companies vary from company to company.

Upstream or downstream	Scope 3 category
Upstream	1. Purchased goods and services; 2. Capital goods; 3. Fuel- and energy-related activities; 4. Upstream transportation and distribution; 5. Emissions relating to the waste generated in operations; 6. Business travel; 7. Employee commuting; 8. Upstream leased assets.
Downstream	9. Downstream transportation and distribution; 10. Processing of sold products; 11. Use of sold products; 12. End-of-life treatment of products sold; 13. Downstream leased assets; 14. Franchises; 15. Investments.

On what scopes is data available?

	Scope 1	Scope 2	Scope 3 upstream	Scope 3 downstream	Avoided emissions
Carbone 4	Yes	Yes	Yes (when relevant)	Yes (when relevant)	Yes
South Pole	Yes	Yes	Yes (Modelled via EIO-LCA)	Yes (Modelled via LCA)	Yes (For specific sectors and projects)
Oekom	<i>cf. South Pole (cooperation between the two providers on carbon data)</i>				
Trucost	Yes	Yes	Yes (for all sectors)	Yes (certain sectors – e.g. auto)	Yes.
Inrate	Yes	Modelled – Scope 2+3 aggregated data only (separation of figures is being developed)		Yes	
MSCI	Yes	Yes	Reported only	Reported only	Potential for future development
Vigeo	Yes	Yes	Reported only	Reported only	
Grizzly	Yes	Yes		Automotive manufacturers (fleet emissions)	Defined as the improvement in performance relative to a historical performance.
Sustainalytics	Yes	Yes			
Bloomberg	Yes	Yes			
CDP	Yes (Reported)	Yes (Reported)	Questions included	Questions included	Qualitative question

- **All providers can provide Scope 1+2 data**
 - Note that Inrate only provides aggregated 'Scope 2 + Scope 3 upstream' data. However, a change to the model is being examined to bring it into line with reporting on three scopes
- **4 providers gives estimations for Scope 3 data**
- **2 provide Scope 3 data as reported by companies**
- **1 provides downstream Scope 3 data solely for the automotive manufacturer sector (emissions linked to the fleet)**
- **At present there is no consensus on the notion of avoided emissions**

Compatibility with portfolio management 'climate objectives'

Reporting on Scopes 1 and 2 is better than that on Scope 3.

Owing to a lack of reported data, several estimation models cannot really provide relevant estimates for Scope 3.

Alternatives are analyses based on production indicators in certain specific sectors and / or modelling via the EIO-LCA models.

	Exposition to risk	Impact	Contribution to the transition
Scope 1	Emissions most likely to be subject to transition risk (emergence of a regulatory constraint to limit direct emissions). Monitoring them reduces exposure to this risk.	Reflects the company's direct impact in terms of emissions of GHGs into the atmosphere. A decrease in emissions over time corresponds to a reduction in the impact and may reflect efficiency efforts in production processes.	Variations in Scope 1 emissions do not really reflect a contribution to the energy transition beyond the reduction in the negative impact.
Scope 2	Scope 2 emissions (indirect stemming from electricity) make it possible to quantify exposure to a possible carbon constraint and / or an increase in electricity prices. This monitoring minimises the exposure of an asset to this risk.	Scope 2 emissions (indirect stemming from electricity) correspond to emissions of GHGs into the atmosphere, relating to electricity generation consumed. A decrease in emissions corresponds to a reduction in the asset's total impact.	Variations in Scope 2 emissions do not really reflect a contribution to the energy transition beyond the reduction in the negative impact, even though proactively securing green energy supplies helps it become more widely used.
Scope 3	The use of Scope 3 data (in particular downstream) makes it possible to assess the regulatory risk in terms of energy efficiency that certain sectors are exposed to (e.g.: Oil & Gas, Automotive, Chemicals, building, capital goods). As such, these estimations may be used for engagement processes with companies.	Factoring in Scope 3 makes it possible to measure more precisely a sector's impact on climate change. Nevertheless, the data has to be analysed according to the companies' levers for action (pricing power with suppliers upstream, ability to improve product efficiency downstream). Once again, engagement is possible.	Ideally, Scope 3 downstream data should make it possible to identify the players with the most efficient products. However, modelling techniques are not precise enough for Scope 3 stock picking. Moreover, Scope 3 by definition does not capture the potential for reductions that company A's product allows for sector B (e.g. Software)

Scope 3 quantitative data cannot be reported as it stands with a view to making comparisons between issuers.

Nevertheless, the way in which the subject is approached by the asset manager sends a message regarding the depth of its thinking regarding Climate issues.



What types of data am I going to work with?

Reported vs. estimated

The origin of the source data per provider

Traceability of the sources

What types of data am I going to get?

Reported

Based on carbon accounting methodologies

Uneven availability depending on the geographic zones

Uneven reliability (errors in scope, incomplete GHG)

Uneven verification by external third parties

Estimated

Based on estimation methodologies

Strong variability in estimations depending on the models and scopes

Waterfall of sources per provider

Bloomberg

1. **Bloomberg-collected total GHG emissions**; if not available -
2. **Bloomberg-collected total CO2 emissions**; if not available -
3. **CDP collected total GHG emissions**; if not available -
4. **Estimated data**

**If data is suspect:
Bloomberg asks for
feedback**



Carbone 4 collects Scope 1+2 data published by the company when available (annual reports, sustainability reports, **CDP**, etc.), and **systematically checks the consistency of the data** -
Activity data published by the company (revenue, m2 of surface, tonnes produced, no. units sold, etc.) is used to calculate Scope 3 emissions (and Scope 1+2 if needed)



No use of companies' reported emissions data within the model.

However, the model is tested against reported data to ensure the consistency of its results.



1. **Data collected by MSCI dedicated team** (Scope 1,2,3 + fossil fuel reserves) based on annual reports, CSR reports, websites
2. Additionally, MSCI ESG research uses GHG data reported through **CDP / government databases** when non direct reporting available
3. **Estimates**

NB: As part of the data verification (DV) process companies are invited to provide feedback on carbon data.



11. **Scope 1 & 2 reported data** based on **CDP** (~1,500, after removal of outliers)
2. **Company-reported emissions data** (annual reports, sustainability reports, regulatory filings, data **from company feedback**) (~350 companies)
3. **Estimated data**



1. / **Data collection based on CDP**
1'/ Other data sources are screened (annual reports, CSR reports, corporate websites, etc.)
- 2/ **Direct engagement with companies** to get the most recent data points (gathers an additional 10% of companies).
- 3/ **Estimated data**



1. **Data as reported (after verification)**, based on Thomson Reuters / Datastream (i.e. indirectly by **CDP**) or data derived from customised benchmarks used by default
2. **Data as reported but extended if missing**
3. **Estimated data (various models)**



Collection of reported data

1. - **CDP**
 2. CSR Reports
 3. Websites
- The data are cleaned and turned into quality data (25% of reported data is kicked out)



1. **Company Reporting** (annual reports, Factbooks, environmental reports, etc.)
2. **Systematic annual company feedback**
3. **CDP** and National GHG Inventory Sources
4. **Modelled data** via Life Cycle Analysis/Emission factor-based model (to validate, adjust or scale-up the other sources)

+ Verification & Standardisation of data



See South Pole
(Collaboration on Carbon Data)



2,443 companies responded to CDP via its 2015 investor-backed climate change questionnaire, including:

- 2,194 with GHG data available for Scope 1
- 2,198 with GHG data available for Scope 2
- 1,721 with GHG data available for Scope 3 (the Scope 3 categories taken into account vary)

Some providers show the origin of the data that they provide

- **Bloomberg:**
 - The origin of the data provided via the FA ESG <GO> tool may be linked to its source
- **Trucost:**
 - Systematic reference in reports to a taxonomy of sources developed in-house (cf. right)
- **Sustainalytics:**
 - Distinction between reported and estimated in the delivery of carbon data
- **South Pole:**
 - Provides a confidence indicator (trust metric) from 1% to 100% for reported data.
- **MSCI:**
 - Provides information on the origin of the data:
"Reported"
"Derived from reported data"
"Estimated"

Taxonomy of the sources used by Trucost

Source	Code	Description
Data directly from the issuer		
Exact value from Annual Report / 10K/ financials account Disclosure	AR	Exact value taken from the annual report, reference document or similar report (publicly available source)
Exact value from CDP	CDP	Exact value taken from the Carbon Disclosure Project report written by the issuer (publicly available source)
Exact value from Env / CSR	ENV	Exact value taken from CSR reports (publicly available source)
Exact value from personal communication	OTH	Exact value as provided in a dialogue with the issuer
Partial data from the issuer, adjusted by Trucost		
Value derived from Annual Report / 10K/ financials account Disclosure	AR*	Value calculated from data in the annual report: mainly converted from operating data or scaled up.
Value derived from data provided in CDP	CDP*	Value calculated from CDP data: mainly converted from operating data or scaled up
Value derived from data provided in Env. / CSR reports	ENV*	Value calculated from Env / CSR reporting data: mainly converted from operating data or scaled up
Value derived from data provided in personal communication	OTH*	Value calculated from data gathered in a dialogue with the emitter: mainly converted from operating data or scaled up
Data modelled by Trucost		
Derived from previous year	PRE	Data estimated by Trucost from environmental data from the previous year. This estimation is based on the growth in revenues from one year to the next. Specific case where the company stops reporting certain environmental data.
Estimated data	TC	Data estimated by Trucost via the breakdown of revenues and the econometric input-output model.
Estimate derived from production data	TC*	Data estimated by Trucost based on factors specific to the company's industrial processes



What is reported data worth?

Availability

Quality assurance process by providers

Quantitative lessons

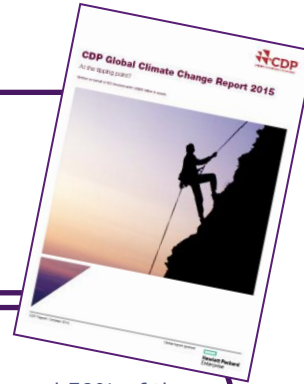
Reported data: what reliability?

An availability issue

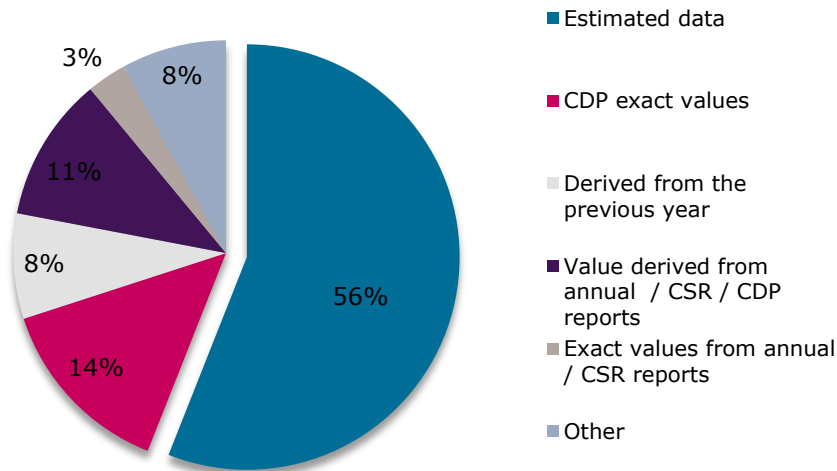
Reported data is increasingly available, but its availability diminishes as the coverage universe is expanded. While a lot of companies report, correction / verification of the reported data is a necessity.

The data collected as part of the Carbon Disclosure Project is a source of data used (directly or indirectly) by all providers (apart from Inrate), among other sources.

- in 2015, **2,443 companies** replied to CDP questionnaires as part of the Climate Change programme.
- This reporting gives rise to a summary report measuring the progress made since the project was launched



Carbon transparency - World Universe (5,500)



Source: Trucost Practical Reporting Errors – 01.07.15

According to **MSCI**, the CDP covers the Stoxx 600 'well', and around 50% of the Stoxx 1800

According to **Sustainalytics**,

- For the Stoxx600, in 2016 data is not available for 8 companies (1.3%); it is **reported for 419 companies (70%)** and estimated for 173 (28.8%)
- For the MSCI Developed Market Index (or around 1,649 constituent companies), around **50% reported in 2014**.

According to **Trucost**, in the 'World' universe **reliable reported data represents 17% of data** (cf. chart left)

- The transparency rate is higher for companies in western Europe even though most of the data has to be estimated or adjusted

According to **Bloomberg**, of **12,000 companies (World scope)**, **2,500 publicly report** their carbon data.

Data for an **additional 500 companies** is available via the CDP. This gives a total of **3,000 reporting companies (25%)**

Reported data – what reliability ...

Differences in reporting depending on the geographic zones (Focus on CDP data)

Responses analysed* by the CDP

Legend:

World

Developed countries

Emerging countries

* The figures correspond to the data analysed by CDP for their 2015 report. They are slightly lower than the figures for companies responding to CDP mentioned in our provider profiles.



Reported data (focus CDP): what reliability?

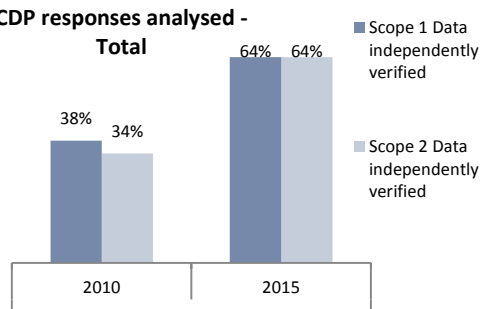
Uneven auditor verification but improving

Data verified by an external third party (Scopes 1 & 2)

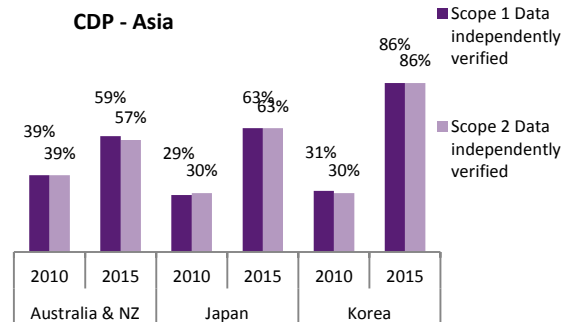
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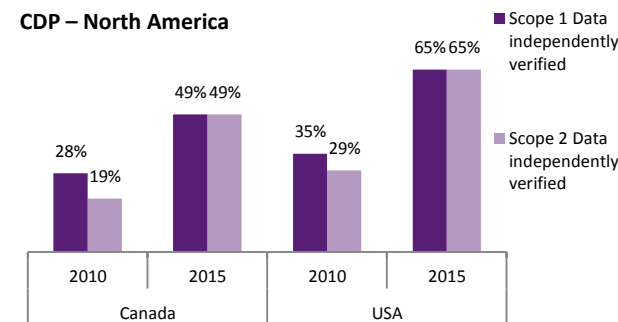
CDP responses analysed - Total



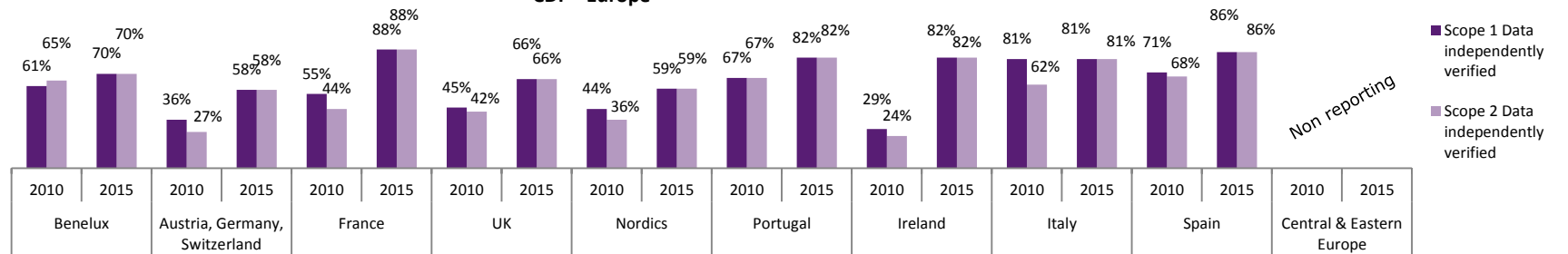
CDP - Asia



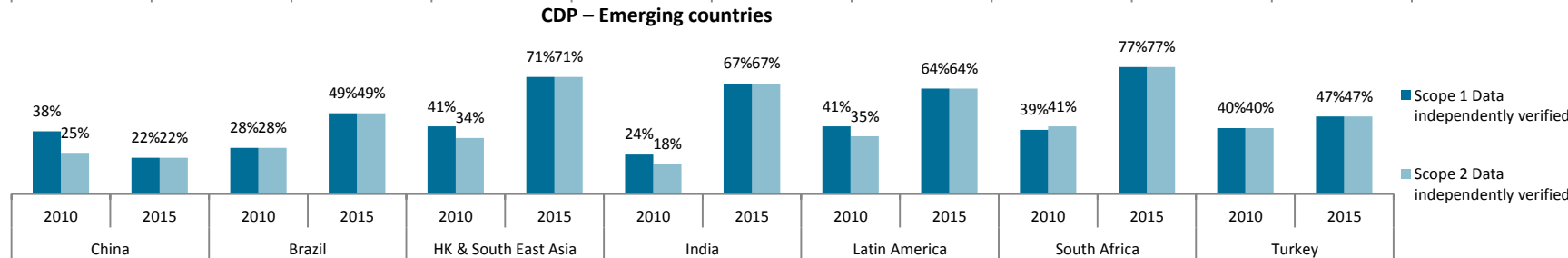
CDP - North America



CDP - Europe



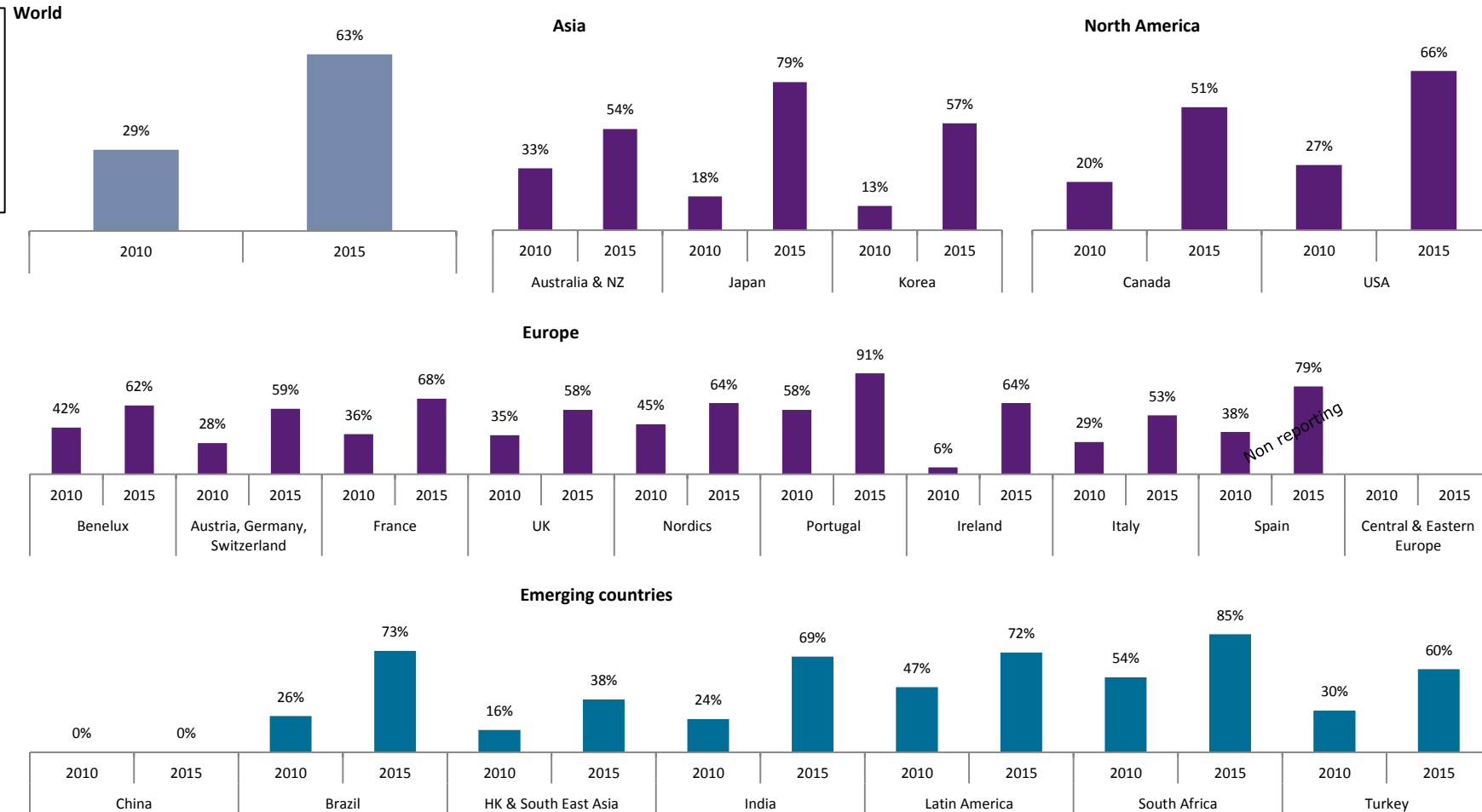
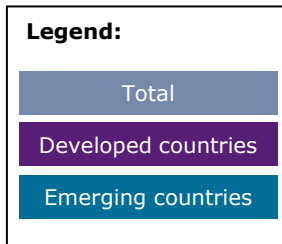
CDP - Emerging countries



Reported data: what reliability?

Scope 3 reporting largely incomplete (Focus CDP data)

Emission data for two or more Scope 3* emission categories



*** NB:**
The CDP questions companies on 17 categories.
The CDP refers to two standards in terms of Scope 3 reporting:

- The 15 GHG protocol categories
- The value chain carbon footprint measurement methodology of the World Resources Institute and the World Business Council for Sustainable Development

On the imperfection of reported data

Reported data is not necessarily closer to the operational reality.

We can distinguish several sources of gaps with reality:

- **The rigour or relevance of the standard, protocol or carbon accounting method used by the company or the emission factors used per activity**
- **Errors in units of measurement in reporting**
 - Use of metric tonnes vs. short tonnes (907 kg)
- **Instability of the scope**
 - Deliberate or involuntary failure to report the emissions of certain subsidiaries or divisions
 - Inclusion of emissions with biogenic sources (e.g. : Scope 1, combustion of biofuels or Scope 3 – end-of-life treatment of waste)
 - Scope 2 data biased depending of the company's reporting choices (emission factors, omission of heat and steam, etc.)
 - Absence of differentiated reporting according to Scopes 1, 2 and 3
- **Difference in the GHGs included in the original estimate**
 - Some companies do not take into account the 6 gases in the GHG Protocol, and only report on CO2
- **Erratic unexplained variations from one year to the next**
 - Simple errors (e.g. decimal point in the wrong place)
 - Changes in scope with no proxy historical data provided

→ In these cases, verification of the reported data is required, involving several types of tests depending on the providers

Reported data: Process for the verification of reported data by the providers

Bloomberg

Varied statistical tests
(conducted on all ESG data)
to ensure its consistency
(detection of outliers and
unusual behaviour, leading to
review by a senior analyst).

Feedbacks requested from
companies when the data is
suspect (5% of companies,
only 40% reply)



**In-house quality
assurance process**
(in-house validation)

**The consistency of the
raw data** is checked.



No use of reported data.

However, the results of the
models are tested against
the reported data.



Tests:

1. Peer Review (verification of consistency vs. peers)
 2. Industry lead review
 3. Ratings Analyst review
 4. Company data verification
 5. Automatic triggers (e.g. significant change from one year to the next)
- In the event of differences between the sources studied, data 1/ with the broadest scope of coverage of the company's activities is selected 2/ that is reported according to the GHG Protocol is selected.



Verification of outliers

Quality control (elimination of reporting with scope that is not group-wide)



Qualitative controls:

- Reporting perimeters
 - Scopes
 - Data consistency
- Verification of the highest and lowest data
- Engagement with the companies

Quantitative controls

- Test of reported data vs. the model giving rise to a supplementary analysis when appropriate
- Use of modelled data in the event that the reported data is not consistent (3% of cases)



Automatic quantitative controls on

1. Abnormal carbon intensities (sector averages + standard deviation)
2. Unusual variations from one year to the next.

These signals give rise to manual verifications



Assessment of the quality of reported data:

- 1/ Historical analysis (variation from one year to the next)
- 2/ Verified data
- 3/ Difference with sector peers
- 4/ Difference between reported data and estimated data (if less than 2% the quality is deemed to be very good)



- Standardisation versus the GHG protocol (unit of measurement errors, scope errors, errors relating to a gas)
- Engagement with the companies
- Quality Management System (Statistical analyses + qualitative verification by analysts)
- Verification of consistency vs. the models

Around 33% of reported data is adjusted by Trucost.



Cf. South Pole



The quality of reported data varies from one company to another depending on the responses to the questionnaires.

CDP applies two layers of verifications:

- 1/ By recommending external third-party verification of reported data (and providing the list of bodies accepted by CDP for this purpose)
- 2/ Verification of outliers vs. peers in the same industry and over time (yoy)

Reported data: Quantitative lessons

2013 reported total (Scope 1+2) GHG Emissions -(t CO2eq)

Company		Provider 6	Provider 8	Provider 7	Provider 5	Provider 3	Provider 4	Min value	Max value	Range	CV
AIRBUS GROUP	Aerospace	1 009 720	1 009 725	1 009 188	1 009 720	1 009 188	1 009 188	1 009 188	1 009 725	537	0%
GALENICA 'R'	Drug retailers	12 561	12 561	12 611	12 611	12 611	12 611	12 561	12 611	50	0%
CARREFOUR	Food Retailers	3 375 000	3 375 000	3 375 000	3 375 000	3 375 000	3 375 000	3 375 000	3 375 000	0	0%
PUBLICIS GROUP	Media Agencies	77 717	77 717	77 717	77 717	77 717	77 717	77 717	77 717	0	0%
KPN KON	Fixed Line Telecommunications	80 900	80 900	37 903	37 903	37 903	37 903	37 903	80 900	42 997	43%
GALP ENERGIA SGPS	Integrated Oil and Gas	4 303 143	4 303 143	4 303 143	4 303 143	4 303 143	4 303 143	4 303 143	4 303 143	0	0%
DSV 'B'	Trucking	3 267 000	3 268 094	3 225 000	3 267 000	3 225 000	3 225 000	3 225 000	3 268 094	43 094	1%
ENEL GREEN POWER	Alternative Electricity	N/A	100 975	100 975	39 121	100 975	100 975	39 121	100 975	61 854	31%
PHILIPS ELTN.KONINKLIJKE	Diversified Industrials	852 000	852 000	852 000	852 000	851 689	851 689	851 689	852 000	311	0%
NESTLE 'R'	Food products	7 800 000	7 800 000	7 799 132	7 800 000	7 799 132	7 799 132	7 799 132	7 800 000	868	0%
GECINA	Industrial & Office REITs	35 289	24 522	28 949	35 289	28 949	28 949	24 522	35 289	10 767	14%
PROVIDENT FINANCIAL	Consumer finance	6 421	5 537	5 537	6 421	5 537	5 537	5 537	6 421	884	8%
HALMA	Electronic Equipment	12 000	21 313	21 304	21 304	21 304	21 304	12 000	21 313	9 313	19%
VESTAS WINDSYSTEMS	Renewable Energy Equipment	100 000	100 000	100 137	100 137	100 137	100 137	100 000	100 137	137	0%
STMICROELECTRONICS (MIL)	Semiconductors	1 369 000	1 369 000	1 369 050	1 369 050	1 369 050	1 369 050	1 369 000	1 369 050	50	0%
LAFARGEHOLCIM	Building Materials & Fixtures	101 800 000	102 100 000	106 499 295	106 499 297	106 499 295	106 499 295	101 800 000	106 499 297	4 699 297	2%
TECHNIP	Oil Equipment & Services	539 204	539 204	539 204	539 204	539 204	539 204	539 204	539 204	0	0%
GIVAUDAN	Specialty Chemicals	217 818	216 950	216 950	217 818	216 950	216 950	216 950	217 818	868	0%
CENTRICA	Gas Distribution	7 146 411	7 146 411	7 044 012	7 146 411	7 146 411	7 146 411	7 044 012	7 146 411	102 399	1%
STAGECOACH GROUP	Travel & Tourism	1 176 664	1 176 664	1 264 913	1 257 183	1 257 183	1 257 183	1 176 664	1 264 913	88 249	3%

For 2013, the reported data provided to us by the providers is fairly similar, even though for some companies, we observe variations relative to the consensus.

These variations are rarely significant however in terms of the order of magnitude (with the exception of KPN, ENEL and Halma)

For the sake of simplicity, we chose the most consensual data among the sample of reported data supplied by the providers.



What is estimated data worth?

Presentation of the 4 families of estimation models

Who does what?

What verification mechanisms?

Presentation of our quantitative sample

EIO-LCA

EIO-LCA methodologies bring together a set of econometric models, which have been perfected in an ad-hoc manner to different degrees by the various providers. The EIO-LCA model is based on an Input-Output (IO) matrix, which represents the economic flows ('E' for Economic) in 'sub-sector' classifications that are often fairly granular (close to the notion of 'activity').

The definition of the **sub-sectors used and how they relate to one another** is generally based on **input / output tables in national accounts** (e.g. US BEA). As these tables also include the 'final consumption' component, they enable a life-cycle analysis insofar as the inputs / outputs between sectors constitute a company's upstream and downstream; **Emission factors are allocated to each activity**. The sources used to allocate these factors vary from provider to provider. They can be **academic sources, sectorial sources and life-cycle analysis (LCA) databases**. Note that their applications are not limited to modelling carbon footprints.

EIO-LCA models are independent of reported data.

Regressions

What methodologies based on **regressions have in common is that they use reported data as the basis for their calculations**, and seek to establish statistical regressions between the reported data of a sub-sector, and an independent variable (such as revenues, employee numbers or market capitalisation).

The statistical validity of these regressions will therefore be influenced by: 1/ **the quality of the reported data**; 2/ **The sub-sector classifications used** (relevance of the company groupings) on which the regressions are tested; and 3/ **the choice of the independent variable** (the relevance of which may vary depending on the groups of companies).

The search for the best regression implies: 1. numerous statistical corrections; and 2. numerous attempts in order to find the best regression

Sector averages & medians

'Sector averages' **are not, in our view, strictly speaking an estimation 'methodology'**, but we chose to include them here, insofar as they constitute the core of Bloomberg's estimations, and certain estimations provided by MSCI and Grizzly (when the other models cannot be used).

These estimations merely **calculate the average or median carbon intensity (e.g. g/€ of sales) of a sector level** (which may vary in granularity), depending on the classification systems used (e.g. Bloomberg proposes levels 1 to 3 of GICS, BICS and ICB; MSCI level GICS4 (second-last resort) and Grizzly the ICB4 median (last resort)), and recalculate, based on this average or median, the emissions of a company that does not report.

Bottom-up / physical indicators

Bottom-up methodologies are mixed. By this we mean first an **approach aimed at studying each company on a case by case basis, seeking to get as close as possible to the company's operational reality**, based on activity indicators (units produced, mix, reserves, etc.) when available.

- At the core of the approach (Carbone 4)
- Used for certain sectors only where these indicators are available (Grizzly, MSCI, South Pole, Vigeo, Inrate)

However, **more 'broadly' speaking**, bottom-up components are found at varying depths in other models:

- In the calculation of emission factors with IDWI (use of SIC to perform a breakdown of revenues)
- In the application of the EIO model (a company's revenues are re-distributed according to the sub-sector categories of the EIO matrix)
- In the adaptation of the sector classifications used to perform regressions, so that they make sense from the point of view of the carbon profiles of the companies.
- In the breakdown of revenues to run regression models.

Matrix of the models used by the providers

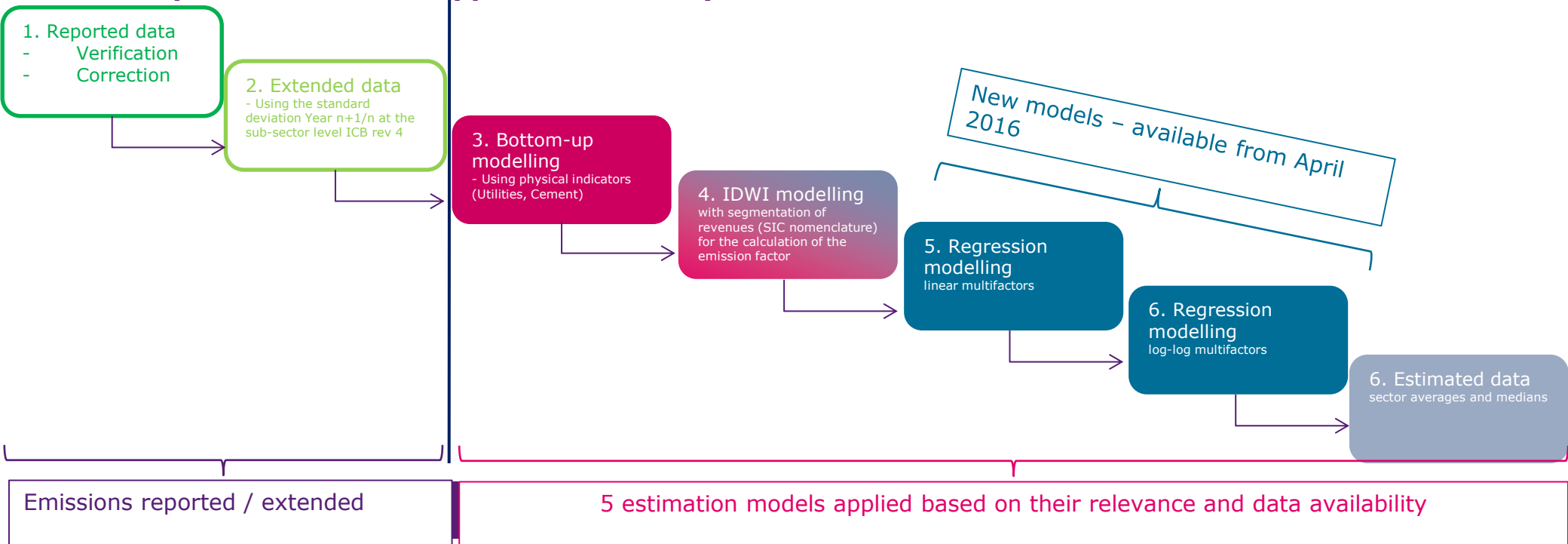
	Reported data		Estimated data						Combination of models
	Reported	Extension of reported data	EIO-LCA	Regression models	Sector averages	Bottom-Up analysis	Modelling based on physical indicators	Granularity by activity	
Carbone 4	Yes	No.	No.	No.	No.	Yes (Core of the approach)	Yes.	Yes.	No (but bottom-up diversified by sector)
South Pole	Yes.	No.	Yes (for Scope 3)	Yes. (Main model)	No.	For certain sectors.	Yes	Yes (+taxonomy of sub-sectors based on carbon profiles)	Yes
Oekom									
Trucost	Yes.	Yes.	Yes (Main model)	Yes (to improve EEIO)	No.	Yes (to improve EEIO-LCA)	No	Via. EEIO (cf. 531 sub-sectors in the Trucost model).	Yes
Inrate	No.	No.	Yes. (Main model)	No.	No.	For Scope 3 utilities	Yes.	Via EIO (cf. 330 sub-sectors dans EEIO)	Yes
MSCI	Yes. (1)	Yes (2)	Yes (5)	No.	Yes (4) GICS4	For certain sectors (utilities)	Yes (3)	No.	Yes - Staircase approach.
Vigeo	Yes.	No.	No.	Yes. (+ penalty rule)	(if regressions do not work).	For certain sectors	Yes.	Yes.	Yes
Grizzly	Yes. (1)	Yes (2) (via regressions)	No.	Yes Mod. (5) & (6) – April 2016.	Yes (7) ICB4	Yes (cf. IDWI) - (4)	Yes (3)	Yes. (breakdown of revenues in the calculation of emission factors IDWI : 987 sub-sectors)	Staircase approach.
Sustainalytics	Yes.	No.	No.	Yes.	No.	No.	No.	No (Conglomerates constitute a regression group in their own right)	No
Bloomberg	Yes.	No.	No.	No.	Yes (ICB / BICS / GICS 1-3)	No.	No.	No.	No
CDP	Yes (collected via questionnaire)	No.	Yes (Certain Scope 3 categories)	Yes (Scope 1 + 2 + certain Scope 3 categories) for high-stake issuersthat do not report	No.	No.	No.	Yes (Reconstruction of GICS and BICS sector classifications))	Yes.

In most cases (except 1), the providers will offer reported data when available (corrected and standardised, depending on the provider).

All the providers use several estimation models for each company or sub-sector:

- Some have systematised, and communicated on the sequencing of the use of estimation models (so-called staircase estimation model – cf. below) depending on the relevance & reliability of the model, data availability and perhaps the choice of the user
- Others chose not to provide this transparency or systematise the sequencing in the description of their processes (Grizzly and MSCI). Some providers will only use certain models for very specific sectors. Others will add rules to 'bump up' the estimated data (Vigeo).

Example: the staircase approach of Grizzly:



Estimated data: Data verification process

Estimated data verification process

Bloomberg

No specific tests for carbon data (logical and statistical tests are applied to ESG data in general);

Bloomberg says that above a level of 20/25% estimated data in a portfolio, the carbon allocation varies significantly relative to a reported data portfolio.



In-house analysis validation process.



Verification of the model by analysts, as well as the individual results of each company.

The model is backtested against reported data – the data match 85% in Scope 1.

MSCI

To calculate GICS 4 average sector intensities, outliers (more than 10x the GICS average and less than 0.01x) are excluded from the calculation)

A confidence metric (coefficient of variance) is provided for each piece of estimated data, corresponding to a 'confidence level' (cf. following slide)



Reduction in errors relating to regressions (underfitting and overfitting)

Statistical testing of the quality of the regression:

- Calculation of the coefficient of determination (R^2)
- Calculation of the average error per industry category between estimated and reported data
- Calculation of the median error



- Calculation of the coefficient of determination (R^2) of each linear regression model
- Backtest of the regression data vs. reported data
- Calculation of the standard deviations for all the normalised ratios for each sector



Backtest vs. reported data.

Analysis of uncertainty: (Correlation, adjusted coefficient of determination, standard error, etc.)



Backtests vs. reported data.

Production of a confidence indicator for estimated data (between 1% and 100%)



Comparison relative to the sector averages of each sector

Evaluation of the uncertainty for each sector



See South Pole

Focus – Estimation confidence level indicator (MSCI)

To measure the accuracy of its models vs. reported data, MSCI calculates the coefficient of variance (CV = standard deviation of the reduced universe* / GICS 4 average)

* i.e. a universe where outliers have been removed

According to this coefficient of variance, a confidence level (cf. table right) is established.

→ One may question the choice of the 'GICS 4 average' denominator in this test.

Why not use reported data?

Confidence level Split	Coefficient of Variance	As a % of Total GICS SI
High	0.00-0.25	10.4%
Moderately High	0.26-0.50	26.6%
Moderate	0.51-0.75	40.9%
Moderately Low	0.76-1.00	12.3%
Low	>1.01	9.7%

Source: MSCI ESG Research Carbon Estimation Methodology

We decided to perform some statistical tests on the sample of 20 Stoxx 600 companies

In order to get an idea of the reliability of the different families of estimation models, we asked the providers to supply us with 2013 Scope 1 + 2 data from their different estimation models on a sample of 20 companies for which 2013 Scope 1 and 2 reported data exists.

The sample is arbitrary; it includes 20 companies from the STOXX:

- for which reported data is available in 2013.
- taken from the typology developed for the 'Natixis COP' climate index
 - 10 of them have carbon intensity > 100gCO₂e/€ of revenue
 - 10 of them may be considered as belonging to sectors that are 'providers of climate value added solutions'.
- taken from diversified sector categories

Warning:

- This sample offers limited testing capacities: one provider only supplied 3 estimations, another only provides estimates for certain sectors, a third does not separate Scope 2 from upstream Scope 3 ...
- This is therefore not a comparison of the 'best provider', but rather a comparison of the different models

Companies	Sub-sector (ICB 4)
AIRBUS GROUP	Aerospace
GALENICA 'R'	Drug retailers
CARREFOUR	Food Retailers
PUBLICIS GROUP	Media Agencies
KPN KON	Fixed Line Telecommunications
GALP ENERGIA SGPS	Integrated Oil and Gas
DSV 'B'	Trucking
ENEL GREEN POWER	Alternative Electricity
PHILIPS ELTN.KONINKLIJKE	Diversified Industrials
NESTLE 'R'	Food products
GECINA	Industrial & Office REITs
PROVIDENT FINANCIAL	Consumer finance
HALMA	Electronic Equipment
VESTAS WINDSYSTEMS	Renewable Energy Equipment
STMICROELECTRONICS (MIL)	Semiconductors
LAFARGEHOLCIM	Building Materials & Fixtures
TECHNIP	Oil Equipment & Services
GIVAUDAN	Specialty Chemicals
CENTRICA	Gas Distribution
STAGECOACH GROUP	Travel & Tourism



Qualitative and quantitative deciphering of the estimation models

1 - EIO-LCA

EIO-LCA: Key takeaways

The EIO-LCA models	Disadvantages?	Corrections possible?	Advantages?	Our opinion
... are not based on reported data...	This means they are far from the operational reality of the company e.g.: they will not reflect the operational changes made at the level of an issuer.	Apply an alternative model when reported data is available	Obtain an estimate where there is no historical data available.	One of the only models available for upstream Scope 3 Possibility to run it for downstream Scope 3 (even if a product LCA is preferable when technically possible) Technically applicable to Scopes 1 and 2, but unadvisable in terms of realism
... and work with input-output tables with granular sub-sector classifications...	The categories of sub-sectors necessarily imply 'arbitrary' choices in terms of the classification of groups of companies (relative to their carbon profile).	Adapt these sub-sector classifications to make them consistent with an approach where activities are grouped together according to their carbon profiles		Prefer providers that adapt sub-sector categories using a carbon approach
... reflecting the economic flows between these sub-sector categories (for €1 of output from sector A, how much does that imply in input units for sector B?)...	The values of these flows, depending on the model, correspond to a precise geography (the most commonly used being the flows in the US economy). Their application at the global level assumes that modes of production are the same in all geographies.	Develop models by geography (which represents much too big an investment)	Avoids scope problems in calculating the footprint of a supply chain	Specific models per geography would be desirable. Some are available; nevertheless, the development cost for a provider is high.
... at a given date.	Some flows between sectors are stable over time (e.g. metalworking industries). Others change rapidly (e.g. IT). And this data is not regularly updated. These models use the currency of the original economy for which they were built, with the value of this currency at the date when the models were built.	Increase updates of the I/O data. (There is some uncertainty surrounding updates. Some say every five years, but it seems as though the most recent models used by the providers are 2002 or 2007.) Running the models with current prices makes it necessary to adjust the values for inflation.		Ideally, I/O tables would be updated more frequently to better reflect the economic (and carbon) reality of the sectors. (this raises cost issues, however.)
Emission factors are given for each sub-sector category.	The calculation of these emission factors is often fairly black-box (stemming from academic research, product LCA tables) By definition, these emission factors are incomplete.	Regular updates to these emission factors. Transparency on the sources used.	Factors in environmental impacts other than carbon	Interesting for investors that opt for monitoring / reporting on the impact of their investment on the environment
In the analysis, a company's revenue will have to be broken down according to these sub-sector categories	Implies uncertainty when revenues are allocated to such or such an activity	None	Makes it possible to treat conglomerates with a bottom-up dimension	A risky exercise but one that makes sense. Improving the reporting of companies to include this type of breakdown is an engagement challenge.

Which providers use EIO-LCA?



Trucost

- Main model, proprietary methodology (£10m investment in developing the model)



Inrate

- Main model, proprietary methodology



South Pole

- Use of EIO for mapping a sector's supply chain
- Use of LCA for certain downstream Scope 3 products



MSCI:

- Model used as a last resort (with a SIC sector classification), for the following reasons:
 - 1. In most cases, MSCI says that the carbon intensities calculated via the EIO-LCA model do not correspond to the data reported by the companies, with often high variance.
 - 2. The EIO-LCA models use emission factors per industry, and data derived from GDP (flows between industries), which are generally out of date (for emission factors), and adjusted using GDP deflators for several industries. This approach does not capture recent technological changes, which could have weighed on the carbon intensities of the different industries each year (hence the preference for models that use reported data as the basis of their calculations).
 - 3. The EIO-LCA models allocate the same emission factor to all the companies operating in the same segment, irrespective of their energy efficiency (and therefore carbon efficiency) efforts.



CDP:

- The EIO-LCA model is used in the open-source methodology for estimating emissions from energy-intensive industries for certain Scope 3 categories (see. appendices)

Summary of the modelling processes via EIO-LCA:

- **Sub-sector classification:**
 - 330 sub-sectors for Inrate
 - 531 for Trucost (adapted for the carbon modelling targets based on ACV analyses)
- **Processes:**
 - Analysis of the company's accounts, to determine in which segments of activity its revenues will be classified
 - A company's different activities are classified as outputs (implies a certain level of uncertainty)
 - The input-output table gives the number of units of input needed for each unit of output.
 - Multiplication of these units of input by the emission factor corresponding to this sub-sector to calculate Scope 2 and 3 emissions.
 - Multiplication of the company's revenues by its sub-sector emission factor for Scope 1 emissions.
- **How are the emission factors calculated?**
 - Based on **academic literature** and / or other sources such as the IEA, or government bodies (DEFRA, Department for Environment, Food & Rural Affairs in the UK), based on product LCA analyses.
 - **These are updated every year** → in order to include a component in the model that seeks to reflect recent technological changes.
- **At Trucost these models are improved by the use of regressions / bottom-up analyses in certain sectors. The same is true at Inrate (bottom-up utilities).**

Example of an input-output table

OUTPUT \ INPUT							
		1119B0	211111	325310	325320	484000	531000
		Crop farming	Crude Petroleum a	Fertilizer manufac	Pesticide and ot	Truck transportatio	Real estate
1111B0	Grain farming	0.016253228	0.035748711	0.079749789	0.052571582	0.035139879	0.251720312
1121A0	Cattle ranching and farming	0.250789579	0.031669516	0.01964488	0.01921605	0.046134783	0.154355968

Source: Trucost documentation .

EIO-LCA – Quantitative lessons

Of the data on our sample supplied by the providers, only the data from two of them is based on a EIO-LCA model for all their scopes. However, the quantitative lessons are limited insofar as one of the providers was only able to supply data for 3 stocks in our sample.

			2013 data supplied by Provider 1 (EIO 1)						2013 data supplied by Provider 2 (EIO 2)									
	Unit: MtCO2eq		Scope 1 (estimated)	% Chg. vs. reported	Scope 2 + 3 (upstream)	Scope 1+2+3 upstream	Scope 3 (downstream)	Total	Reported according to CDP Scope 1	Reported according to CDP Scope 2	Reported Scope 1+2	Estimated Scope 1+2	Estimated Scope 3 upstream	Reported (1+2) + upstream Scope 3 (estimated)	Scope 1+2+3 upstream (estimated)	% Chg. between provider 1 and 2	Estimates Scope 1	Estimates Scope 2
NL000023519 0	AIRBUS GROUP	Aerospace	0.54	-8%	16.93	17.48	642.17	659.65	0.59	0.44	1.02	1.02	13.31	14.33	14.33	22%	N.A.	N.A.
CH003886335 0	NESTLE 'R'	Food products	3.43	-14%	71.33	74.76	-	74.76	4	3.81	7.81	7.81	73.89	81.7	81.7	-8%	N.A.	N.A.
CH001064593 2	GIVAUDAN	Specialty Chemicals	0.28	155%	2.26	2.54	-	2.54	0.11	0.11	0.22	0.21	0.75	0.97	0.96	165%	N.A.	N.A.

We can see that in Scope 1, the estimations of Provider 1 relative to CDP data (or derived from CDP by Provider 2) are very close for Airbus and Nestlé.

For Givaudan, they differ by a factor of 2 (over-estimation by Provider 1 vs. reported data)

The total estimations (Scope 1, 2 + 3 upstream) are of the same order of magnitude at both providers, but nevertheless show differences amounting to several millions of tonnes:

~3 Mt for Airbus (Provider 1 is 22% higher than Provider 2);

~7 Mt for Nestlé (Provider 1 is 8.5% lower than Provider 2);

~1.5 Mt for Givaudan (Provider 1 is 165% higher than Provider 2).

However, the quantitative lessons are limited here:

For confidentiality reasons, Provider 2 was only able to supply information on 3 companies.

Moreover, the 'Scope 1' / 'Scope 2' breakdown of Provider 2's estimates was not available.



Deciphering estimation models

2- Regressions

How the estimated data are produced

Regressions focus– key takeaways

Regression models	Disadvantages?	Possible corrections?	Advantages?	Our view
Based on reported databases ...	These reported databases may contain errors that reduce the explanatory scope of the regression. As reported data are more available in geographic zones such as Europe and the US, regressions will comprise a geographic bias, with the probability of underestimating for companies from geographic zones that do not report. Reported data are not very available and very contrasting on Scope 3 of companies	Exclusion of outlier values (database cleanup), through statistical tests and human intervention Calculate a specific regression coefficient on a sample of reported data in emerging markets. (But a need to assume that the nationality of the company equates to its production site) Prefer another estimation model.	Closer to the operating reality of companies Corrects the geographic bias of estimates	Models to be preferred for scope 1 and 2 estimates, where reported data are available Additional effort welcome, but no correction is really satisfactory. If the issue is to have scope 3 for the whole of a portfolio to estimate the impact, it is better to opt for EIO. If it is a case of estimating certain scope 3 categories with greater precision, CDP methodology seems to have placed the emphasis on regressions.
... which comprise data over several years.	Technological developments which bring down the emissions of a sector will take longer to be taken into account.	None – this choice is made to correct another type of error	Irons out the gaps in reported data that may occur from one year to another (changes in scope, etc.)	Taking account of several years' reported data is a good practice.
Regressions are carried out for each group in the chosen subsector classification, for each scope...	Granularity and carbon “thinking” (or not) in the construction of the subgroups influences the relevance of the regression. Nonetheless, what works for one group will not work for all issuers in this group. The statistical relevance of each model may vary one year to another (new reported data)	Have granular subgroups that are formed on the basis of the carbon profiles of the companies that comprise them It is also good practice to break down the sales of an issuer to attribute to different groups with different issuer factors, calculated on a regression basis. Retest the models each year to re-determine the best regression	The statistical tests showing the explanatory force of the regression are easily understandable (determination coefficient, dispersion measures, etc.). Improves the statistical relevance of the regression and incorporates a bottom-up dimension in the analysis. Breaking down sales means it is possible to be close to companies' operating reality, particularly where they have diversified operations.	One of the best practices is to have both granular sector subcategories constructed on a carbon discussion and to break down sales to apply emission factors calculated through regressions.
... between GHG emissions and independent variables	Requires trial and error to find the independent variable through which to establish the most relevant statistic for the classification group. Assumes that the independent variable used is homogenous for all issuers.	In theory, it should be possible to correct the exchange rate effect, the accounting standards used, any financial restructuring ex-post.	The types of variables used are often generally available (for example sales, number of staff, etc.)	These disadvantages (contrasting independent variables) need to be borne in mind but it is not essential to correct them.
... to calculate an emission factor which will then be applied to all the companies that do not report.	Makes the assumption that companies operate in similar market conditions in the same sector (whereas revenues may differ depending on the monopoly situation or market positioning (high end, for example) Makes the assumption that companies have the same way of producing the same product (which is incorrect – for example dry lines and wet lines for cement production) and does not reflect the technological efforts of an issuer that does not report.	Prefer another (core) bottom-up estimation model where possible.	Provides data where no reporting is available.	This issue comes up across all models (a little less on bottom-up ones). Another reason to encourage companies to report.

Regression focus – on the importance of sector classifications

Name	Composition	Advantage	Disadvantage
GICS	Global Industry Classification Standard System launched by MSCI and S&P in 1999. 10 sectors (Sector) – GICS 1 24 industrial groups (Industry Groups) – GICS 2 67 industries (Industries) – GICS 3 156 subindustries (Subindustries) – GICS 4	The most commonly used by the financial markets	Not originally designed for the carbon impact (the classification is based on the market addressed rather than the activity itself and ultimately its carbon impact). For example: a fabless semiconductor firm, which is not involved in the fabrication of semiconductors, does not have the same carbon footprint as one that owns its plants. However, they will belong to the same subindustry.
BICS	Bloomberg Industry Classification System 10 macrosectors 47 subsectors ... 8 possible subdivision levels (but most firms use only 4) All told, the classification system to its highest degree of granularity would have up to 2,294 subsectors	More granular than GICS	Not originally designed for the carbon impact Less transparent in terms of hierarchy and methodology underlying the classification
ICB	Industry Classification Benchmark System launched by Dow Jones and FTSE in 2005, property of FTSE International 10 industries (Industry) – ICB 1 19 supersectors (Supersector) – ICB 2 41 sectors (Sector) – ICB 3 114 subsectors (Subsector) – ICB 4		Not originally designed for the carbon impact Among the less granular classifications
Others	Proprietary classifications: South Pole Carbon: 200 subsectors Sustainalytics: 40 subsectors Vigeo: 38 subsectors. Hybrid classifications (see CDP estimate methodology)	Built on a way of thinking guided by the carbon impact of the component companies	Limited transparency (providers' intellectual property)

Proprietary classifications, based on the carbon footprints of companies in each group, are the most relevant choice in our view.

NB:
The sector classification issue comes up in all the models when the emission factor is calculated.

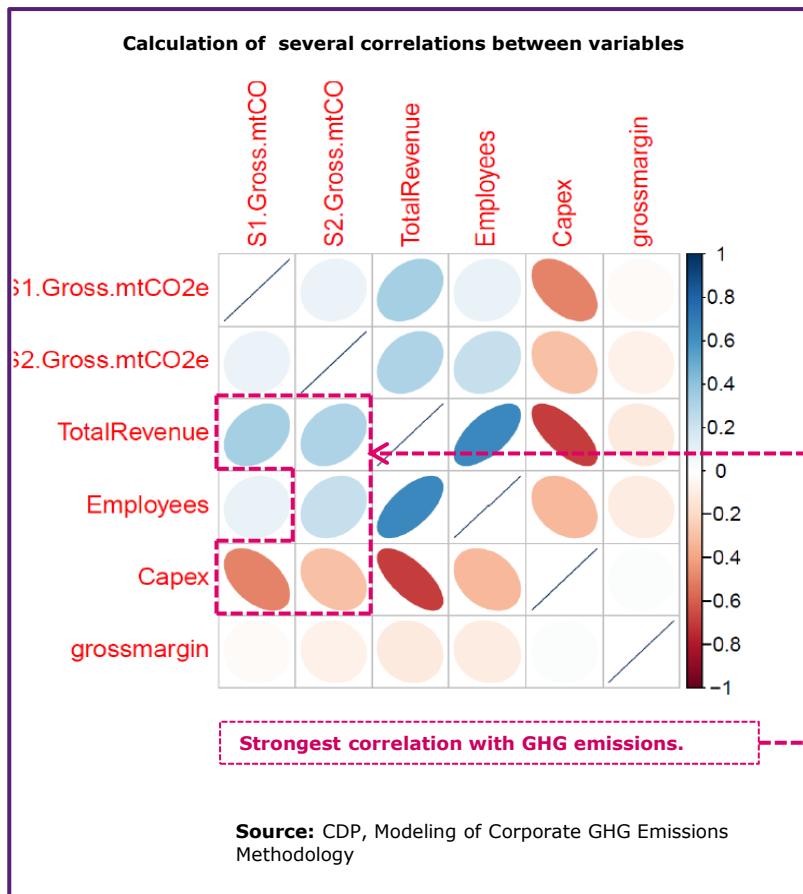
It is particularly important in regressions and sector average/median models.

For each sector category used, several regressions will be tested between each scope (differentiating between scope 1 and 2) and independent variables.

These independent variables differ depending on the providers:

			
Independent Variables	- Market capitalisation - Number of employees - Sales	- Sales - Number of employees - Cost of goods - Geography	- Sales - Number of employees - Environmental score of Sustainalytics
Sector categories	38 subsectors	200 subsectors	40 subsectors

Finally, after testing several independent variables and verified which are correlated (it is not very desirable to use correlated independent variables due to the lack of clarity on which has most influence on emissions), the estimation methodology developed by CDP only uses sales as an independent variable.



Although Vigeo uses regression models to estimate the volume of carbon emitted by each enterprise, the provider then introduces a rule aimed at penalising companies that do not report.

This rule divides companies into four groups, based on the volumes of emissions modelled (see opposite)

The volume of emissions allocated in the context of portfolio analyses will be the volume of the biggest emitter in the same sector within the category.

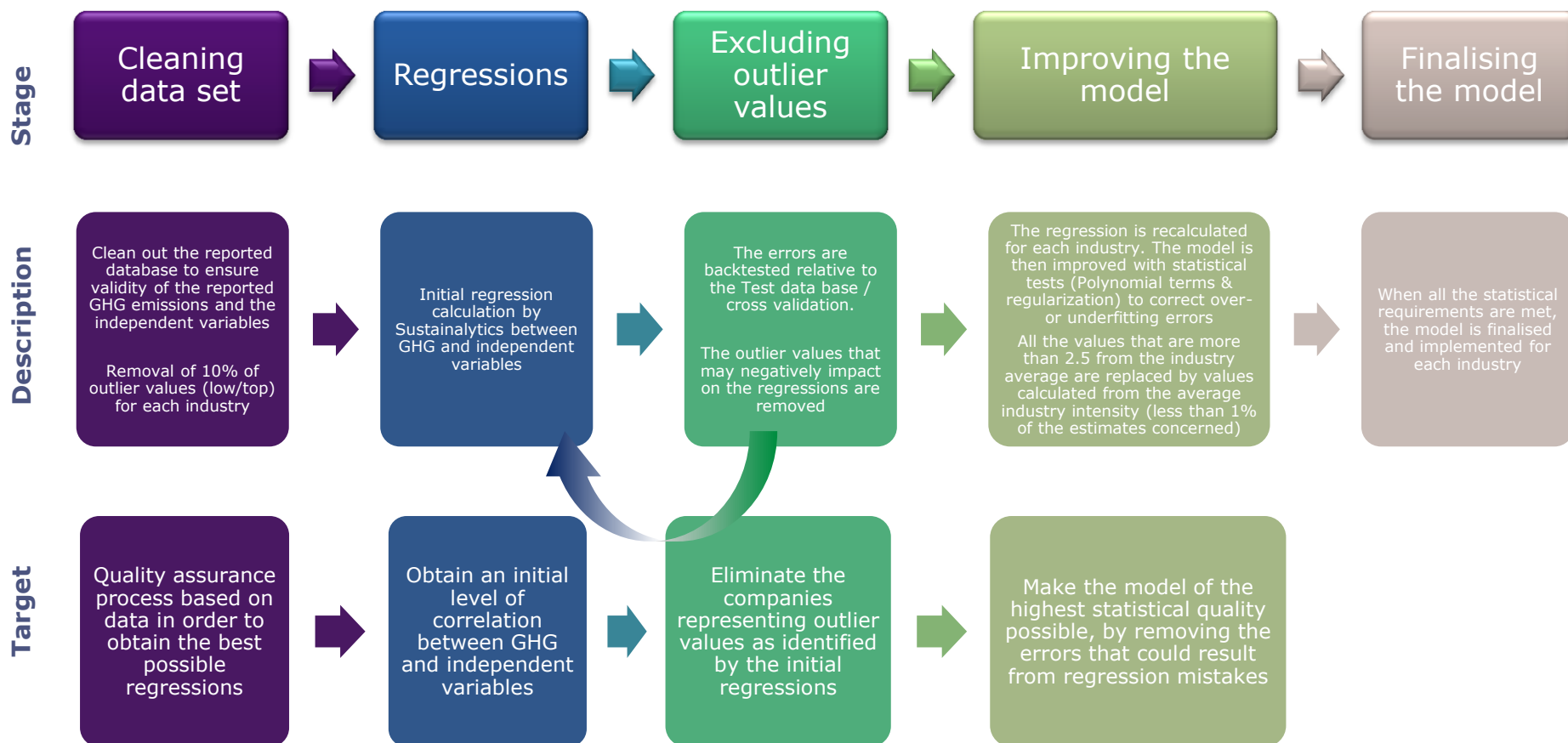
→ This voluntary upward bias (assuming that the company in question is not substantially bigger in terms of business volumes) is designed to reflect the idea that what is not measured is not managed.

4 families of issuers depending on their absolute impact

Grade	Emissions (t CO2 eq)	Category
A	<100 000	Moderate
B	>=100 000 and < 1 000 000	Significant
C	>= 1 000 000 and < 10 000 000	High
D	>=10 000 000	Intense

Source: Vigeo

Regression focus – Reducing uncertainties– Ex: Sustainalytics (1/2)



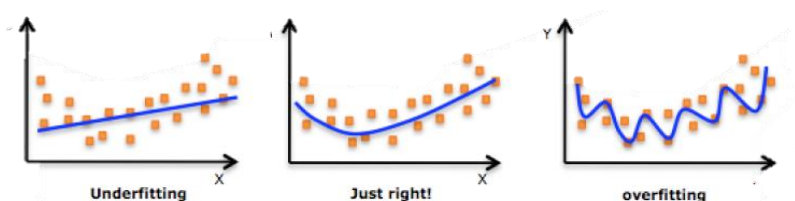
Regression focus – Reducing uncertainties - Ex: Sustainalytics (2/2)

Sustainalytics customises and tests the level of error of each model (i.e. 80: 40 models x 2 scopes) to determine the strongest possible correlations between an independent variable and GHG emissions.

- Each model has a correlation with an R^2 of over 0.8 (which suggests that the relationship between the measured variable and the GHG emissions is not random)
- The models are back-tested to ensure their precision and their level of integrity.

The database used to calculate regressions is comprised of the most recent data as well as over 3 years of historical data, i.e. close to 4,000 datapoints collected on the S&P Global BMI

Statistical tests (Polynomial terms and Regularization parameters) are used to reduce under-fitting and over-fitting



- **Under-fitting:** the model is too insensitive to datapoint variability
- **Over-fitting:** the model is hypersensitive to datapoint variability

Three other tests are conducted – each with internal targets:

- **Value of R^2 for the industry correlation:**
 - Reflects the degree to which GHG emissions are influenced by the independent variables on which the regressions are calculated
- **Level of error relative to the average (Industry Mean Error):**
 - Reflects the average level of error between the known and estimated emissions for each industry
- **Median level of error (Industry Median Error):**
 - Reflects the median error point between the known and estimated emissions for each industry.

Outlier values are treated at several stages of the model's construction

Regression focus - Quantitative conclusions

Provider Model type	Provider 3		Provider 4		Provider 5		Reported
	Regressions 1	% chg vs. reported data*	Regressions 2**	% chg vs. reported data	Regressions 3**	% chg vs. reported data	
PROVIDENT FINANCIAL	23,577	326%	14,783	167%	10,322	86%	5,537
GALENICA 'R'	108,061	757%	9,962	-21%	21,075	67%	12,611.00
HALMA	131,476	517%	39,328	85%	32,116	51%	21,304
GECINA	197,895	584%	43,346	50%	50,820	76%	28,949
KPN KON	524,982	1285%	323,110	752%	45,094	19%	37,903
PUBLICIS GROUP	150,554	94%	97,055	25%	95,834	23%	77,717
VESTAS WINDSYSTEMS	224,906	125%	92,052	-8%	157,620	57%	100,137
ENEL GREEN POWER	57,718	-43%	111,081	10%	39,121	-61%	100,975
GIVAUDAN	1,112,775	413%	224,272	3%	276,850	28%	216,950
TECHNIP	2,075,367	285%	577,898	7%	433,826	-20%	539,204
PHILIPS ELTN.KONINKLIJKE	2,625,776	208%	868,640	2%	1,179,515	38%	851,689
AIRBUS GROUP	319,956	-68%	1,196,854	19%	1,611,155	60%	1,009,188
STAGECOACH GROUP	1,279,443	2%	2,791,752	122%	1,214,708	-3%	1,257,183
STMICROELECTRONICS (MIL)	798,808	-42%	910,711	-33%	1,818,161	33%	1,369,050
DSV 'B'	4,259,388	32%	3,066,545	-5%	2,202,433	-32%	3,225,000
CARREFOUR	5,144,747	52%	3,632,756	8%	3,940,194	17%	3,375,000
GALP ENERGIA SGPS	9,098,088	111%	4,652,786	8%	3,583,824	-17%	4,303,143
CENTRICA	431,562	-94%	9,841,344	38%	10,542,340	48%	7,146,411
NESTLE 'R'	1,826,897	-77%	7,780,096	0%	7,168,539	-8%	7,799,132
LAFARGEHOLCIM	95,360,735	-10%	102,063,621	-4%	90,802,877	-15%	106,499,295
Average of absolute values of % of var.		256%		68%		38%	
Total portfolio	125,752,711	-8.86%	138,337,992	0.26%	125,226,424	-9.24%	137,976,378

Two factors to note:

1. All regression models (except for one) produce on average estimated data that is quite faithful to the reported data (see low average of absolute value of % of var.).
2. Also, when we add the total volume of estimates for the 20 issuers, the total estimated volume is quite close to the total reported volume. (between 0 and -9% variation!)

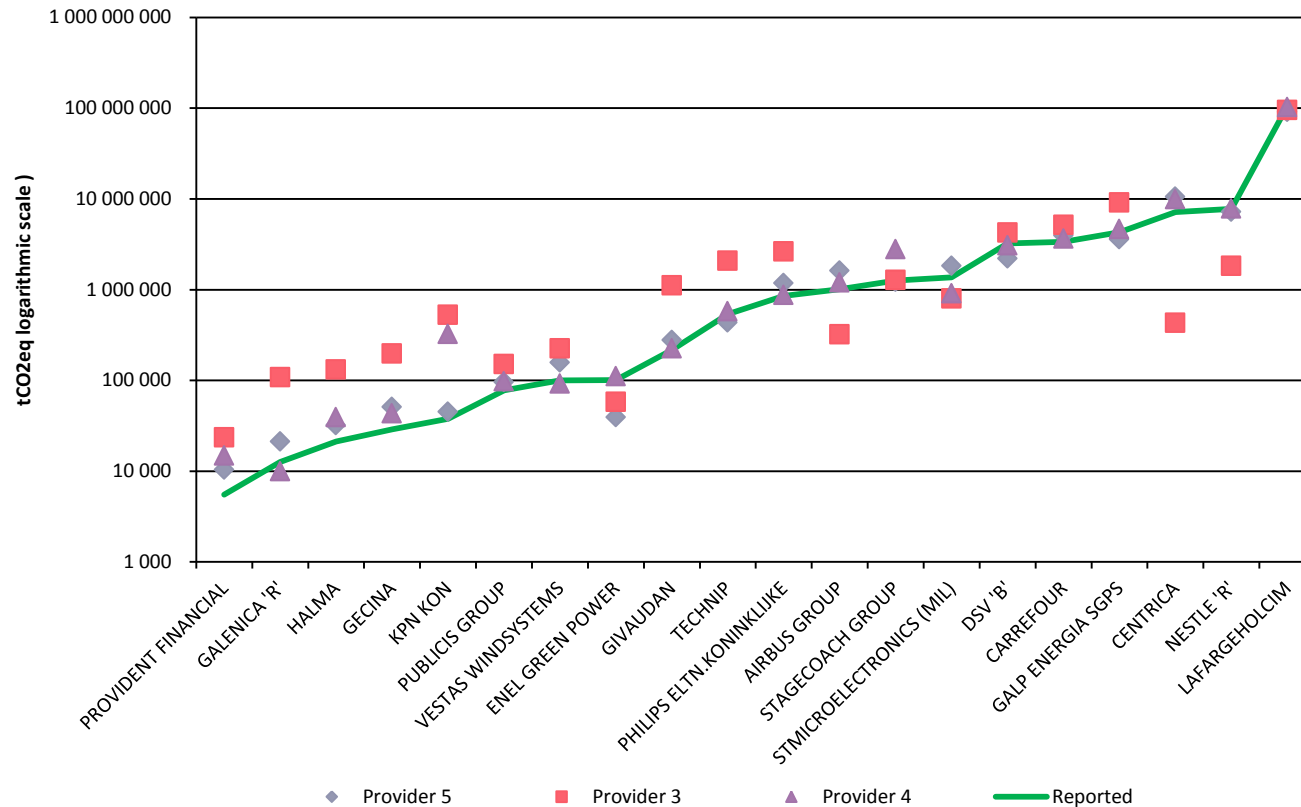
In conclusion, although, by issuer, the estimated data through regression may show significant gaps with the reported data (making a stock-picking approach less suitable), these variations cancel each other out when they are aggregated at the level of the sample.

$$* \text{Percentage of variation vs. reported data} = \frac{\text{Estimated GHG volume} - \text{reported GHG volume}}{\text{reported GHG volume}} * 100$$

** Caution: the data received from certain providers does not indicate when several models were used to calculate the estimated data. To simplify, we put the name of the main model on the top of the column, which is likely to slightly bias our results.

Regression focus – Quantitative conclusions

2013 Estimations Scope 1+2 - Regressions models (tCO2e)



This chart shows the data on a logarithmic scale, classifying the issuers by reported data from smallest to largest.

We can clearly see that the regression estimations follow the trend of reported data, even though for some issuers some estimations are significantly higher or lower.



Deciphering estimation models

3 – Sector average and medians

Focus on sector averages

Key takeaways

Sector averages	Disadvantages?	Possible corrections?	Advantages?	Our view
Based on reported data ...	Reported databases may contain errors which skew the sector averages As reported data are more available in geographic zones such as Europe and the US, regressions will comprise a geographic bias, with the probability of underestimating for companies from geographic zones that do not report.	Exclusion of outlier values (database cleanout), through statistical tests and human intervention	Using reported data makes the estimate closer to the operating reality of companies	The reported data advantage of sector average/median models is cancelled out by the issue of granularity and the carbon suitability of the subsector classifications on which they are calculated.
... which comprise data over several years.	Technological developments which bring down the emissions of a sector will take longer to be taken into account.	None – this choice is made to correct another type of error	Iron out the gaps in reported data that may occur from one year to another (change of scope, etc.)	It is good practice to take into account several years of reported data.
They are simply constructed: an emission factor is calculated based on the average carbon intensity of a sector subgroup (for ex. with sales – as gCO₂ / € of sales) This emission factor is then applied to companies that do not report, taking the denominator variable of the calculated intensity	Carbon Intensity of a j-sector = $CI_j = \sum_{i=0}^n \frac{Emissions\ CO2_i}{Sales\ CO2_i}$			
	Most of the time, the subsector classifications used (BICS, GICS, ICB) are not very granular and are not designed using a carbon rationale	Sector averages calculated on the basis of subsector classifications designed using a carbon rationale. Breakdown of the sales of companies based on a granular classification and calculation of the emission factor differentiating the share of sales attributable to one of these categories and the share of CO₂ related to this proportion of sales (see IDWI to understand detail)	Gets around the huge biases that result from the use of averages/medians on sector classifications lacking granularity and with companies characterised by different carbon footprints.	This degree of complexity in the subsector classification is rather counterintuitive for a model that is regularly used for the economy of means it affords. IDWI is likened to the sector average model but differs in its complexity, which ensures it greater precision.
	Assumes that the accounting reporting is homogenous Currency effect			
	All the above-mentioned biases imply major risks of a gap with the reported data.			

Focus on sector averages

Who uses sector averages?

Bloomberg

Bloomberg

- Bloomberg's estimated data are all derived from sector averages
- With Bloomberg it is possible to choose which sector classification to use, between BICS, GICS and ICB. Calculations may be made on levels 1 to 3.

MSCI

MSCI

- Sector averages are the fourth model used by MSCI when 1/ reported data are not available
2/ the estimation could not be achieved by extending the data reported for previous years
3/ the business sector does not lend itself to a reconstruction from physical indicators.
- These sector averages at MSCI are calculated from a GICS sector classification, level 4.

vigeo

Vigeo

- If the regression tests do not identify a systematically relevant relationship (using the criteria applied by Vigeo), Vigeo uses the sector average system

GRIZZLY RESPONSIBLE INVESTMENT

Grizzly

- Grizzly uses the sector average method (with ICB 4 granularity) as a last resort
- It prefers finer methods – inverse distance weighted interpolation (IDWI), which reconstructs the sales of companies based on very granular sector categories or regression methods.

Focus: a hybrid model

Grizzly's IDWI method

The IDWI (Inverse-Distance-Weighted Interpolation) model developed by Grizzly is a method which calculates emission factors based on a segmentation of a company's sales into a set of very granular activities (US SIC/NAICS $\approx$ 1,000 activities)

- This is a "bottom-up" method, using companies that report and for which a sales segmentation is available, in order to calculate an emission factor for each activity in the US SIC / NAICS classification
- These emission factors are then applied to the breakdown of sales for other companies, so as to obtain a customised estimation of each company's emissions
- The calculation method is quite similar to sector averages, except that it enters into a level of infra-company detail, both in the calculation of emission factors and in calculating the emissions of companies that do not report.

Calculating the emission factor with a traditional sector average

$$(1) \text{ Carbon Intensity of a j-sector} = \text{CI}_j = \frac{\sum_{i=0}^n \text{Emissions CO}_2 i}{\text{Sales CO}_2 i}$$

Calculating the emission factor with Inverse-Distance-Weighted Interpolation (with non pure players)

$$(2) \text{ Carbon Intensity of a j-activity} = \text{CI}_j = \frac{\sum_{i,j}^n \text{CO}_2 i * \text{Weight}_{i,j}^k}{\sum_{i,j}^n \text{Sales } i * \text{Weight}_{i,j}^k}$$

- $\text{Weight}_{i,j}^k$ = the weight of the activity j as % of company's sales to a factor k (k being a power)
- $\text{Weight}_{i,j}^k$ is the inverse distance to a pure player (its value is comprised between [0 ; 1])
- If the company is a pure player, formula 2 becomes formula 1.

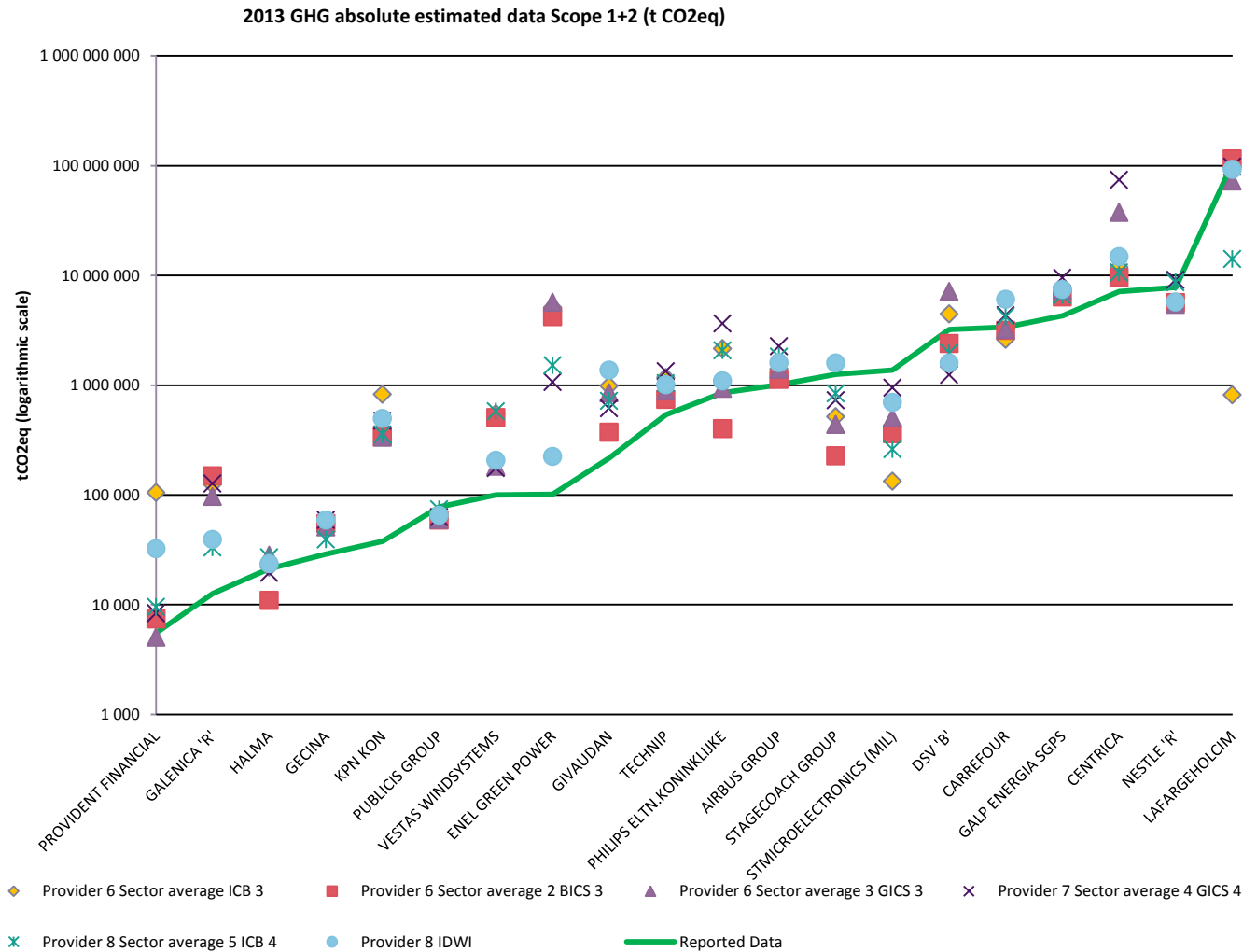
Focus on sector averages– Quantitative conclusions

Provider	Provider 6		Provider 6		Provider 6		Provider 7		Provider 8		Provider 8		tCO2eq
Type of model	Sector average ICB 3	% var vs. reported data*	Sector average 2 BICS 3	% var vs. reported data	Sector average 3 GICS 3	% var vs. reported data	Sector average 4 GICS 4	% var vs. reported data	Sector average 5 ICB 4	% var vs. reported data	IDWI	% var vs. reported data	Reported
PROVIDENT FINANCIAL	105,016	1797%	7,388	33%	5,034	-9%	8,353	51%	9,481	71%	32,206	482%	5,537
GALENICA 'R'	124,125	884%	149,035	1082%	96,307	664%	126,707	905%	33,089	162%	39,239	211%	12,611.00
HALMA	21,870	3%	10,913	-49%	28,086	32%	19,429	-9%	26,862	26%	23,558	11%	21,304
GECINA	54,555	88%	54,555	88%	51,017	76%	58,759	103%	39,197	35%	58,954	104%	28,949
KPN KON	822,421	2070%	340,971	800%	334,700	783%	470,132	1140%	355,534	838%	494,408	1204%	37,903
PUBLICIS GROUP	59,519	-23%	58,988	-24%	59,519	-23%	62,520	-20%	73,645	-5%	65,034	-16%	77,717
VESTAS WINDSYSTEMS	548,498	448%	504,383	404%	181,805	82%	175,689	75%	575,620	475%	205,900	106%	100,137
ENEL GREEN POWER	5,090,000	4941%	4,200,000	4059%	5,670,000	5515%	1,066,006	956%	1,509,228	1395%	223,080	121%	100,975
GIVAUDAN	980,719	352%	372,691	72%	848,409	291%	613,000	183%	716,351	230%	1,365,225	529%	216,950
TECHNIP	1,166,849	116%	738,569	37%	886,999	65%	1,334,429	147%	1,036,833	92%	1,009,517	87%	539,204
PHILIPS ELTN.KONINKLIJKE	2,142,015	152%	401,716	-53%	936,545	10%	3,646,870	328%	2,072,116	143%	1,092,572	28%	851,689
AIRBUS GROUP	1,401,031	39%	1,123,299	11%	1,396,040	38%	2,260,671	124%	1,817,406	80%	1,601,753	59%	1,009,188
STAGECOACH GROUP	514,048	-59%	226,174	-82%	437,259	-65%	726,608	-42%	837,270	-33%	1,586,214	26%	1,257,183
STMICROELECTRONICS (MIL)	133,380	-90%	361,068	-74%	501,665	-63%	942,521	-31%	260,118	-81%	694,026	-49%	1,369,050
DSV 'B'	4,452,547	38%	2,388,983	-26%	7,126,034	121%	1,238,393	-62%	1,973,965	-39%	1,590,455	-51%	3,225,000
CARREFOUR	2,617,313	-22%	3,142,580	-7%	3,203,020	-5%	4,323,446	28%	4,193,186	24%	6,028,204	79%	3,375,000
GALP ENERGIA SGPS	7,130,345	66%	6,362,665	48%	7,282,946	69%	9,488,486	121%	6,587,463	53%	7,452,795	73%	4,303,143
CENTRICA	11,853,243	66%	9,575,521	34%	37,518,109	425%	74,292,486	940%	10,611,685	48%	14,834,379	108%	7,146,411
NESTLE 'R'	5,497,745	-30%	5,630,100	-28%	5,434,553	-30%	9,073,218	16%	8,633,302	11%	5,719,355	-27%	7,799,132
LAFARGEHOLCIM	812,450	-99%	114,661,279	8%	72,461,255	-32%	97,784,968	-8%	14,071,344	-87%	92,500,000	-13%	106,499,295
Average of absolute values of % variation		569%		351%		420%		264%		197%		169%	
TOTAL sample	45,527,692	-67%	150,310,878	8.94%	144,459,301	4.70%	207,712,691	50.54%	55,433,695	-59.82%	136,616,875	-0.99%	137,976,378

As expected:

1. The datapoints vary considerably in relation to the estimated data
2. There are very significant average variations with estimation models.
3. The averages calculated on level 4 (GICS 4, ICB 4) show lower variations than models calculated on level 3 (due to granularity of company groupings)
4. IDWI shows clearly lower variations
5. At the level of the portfolio, these variations cancel each other out, for the classifications BICS3, GICS 3 and the IDWI model. For the others, there are significant gaps
6. Only IDWI gives a total estimate that is extremely close to the reported data

Focus on sector averages– Quantitative conclusions



As for the regressions:

1. We see that the estimates mirror the trend for reported data
2. But there is greater dispersion than for regression models
3. The variations are significant in terms of carbon volume



Deciphering estimation models

4 - Bottom up / physical indicators

Bottom-up focus

Carbone 4's modelling approach

Bottom-up modelling for each company

- The activity of each company is allocated to a sector subcategory created by Carbone 4. For each of the categories, a different estimation methodology is put in place.
- An analyst will carry out an estimation of the carbon emissions (Scope 1, 2, 3) based on activity indicators (sales, m², tonnes produced, number of units produced, etc.) for each company

A differentiated approach depending on the sector

- Sectors characterised as having low carbon stakes are subjected to lighter-weight modelling, using scope 1 + 2 only
- 46 subsectors are identified as high carbon stake. For each of these sectors, the modelling approach is different, based on Carbone 4's expertise in carbon analysis, with a Scope 3 modelling

There are 46 high stake sectors, divided into 3 families:

- **Energy:**
 - The challenge for the companies in these sectors is to diversify their energy mix by favouring less carbon-intensive sources, and by reducing their direct emissions
- **Equipment suppliers with low carbon potential:**
 - The challenge for these companies is to get these energy-efficient solutions into the market
- **Carbon-intensive sectors:**
 - The challenge for these sectors is to put in place improved operating performance systems from an environmental perspective (implementing energy efficient solutions)

This modelling is also used to calculate avoided emissions (see specific slides).

The Carbone 4 approach, which is very holistic, is supported by forward-looking qualitative opinions on the energy transition strategy of companies.

High stake categories	Sectors	Subsectors
Category 1: Energy sector	Fossil energies	Gas, Oil, Coal
	Electricity	Electricity industry
Category 2: Suppliers of energy-efficient solutions	Building	Construction of new buildings and suppliers of energy-efficient equipment (insulation, etc.)
	Energy	Suppliers of equipment and solutions for the energy sector (electricity and fossil)
	Transport	Suppliers of energy-efficient transport equipment and construction of transport infrastructure.
	Industry	Suppliers of energy-efficient equipment and solutions
Category 3: Carbon-intensive sectors	Heavy industry	Cement and clinker production
		Steel production
		Aluminium production
		Plastics production
		Chemicals production
		Glass production
		Sugar production
	Paper and forests	Forest-generated products
	Transport	Transport operators
		Transport infrastructure operators
	Building	Real-estate managers and real-estate owners
	Agriculture	Agriculture, fishing, food processing, fertiliser industry

Bottom-up focus - Quantitative conclusions

Provider 10 Bottom up 1	% var vs. reported data	Provider 7 Bottom-up 2	%Var vs. reported data	Reported
NA	ND	NA	ND	5,537
NA	ND	NA	ND	12,611.00
NA	ND	NA	ND	21,304
211	-99%	NA	ND	28,949
NA	ND	NA	ND	37,903
NA	ND	NA	ND	77,717
1,490	-99%	NA	ND	100,137
1,014,700	905%	18,235	-82%	100,975
NA	ND	NA	ND	216,950
386,228	-28%	NA	ND	539,204
NA	ND	NA	ND	851,689
940,492	-7%	NA	ND	1,009,188
NA	ND	NA	ND	1,257,183
1,404,000	3%	NA	ND	1,369,050
3,433,000	6%	NA	ND	3,225,000
NA	ND	NA	ND	3,375,000
3,392,027	-21%	NA	ND	4,303,143
5,648,142	-21%	NA	ND	7,146,411
7,456,332	-4%	NA	ND	7,799,132
110,100,000	3%	NA	ND	106,499,295
Average of absolute values of % variation		109%	Non relevant	
133,776,622	-3.04%			137,976,378
133,776,622	1.25%			132,120,484

Total sample

Total sample (with only the values where provider 10 supplied data).

A single bottom-up model (based on physical indicators) provided enough data to be able to make a useful comparison vs. reported data.

We see that with the exception of one value, the estimates are quite close to the reported data, particularly for large emission volumes.

At the aggregated level, the estimate is very close to the aggregated reported volume.



Deciphering estimation models

5 - SUMMARY

The key with the following figures is to compare models rather than providers.

Indeed, several limitations need to be borne in mind in analysing these figures:

- **1. For the sample as a whole, with the reported data available, all the providers, with the exception of Inrate, supplied this data instead of the estimate, applying their respective quality controls.**
- **2. Several providers carry out a range of estimated data calculations, and will choose to provide only one of these estimates if reported data are not available.**
- **Here our calculations are based on 13 iterations of estimates using the four main families of models, some of which come from the same provider.**

General overview – Estimate variability?

**** Caution:** the data received from certain providers does not indicate when several models were used to calculate the estimated data. To simplify, we put the name of the main model on the top of the column, which is likely to slightly bias our results.

MtCO2eq.	Provider 1 EEIO 1 (Scope 1+2+3 up)	Provider 2 EEIO 2	Provider 3 Regressions 1	Provider 4 Regressions 2	Provider 5 Regressions 3	Provider 6 Sector average 1	Provider 6 Sector average 2	Provider 6 Sector average 3	Provider 7 Sector average 4	Provider 8 Sector average 5	Provider 9 IDWI	Provider 10 Bottom up 1	Provider 7 Bottom-up 2	Provider 7 Extension	Reported	Ave. est.	SD	VC	VC (with estimated)	% var: estimation vs. reported
PROVIDENT FINANCIAL	NA	NA	0.024	0.015	0.010	0.105	0.007	0.005	0.008	0.009	0.032	-	NA	0.008	0.006	0.02	0.03	135%	546%	304%
GALENICA 'R'	NA	NA	0.108	0.010	0.021	0.124	0.149	0.096	0.127	0.033	0.039	-	NA	0.014	0.013	0.07	0.05	74%	426%	472%
HALMA	NA	NA	0.131	0.039	0.032	0.022	0.011	0.028	0.019	0.027	0.024	-	NA	0.026	0.021	0.03	0.03	96%	162%	69%
GECINA	0.147	-	0.198	0.043	0.051	0.055	0.055	0.051	0.059	0.039	0.059	0.000	NA	0.036	0.029	0.05	0.05	93%	172%	103%
KPN KON	1.596	NA	0.525	0.323	0.045	0.822	0.341	0.335	0.470	0.356	0.494	-	NA	0.119	0.038	0.35	0.22	57%	574%	911%
PUBLICIS GROUP	1.565	NA	0.151	0.097	0.096	0.060	0.059	0.060	0.063	0.074	0.065	-	NA	0.100	0.078	0.07	0.03	36%	38%	6%
VESTAS WINDSYSTEMS	NA	NA	0.225	0.092	0.158	0.548	0.504	0.182	0.176	0.576	0.206	0.001	NA	0.116	0.100	0.25	0.20	78%	196%	153%
ENEL GREEN POWER	0.994	NA	0.058	0.111	0.039	5.090	4.200	5.670	1.066	1.509	0.223	1.015	0.018	0.159	0.101	1.60	2.12	133%	2104%	1481%
GIVAUDAN	2.536	0.208	1.113	0.224	0.277	0.981	0.373	0.848	0.613	0.716	1.365	-	NA	0.252	0.217	0.58	0.40	64%	186%	192%
TECHNIP	4.400	NA	2.075	0.578	0.434	1.167	0.739	0.887	1.334	1.037	1.010	0.386	NA	0.593	0.539	0.93	0.49	52%	90%	73%
PHILIPS ELTN.KONINKLIJKE	10.657	NA	2.626	0.869	1.180	2.142	0.402	0.937	3.647	2.072	1.093	-	NA	0.923	0.852	1.44	1.00	63%	118%	87%
AIRBUS GROUP	17.478	1.029	0.320	1.197	1.611	1.401	1.123	1.396	2.261	1.817	1.602	0.940	NA	1.267	1.009	1.33	0.49	36%	48%	32%
STAGECOACH GROUP	NA	NA	1.279	2.792	1.215	0.514	0.226	0.437	0.727	0.837	1.586	-	NA	1.557	1.257	1.02	0.75	67%	60%	-11%
STMICROELECTRONICS (MIL)	4.535	NA	0.799	0.911	1.818	0.133	0.361	0.502	0.943	0.260	0.694	1.404	NA	1.264	1.369	0.83	0.52	63%	38%	-40%
DSV 'B'	8.065	NA	4.259	3.067	2.202	4.453	2.389	7.126	1.238	1.974	1.590	3.433	NA	3.510	3.225	3.20	1.67	52%	52%	-1%
CARREFOUR	80.690	NA	5.145	3.633	3.940	2.617	3.143	3.203	4.323	4.193	6.028	-	NA	3.729	3.375	3.63	1.00	25%	30%	18%
GALP ENERGIA SGPS	22.125	NA	9.098	4.653	3.584	7.130	6.363	7.283	9.488	6.587	7.453	3.392	NA	4.300	4.303	6.30	2.09	33%	49%	46%
CENTRICA	69.361	NA	0.432	9.841	10.542	11.853	9.576	37.518	74.292	10.612	14.834	5.648	NA	11.402	7.146	17.87	20.86	117%	292%	150%
NESTLE 'R'	74.763	7.812	1.827	7.780	7.169	5.498	5.630	5.435	9.073	8.633	5.719	7.456	NA	7.340	7.799	6.61	1.95	29%	25%	-15%
LAFARGEHOLCIM	92.054	NA	95.361	102.064	90.803	0.812	114.661	72.461	97.785	14.071	92.500	110.100	NA	107.175	106.499	81.62	38.47	47%	36%	-23%

The variation coefficient (VC) is a relative measurement of data dispersion around the average, whereby the degree of variation of one sample can be compared with another, even if the averages are different. The higher the value of the variation coefficient, the greater the dispersion around the average (and the smaller the consensus between providers).

We note that : → **For several companies, the values of the estimates are very dispersed (with variation coefficients of >100%)**

→ **In many cases, the average of the estimates is very different from the reported data**

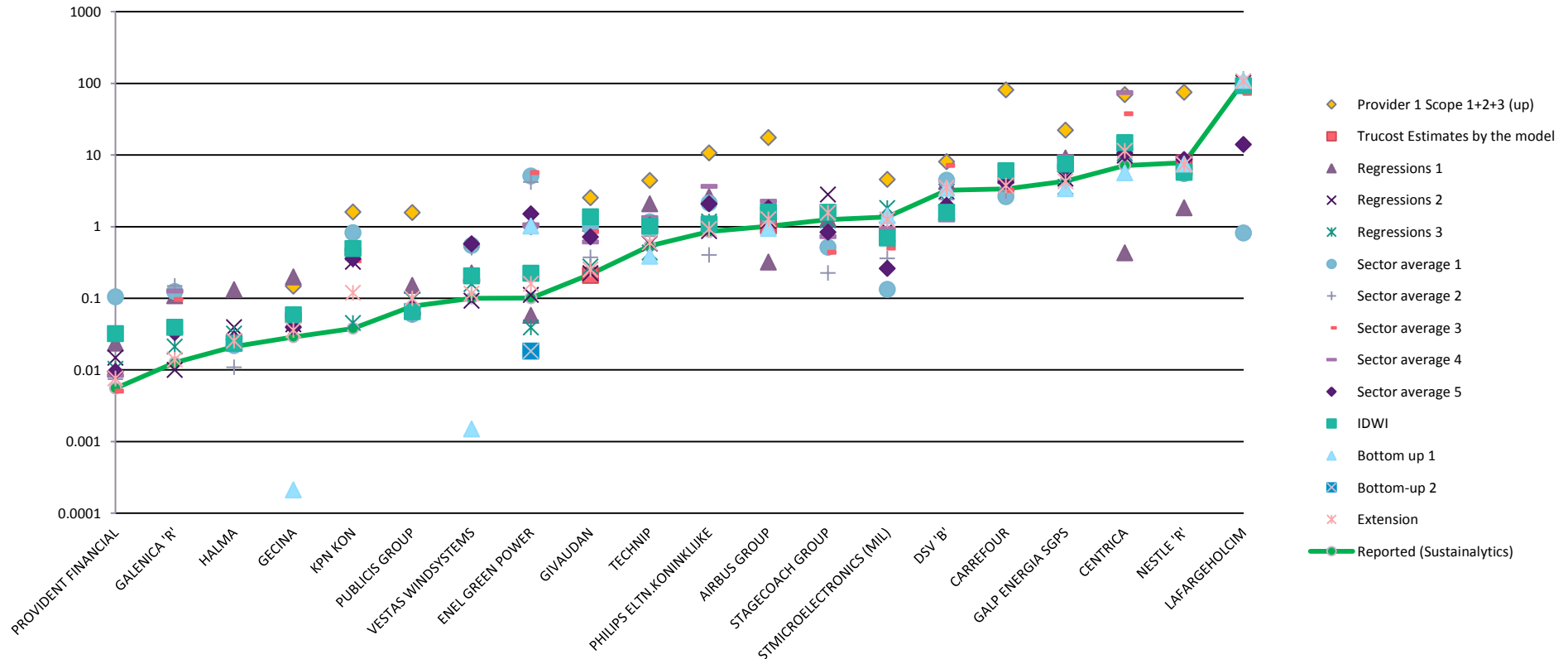
General overview – Estimate variability?

tCO2eq.	Average estimates	SD estimates	Variation coefficient	Median estimates	Min. estimate	Max estimate	Range	% Var : estimate vs. reported
PROVIDENT FINANCIAL	22,379.30	30,251.02	135.17%	9,901.33	5,033.73	105,016.21	99,982.49	304%
GALENICA 'R'	72,158.01	53,676.92	74.39%	67,772.78	9,962.00	149,035.03	139,073.03	472%
HALMA	35,917.53	34,409.04	95.80%	26,199.10	10,913.22	131,476.34	120,563.11	69%
GECCINA	58,637.13	49,088.60	83.72%	51,017.45	211.00	197,895.03	197,684.03	103%
KPN KON	383,077.75	217,395.15	56.75%	348,252.72	45,094.00	822,420.81	777,326.81	911%
PUBLICIS GROUP	82,223.44	29,256.01	35.58%	69,339.52	58,988.21	150,554.42	91,566.21	6%
VESTAS WINDSYSTEMS	253,089.75	196,384.93	77.59%	181,804.52	1,490.00	575,619.85	574,129.85	153%
ENEL GREEN POWER	1,596,482.92	2,124,491.84	133.07%	618,889.83	18,235.00	5,670,000.00	5,651,765.00	1481%
GIVAUDAN	633,682.25	403,517.31	63.68%	613,000.00	208,161.00	1,365,225.18	1,157,064.18	192%
TECHNIP	930,851.45	486,546.09	52.27%	886,998.55	386,228.00	2,075,367.24	1,689,139.24	73%
PHILIPS ELTN.KONINKLIJKE	1,588,908.00	1,003,353.98	63.15%	1,136,043.56	401,715.52	3,646,870.00	3,245,154.48	87%
AIRBUS GROUP	1,330,370.23	485,511.43	36.49%	1,331,373.03	319,955.96	2,260,671.00	1,940,715.04	32%
STAGECOACH GROUP	1,117,028.57	753,078.57	67.42%	1,025,989.18	226,174.49	2,791,752.00	2,565,577.51	-11%
STMICROELECTRONICS (MIL)	826,245.68	516,791.51	62.55%	798,808.18	133,380.46	1,818,161.00	1,684,780.54	-40%
DSV 'B'	3,203,792.01	1,669,356.96	52.11%	3,066,545.37	1,238,393.00	7,126,033.59	5,887,640.59	-1%
CARREFOUR	3,995,442.94	1,003,319.49	25.11%	3,834,588.74	2,617,312.99	6,028,203.84	3,410,890.85	18%
GALP ENERGIA SGPS	6,302,846.13	2,088,408.75	33.13%	6,587,462.78	3,392,027.00	9,488,486.00	6,096,459.00	46%
CENTRICA	17,868,240.47	20,856,430.56	116.72%	10,611,685.30	431,561.77	74,292,486.00	73,860,924.23	150%
NESTLE 'R'	6,614,325.30	1,949,026.12	29.47%	7,254,302.19	1,826,896.91	9,073,218.00	7,246,321.09	-15%
LAFARGEHOLCIM	81,617,558.50	38,474,918.62	47.14%	95,360,734.80	812,450.41	114,661,279.06	113,848,828.65	-23%

*** Caution: the data received from certain providers does not indicate when several models were used to calculate the estimated data. To simplify, we put the name of the main model on the top of the column, which is likely to slightly bias our results.*

General overview – All models combined

2013 GHG absolute estimated data Scope 1+2 (Mt CO₂eq)



All told, the dispersion of estimates, for each company, is much greater than for the reported data. This chart places the estimates (MtCO₂e) on a logarithmic scale, which shows the extensive range between the minimum and maximum estimated data for some companies (for example: Enel Green Power, Min (0,18 MtCO₂e) and Max (5.7 MtCO₂).

In general, though, estimates tend to follow the reported data trend.

% variation vs reported data



Source: Natixis SRI Research, based on data sent by providers

Provider	Provider 2		Provider 3		Provider 4		Provider 5		Provider 6		Provider 6		Provider 6		Provider 7		Provider 8		Provider 9		Provider 10		Provider 7		Provider 7		Reported
Type of model	EEIO 2	%Var vs. reported data	Regressi ons 1	%Var vs. reported data	Regressi ons 2	%Var vs. reported data	Regressi ons 3	%Var vs. reported data	Sector average 1 (ICB 3)	%Var vs. reported data	Sector average 2 (BICS 3)	%Var vs. reported data	Sector average 3 (GICS 3)	%Var vs. reported data	Sector average 4 (GICS 4)	%Var vs. reported data	Sector average 5 (ICB 4)	%Var vs. reported data	IDWI	%Var vs. reported data	Bottom up 1	%Var vs. reported data	Bottom-up 2	%Var vs. reported data	Prolongat ion	%Var vs. reported data	
PROVIDENT FINANCIAL	ND	ND	23,577	326%	14,783	167%	10,322	86%	105,016.21	1797%	7,388	33%	5,033	-9%	8,353	51%	9,481	71%	32,206	482%	NA	ND	NA	ND	7,633	38%	5,537
GALENICA 'R'	ND	ND	108,061	757%	9,962	-21%	21,075	67%	124,124.55	884%	149,035	1082%	96,306	664%	126,707	905%	33,089	162%	39,239	211%	NA	ND	NA	ND	13,981	11%	12,611.00
HALMA	ND	ND	131,476	517%	39,328	85%	32,116	51%	21,870.47	3%	10,913	-49%	28,086	32%	19,429	-9%	26,862	26%	23,558	11%	NA	ND	NA	ND	25,536	20%	21,304
GECINA	ND	ND	197,895	584%	43,346	50%	50,820	76%	54,555.32	88%	54,555	88%	51,017	76%	58,759	103%	39,197	35%	58,954	104%	211	-99%	NA	ND	35,698	23%	28,949
KPN KON	ND	ND	524,982	1285%	323,110	752%	45,094	19%	822,420.81	2070%	340,970	800%	334,700	783%	470,132	1140%	355,534	838%	494,408	1204%	NA	ND	NA	ND	119,425	215%	37,903
PUBLICIS GROUP	ND	ND	150,554	94%	97,055	25%	95,834	23%	59,519.19	-23%	58,988	-24%	59,519	-23%	62,520	-20%	73,645	-5%	65,034	-16%	NA	ND	NA	ND	99,565	28%	77,717
VESTAS WINDSYSTEMS	ND	ND	224,906	125%	92,052	-8%	157,620	57%	548,498.21	448%	504,382	404%	181,804	82%	175,689	75%	575,620	475%	205,900	106%	1,490	-99%	NA	ND	116,025	16%	100,137
ENEL GREEN POWER	ND	ND	57,718	-43%	111,081	10%	39,121	-61%	5,090,000.00	4941%	4,200,000	4059%	5,670,000	5515%	1,066,006	956%	1,509,228	1395%	223,080	121%	1,014,700	905%	18,235	-82%	158,626	57%	100,975
GIVAUDAN	208161	-4%	1,112,775	413%	224,272	3%	276,850	28%	980,718.60	352%	372,690	72%	848,409	291%	613,000	183%	716,351	230%	1,365,225	529%	NA	ND	NA	ND	252,051	16%	216,950
TECHNIP	ND	ND	2,075,367	285%	577,898	7%	433,826	-20%	1,166,848.68	116%	738,568	37%	886,998	65%	1,334,429	147%	1,036,833	92%	1,009,517	87%	386,228	-28%	NA	ND	592,852	10%	539,204
PHILIPS ELTN.KONINKLIJKE	ND	ND	2,625,776	208%	868,640	2%	1,179,515	38%	2,142,015.11	152%	401,715	-53%	936,544	10%	3,646,870	328%	2,072,116	143%	1,092,572	28%	NA	ND	NA	ND	923,316	8%	851,689
AIRBUS GROUP	1029079	2%	319,956	-68%	1,196,854	19%	1,611,155	60%	1,401,031.11	39%	1,123,299	11%	1,396,040	38%	2,260,671	124%	1,817,406	80%	1,601,753	59%	940,492	-7%	NA	ND	1,266,706	26%	1,009,188
STAGECOACH GROUP	ND	ND	1,279,443	2%	2,791,752	122%	1,214,708	-3%	514,048.32	-59%	226,174	-82%	437,258	-65%	726,608	-42%	837,270	-33%	1,586,214	26%	NA	ND	NA	ND	1,556,809	24%	1,257,183
STMICROELECTRONICS (MIL)	ND	ND	798,808	-42%	910,711	-33%	1,818,161	33%	133,380.46	-90%	361,067	-74%	501,665	-63%	942,521	-31%	260,118	-81%	694,026	-49%	1,404,000	3%	NA	ND	1,264,245	-8%	1,369,050
DSV 'B'	ND	ND	4,259,388	32%	3,066,545	-5%	2,202,433	-32%	4,452,547.11	38%	2,388,982	-26%	7,126,033	121%	1,238,393	-62%	1,973,965	-39%	1,590,455	-51%	3,433,000	6%	NA	ND	3,509,969	9%	3,225,000
CARREFOUR	ND	ND	5,144,747	52%	3,632,756	8%	3,940,194	17%	2,617,312.99	-22%	3,142,579	-7%	3,203,020	-5%	4,323,446	28%	4,193,186	24%	6,028,204	79%	NA	ND	NA	ND	3,728,983	10%	3,375,000
GALP ENERGIA SGPS	ND	ND	9,098,088	111%	4,652,786	8%	3,583,824	-17%	7,130,345.34	66%	6,362,665	48%	7,282,945	69%	9,488,486	121%	6,587,463	53%	7,452,795	73%	3,392,027	-21%	NA	ND	4,299,882	0%	4,303,143
CENTRICA	ND	ND	431,562	-94%	9,841,344	38%	10,542,340	48%	11,853,243.39	66%	9,575,521	34%	37,518,108	425%	74,292,486	940%	10,611,685	48%	14,834,379	108%	5,648,142	-21%	NA	ND	11,401,834	60%	7,146,411
NESTLE 'R'	7811701	0%	1,826,897	-77%	7,780,096	0%	7,168,539	-8%	5,497,745.37	-30%	5,630,099	-28%	5,434,553	-30%	9,073,218	16%	8,633,302	11%	5,719,355	-27%	7,456,332	-4%	NA	ND	7,340,065	-6%	7,799,132
LAFARGEHOLCIM	ND	ND	95,360,735	-10%	102,063,621	-4%	90,802,877	-15%	812,450.41	-99%	114,661,279	8%	72,461,255	-32%	97,784,968	-8%	14,071,344	-87%	92,500,000	-13%	110,100,000	3%	NA	ND	107,174,614	1%	106,499,295
Average of % in absolute value		Not relevant	256%		68%		38%		569%		351%		420%		264%		197%		169%		109%		Not relevant		29%		

Variation vs. reported data

A number of conclusions can be drawn from this table:

- Extending reported data from previous years is, not surprisingly, a “model” that sticks very close to the reported data
- The regression models show on average the lowest variation to the reported data
- Bottom-up models show the next-lowest variation, with good scores for large emitters.
- Sector average models show, unsurprisingly, a high degree of variation with the reported data. Also, the more granular the sector classification used, the more exact the estimate seems to be.
- In the absence of sufficient data, we could not analyse the estimates derived from EIO models.

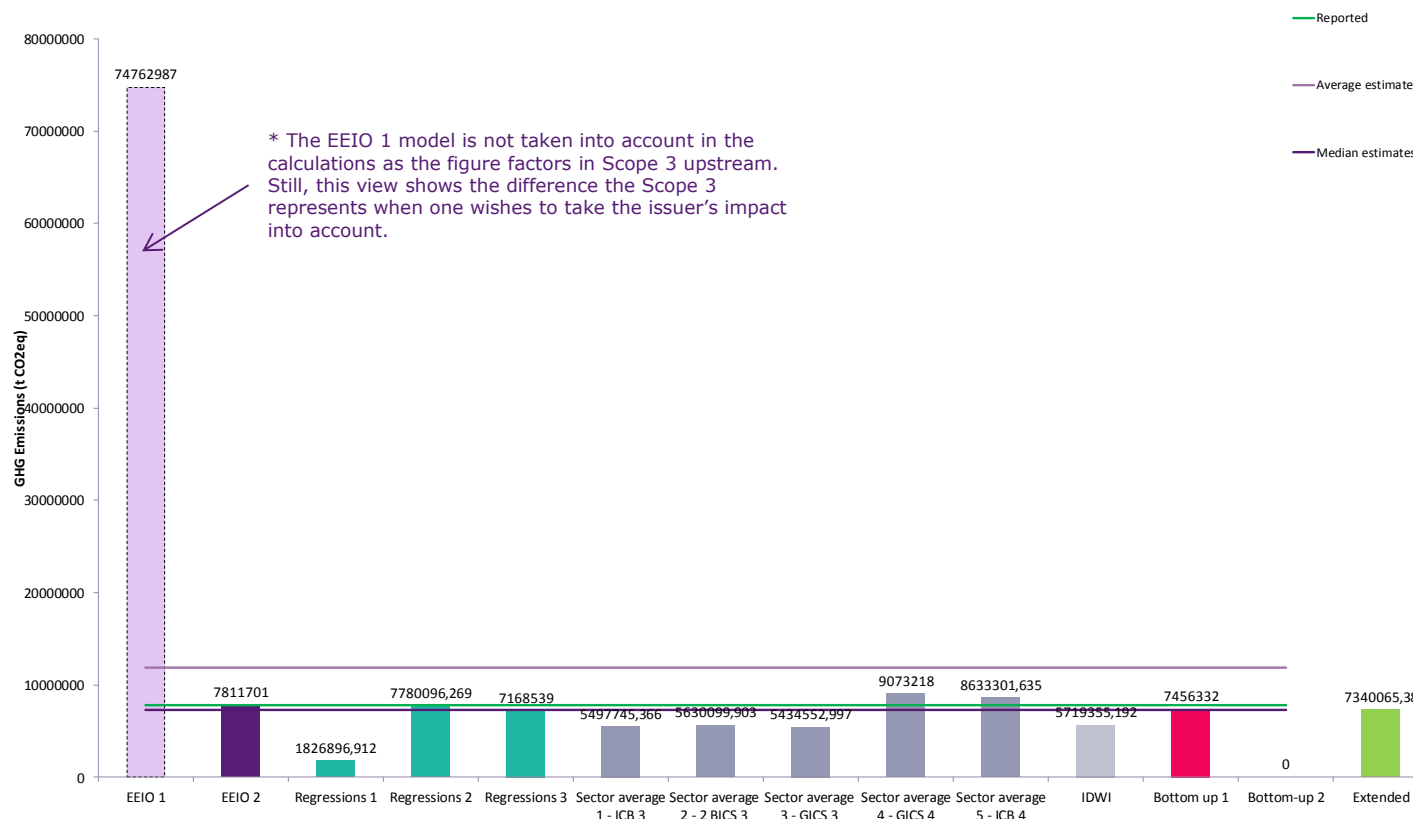
Again, these variations vs. reported data cancel each other out in the aggregated volumes for the sample

Provider	Provider 2		Provider 3		Provider 4		Provider 5		Provider 6		Provider 6		Provider 6		Provider 7		Provider 8		Provider 9		Provider 10		Provider 7		Provider 7		
Type of model	EEIO 2	% Var vs. reported data	Regressions 1	% Var vs. reported data	Regressions 2	% Var vs. reported data	Regressions 3	% Var vs. reported data	Sector average 1 (ICB 3)	% Var vs. reported data	Sector average 2 (BICS 3)	% Var vs. reported data	Sector average 3 (GICS 3)	% Var vs. reported data	Sector average 4 (BICS 4)	% Var vs. reported data	Sector average 5 (ICB 4)	% Var vs. reported data	IDWI	%Var vs. reported data	Bottom up 1	%Var vs. reported data	Bottom-up 2	% Var vs. reported data	Prolongation	%Var vs. reported data	Reported
TOTAL SAMPLE	9,048,941	Non pertinent	125,752,711	-9%	138,337,992	0%	125,226,424	-9%	45,527,692	-67%	150,310,878	9%	144,459,301	5%	207,712,691	51%	55,433,695	-60%	136,616,875	-1%	133,776,622	-3%	18,235	Non pertinent	143,887,817	4%	137,976,378

An example of consensus: Nestlé

NESTLÉ 'R'	EEIO 1	EEIO 2	Regressions 1	Regressions 2	Regressions 3	Sector average 1 - ICB 3	Sector average 2 - 2 BICS 3	Sector average 3 - GICS 3	Sector average 4 - GICS 4	Sector average 5 - ICB 4	IDWI	Bottom up 1	Bottom-up 2	Extended
Estimates	74762987	7811701	1826896,912	7780096,269	7168539	5497745,366	5630099,903	5434552,997	9073218	8633301,635	5719355,192	7456332	NA	7340065,38
Reported	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132	7799132
%var. vs reported data		0%	-77%	0%	-8%	-30%	-28%	-30%	16%	11%	-27%	-4%	NA	-6%

2013 GHG Emissions Estimates (Scope 1 + 2 - except for Provider 1)



All providers (except Provider 1)

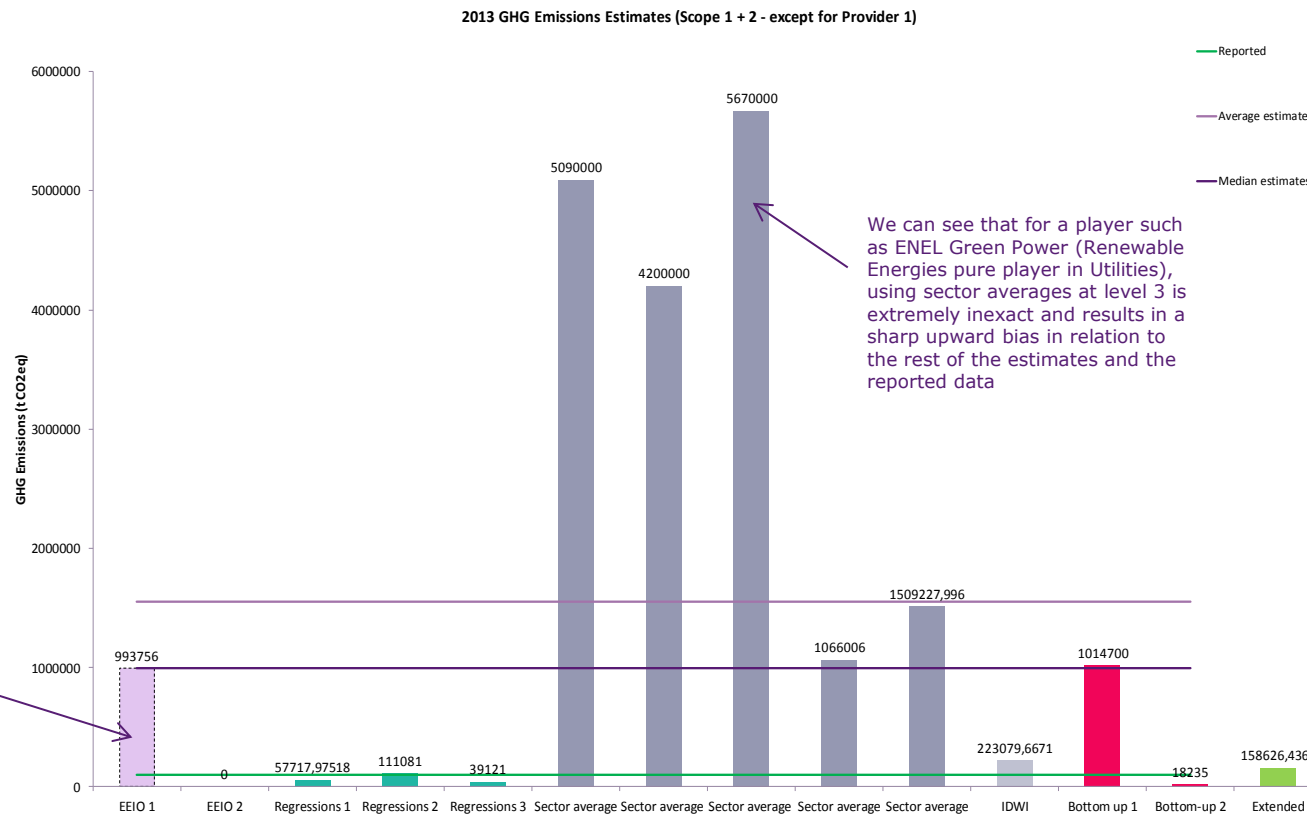
Median	7254302,19
Average	6614325,304
Max value	9073218
Min value	1826896,912
Range	7246321,088
Standard Deviation	1949026,125
Coefficient of variation	29,5%
CV (on esti)	25%

All models (except Provider 1 and Sector averages)

Median	7340065,38
Average	6443283,679
Max value	7811701
Min value	1826896,912
Range	5984804,088
Standard Deviation	2154499,66
Coefficient of variation	33%
CV (on esti)	28%

An example of disagreement: ENEL GREEN POWER

ENEL GREEN POWER	EEIO 1	EEIO 2	Regressions 1	Regressions 2	Regressions 3	Sector average 1 - ICB 3	Sector average 2 - 2 BICS 3	Sector average 3 - GICS 3	Sector average 4 - GICS 4	Sector average 5 - ICB 4	IDWI	Bottom up 1	Bottom-up 2	Extended
Estimates	993756	Not disclosed	57717,97518	111081	39121	5090000	4200000	5670000	1066006	1509227,996	223079,6671	1014700	18235	158626,4366
Reported	100975	100975	100975	100975	100975	100975	100975	100975	100975	100975	100975	100975	100975	100975
%var. vs reported data	Not applicable		-43%	10%	-61%	4941%	4059%	5515%	956%	1395%	121%	905%	-82%	57%



All providers (except Provider 1)	
Median	618889,8336
Average	1596482,923
Max value	5670000
Min value	18235
Range	5651765
Standard Deviation	2124491,844
Coefficient of variation	133,1%
CV (on esti)	2104%

All models (except Provider 1 and Sector averages)	
Median	111081
Average	231794,4399
Max value	1014700
Min value	18235
Range	996465
Standard Deviation	352603,5685
Coefficient of variation	152%
CV (on esti)	349%

* The EEIO 1 model is not taken into account in the calculations as the figure factors in Scope 3 upstream. Still, this view shows that with a player such as ENEL Green Power, the emissions related to the supply chain are not as great as a % of total emissions as they are at Nestlé



What carbon indicator to use for issuers?

What indicators to use?

At issuer level – Advantages and disadvantages (1/2)

Indicator	Advantages	Disadvantages	Possible use	R	I	T
Absolute emissions						
Total GHG (in CO2eq.) emitted by an issuer	Gives the most realistic view of the climate impact (absolute contribution to the greenhouse effect) Helps to monitor that reduction targets are met Makes it possible to assess the weight of each shareholding (line by line or sector) at part of the portfolio's carbon responsibility taken as a whole	Does not enable comparisons between companies (size effect)	Identifying the issuer most exposed to a regulatory "carbon" risk	x		
			Aiding a divestment decision as part of an exclusion approach by threshold or portfolio decarbonisation		x	x
			Aid for engagement actions	x	x	x
			Carbon reporting aid	x	x	
Normalised emissions						
Issuer's carbon intensity Total GHG/€ of sales	Makes it possible to compare companies, adjusting for size effects	Sensitive to denominator changes (with no link to the actual climate impact) Influenced by the pricing effect (diversity of products in any given sector) Exchange rate effects	Strategy for stock-picking the best issuers within a sector (best in class) or universe (best in universe)	x	x	x
	A proxy for companies' operating carbon performance		Aid for engagement actions	x	x	x
	Makes it possible to draw comparisons with other portfolios or indices		Carbon reporting aid	x		
Carbon intensity/physical indicator (e.g. vehicle, MWh, or barrel of oil produced;)	Gives the most realistic view of a company's business	Limited comparisons to a sector where products do not vary widely	Identifying the most energy efficient issuers in high-emitting sectors	x		
	Makes is possible to differentiate between companies on their product/process efficiency efforts (energy mix, energy efficiency, etc.)	Incomplete reporting depending on the sector	"Operational" stock-picking approach		x	x
		Irrelevant for certain sectors	Possibility of capturing the scope 3 emissions of certain products		x	x
			Aid for engagement actions	x	x	x
	Often relevant in high-emitting sectors	Difficult to aggregate at portfolio level	Carbon reporting aid	x		

What indicators should be used?

At issuer level – Advantages and disadvantages(2/2)

Indicator	Advantages	Disadvantages	Possible use	R	I	T
Normalised emissions (cont'd)						
Total GHG /€ of Market cap <i>Aggregated at portfolio level, proportionally to the % of Market Cap owned</i>	Historically the most commonly used ratio	Sensitive to variability in the denominator (no link to actual climate impact)	Aid in deciding to divest in an exclusion approach by threshold or portfolio decarbonisation		x	x
	Makes it possible to compare companies, adjusting for size effects	Different degree of market cap volatility depending on the companies (sanctions companies with poor finances)	Aid for engagement actions	x	x	x
		Varies according to gearing and the companies' financing structure Exchange rate effects	Carbon reporting aid		x	x
Carbon intensity/€ of EV* (Emissions financed, either by equity or debt)	Makes it possible to compare companies, adjusting for size effects	Highly volatile Some recommend taking Total liabilities + shareholders' equity	Aid in deciding to divest in an exclusion approach by threshold or portfolio decarbonisation		x	x
	Makes it possible to take into account debt financing in intensity calculations	Timing horizon issue: e.g. debt is limited to 5 years maturity, but will have served to finance a 20-year issuer / project.	Aid for engagement actions	x	x	x
	Enables aggregation for diversified portfolios (fixed income + equity)	Potentially negative EV (in this case taking the average EV over a given period is unlikely to give a negative result)	Carbon reporting aid	x	x	

Source: Natixis Global Markets Research, MSCI

- Other less-common intensity denominators can be used: EBIT, EBITDA, net assets, etc.

* Carbone 4 uses EV as an aggregation rule and defines it as "Market cap + preferred stocks + (interest bearing short-term and long-term debt – cash & cash equivalents)"



How to measure a portfolio's carbon performance?



What indicators to use at portfolio level?

At portfolio level (1/3)

Indicator	Description	Advantages	Disadvantages	Possible uses	R.	I.	T.
1. Total portfolio emissions (tCO2eq)	$\sum_i \frac{\$ \text{ invested } i}{\text{Issuer's } i \text{ market cap}} * \text{Issuer's } i \text{ emissions}$	Makes it possible to quantify the volume of carbon emitted by the stake owned in the company and as such, the portfolio's contribution to "climate change"	Relevant for equities only	Assessing the portfolio's "absolute" impact on the climate	x	x	
		Makes it possible to monitor changes in this indicator and set reduction targets	Variability of the denominator (cf. previous slides)	Dynamically setting an absolute reduction target	x	x	x
		Makes it possible to compare with other absolute footprints		Carbon reporting aid	x		
2. Total emissions financed	$\frac{\text{Total portfolio emissions}}{\$m \text{ invested}}$	Makes it possible to compare with another portfolio, regardless of the size.	Relevant for equities only (cf calculation of total portfolio emissions using market cap)	Comparison of the impact compared with another portfolio		x	x
				Setting of relative reduction target	x	x	x
				Carbon reporting aid	x		
3. Carbon intensity of the portfolio per euro of sales	$\frac{\sum_i \frac{\$ \text{ invested } i}{\text{Issuer's } i \text{ market cap}} * \text{Issuer's } i \text{ emissions}}{\sum_i \frac{\$ \text{ invested } i}{\text{Issuer's } i \text{ market cap}} * \text{Issuer's } i \text{ sales}}$	Operating efficiency indicator at portfolio level		Comparison of the portfolio's carbon efficiency using a benchmark		x	x
		Measures the portfolio's carbon efficiency by \$ of sales of the portfolio companies, correcting the size bias	Relevant for equities only (use of market cap)	Dynamically setting reduction targets		x	x
				Carbon reporting aid	x	x	

What indicators to use?

At portfolio level (2/3)

Indicator	Description	Advantages	Disadvantages	Possible uses	R.	I.	T.
4. Carbon intensity of the portfolio per € of EV invested	$\sum_n^i \text{Portfolio's exposure to the issuer } i * \frac{\text{Issuer's GHG emissions } i}{\text{Enterprise value}}$	Indicator of operating efficiency at portfolio level Measures the portfolio's carbon efficiency by € of EV of the companies in the portfolio, correcting the size bias Emissions are proportionally allocated between its equity and its debt (€1 of debt and €1 of equity have the same carbon intensity) Prevents double counting for diversified portfolios Relevant for equity, fixed income and diversified portfolios	Highly volatile EV Timing horizons between debt and sources of emissions	Comparison of the portfolio's carbon efficiency with a benchmark		x	x
				Dynamically setting reduction targets		x	x
				Carbon reporting aid	x	x	
5. Portfolio's weighted carbon intensity	$\sum_n^i \text{Issuer's weight in the portfolio } * \frac{\text{Issuer's GHG emissions } i}{\text{Issuer's sales } i}$	Carbon intensity proxy that can be applied to all asset classes Can also be used for fixed income (no use of market cap) Measures the portfolio's carbon risk exposure without the notion of "carbon responsibility"	Gives no information on the contribution to climate change or the energy transition	Comparison with a benchmark	x	x	
				Decarbonising the portfolio	x	x	
				Dynamically setting reduction targets	x	x	
				Carbon reporting aid	x	x	

Be careful of the high degree of volatility of items such as market capitalization and enterprise value (market effect - see ratios 3 and 4)

At portfolio level (3/3)

Once again, the goal must be clear:

- 1. Is it a case of measuring (and why not improving) a portfolio's carbon risk exposure and the carbon efficiency of the issuers it comprises?**
 - If this is the case, we think that the portfolio's weighted carbon intensity (no.5 in our table) is the most relevant indicator insofar as it is unaffected by the notion of asset class and only pertains to the portfolio's efficiency, not the euro invested.
 - Each issuer's carbon intensity can be expressed per € of sales, EBIT, Total balance sheet (with each of these normalisations including a bias),
 - A very risk-oriented approach, in keeping with the spirit of the TCFD or article 173, but less so with the TEEC label, which seeks to measure the investors' contribution (positive to be specific) via their assets to the ecological and energy transition.

- 2. Is it a case of measuring (and why not controlling and reducing) the level of carbon for which the assets are "responsible"?**
 - As a result, the notion of property is again a crucial one, which brings us back to the EV vs. market capitalisation debate (with their market effects and volatility disconnected from their operating and even more so carbon challenges). For equities, the "Portfolio total emissions" (no.1) or "Total emissions financed" (no.2) indicators are the most relevant, in our view, to the extent that they do not lose sight of the notion of vital absolute when we want information on responsibility held (as opposed to reasoning in terms of intensity – no. 3)
 - In the case of fixed income or diversified portfolios, we cannot suggest anything better idea than reasoning in terms of EV intensity, but which still leaves us puzzled.

Equities ok... but what about other asset classes?

Asset class	
Fixed Income	Use of carbon data at issuer level (same as for equities) The issue is how to aggregate them at portfolio level: % debt outstanding held % enterprise value (even if this is highly sensitive to the issuer's leverage) Or: weighted average by the share in the portfolio
Sovereign bond	At yet little coverage by carbon data providers Even less standardised, several sets of data are available nationally Challenge is to decide between: the carbon footprint of goods & services products vs. goods and services consumed... Aggregated according to the % of public debt issued
Private Equity	Little coverage by carbon providers because very little data available from companies Increasingly part of investment due diligence procedures, which, in practice require carbon assessments from their targets. But the carbon/climate challenge is likely to be used to make investment decisions on a case-by-case basis (risk and/or opportunities) than a portfolio management tool If a footprint is required, in a worst-case scenario sector proxies (using sector data from listed peers) can serve as an indicator...
Project finance, Infra	Little coverage by carbon data providers Several initiatives E.g.: Sure Standard: assess the GHG benefit of the infrastructure via avoided or reduced emissions
Real Estate	The quality of reporting available on assets makes it increasingly possible to turn to normalisations by physical output: t CO2/ m2 / year t CO2 / occupier / year t CO2 / visit / year Via: kWh/visitor / year; kWh / m2 / year+ CO2 / kWh Possibility of having recourse to data gathered by GRESB?

Ultimately, portfolio carbon indicators...

... must be chosen according to the desired objective and expected management processes

... have imperfections that must be identified and acknowledged (see confidence interval & estimate model biases; maximising the use of cleaned reported data is clearly preferable)

... are a pretty good reporting tool as provided for by the French regulations, even if they do not cover all aspects: risks, impact and contribution

... are a useful initial tool in portfolio divestment or decarbonisation approaches

... are woefully insufficient in re-directing assets to low-carbon solutions (green solution providers) or in measuring the positive contribution to the transition

What indicators do providers offer? (1/3)

	By issuer		By portfolio	Other
	Absolute	Intensity	Portfolio	
Bloomberg	Scope 1 / Scope 2 / Total GHG (CO2eq)	Normalisation is possible by all data points available in Bloomberg (particularly certain physical indicators)	Carbon efficiency ratios (tCO2/Market cap)	Over a 100 other environmental data via Bloomberg ESG research
Carbone 4	Scope 1 / Scope 2 / Scope 3 (where relevant) / Total / (CO2eq) + Avoided emissions	GHG / € of sales // GHG / Market Cap GHG / Enterprise Value	GHG / € of sales GHG / Market Cap GHG / Enterprise Value	Carbon Impact Ratio: avoided emissions/induced emissions Qualitative scoring of the contribution to the energy transition Qualitative scoring of transparency and quality of reporting
Inrate	Scope 1 / Scope 2 + 3 upstream/ Scope 3 downstream/ Total (CO2eq) (based on intensity multiplied by sales)	GHG / any financial metric (Market Cap, sales, etc.) Can be applied to FI portfolios	CO2eq / € of sales CO2eq / market cap CO2eq / working capital CO2eq normalised for debt	ESG Data LCA assessment of a company's products and services
MSCI	Scope 1 / Scope 2 / Total / (CO2eq) reported Scope 3	CO2eq / \$ of sales	1/ GHG / \$ invested 2/ Total portfolio emissions (based on ownership) 3/ Carbon intensity of the portfolio (Financed emissions/sales proportional to the share of ownership) 4/ Average weighted carbon intensity: Weighted emissions/weighted sales	Portfolio's exposure to fossil fuels vs. benchmarks Potential emissions tied to fossil fuels Qualitative opinion on Carbon Risk Management Green share (Clean Tech Metrics)
Sustainalytics	Scope 1 / Scope 2 / Total / (CO2eq)	CO2eq / \$ of sales	Idem.	ESG research Exposure to high-impact fossil fuels Assessment of exposure to the risk of Stranded assets

What indicators do providers offer? (2/3)

	By issuer		By portfolio	
	Absolute	Intensities	Portfolio	Others
Vigeo	Scope 1 / Scope 2 / Scope 3 reported (tCO2eq)	Available (but Vigeo is somewhat wary regarding intensities)	GHG / € invested (can be applied to FI) Financed emissions (depending on the percentage stake in the capital)	Qualitative opinion on each issuer's climate change strategy Metrics for fossil fuel exposure and potential emissions are under development.
Grizzly	Scope 1 / Scope 2 / Total Scope 3 downstream (Auto) CO2eq.	GHG / revenues GHG / Market Cap GHG / EV GHG / (Total liabilities + shareholders' equity)	Financed emissions (shareholder = owner) Emissions allocated according to gearing for financed emissions	R&D efforts (customised assessment by using IDWI on R&D on sales) Reduced emissions Avoided emissions
South Pole	Scope 1 / Scope 2 / Scope 3 (downstream & upstream) Total (CO2eq)	GHG / sales	Emissions per \$ invested (portfolio level) Weighted emissions/weighted sales (according to weighting in the portfolio)	Screening of Climate Change (customs services) strategies + Other Climate Change consulting services
Trucost	Scope 1 / Scope 2 / Scope 3 (upstream + downstream for certain sectors) / (tCO2eq)	GHG / USDm of sales GHG / GWh or other specific indicators by sector	GHG / equity percentage stake GHG / EV (to include fixed income) GHG / EV or debt (for infrastructure, Green Bonds or real estate projects)	Footprinting services on other environmental metrics - Green share - Brown share - Water use footprint - Waste use footprint - Global environmental footprint - Potential emissions from fossil reserves + Carbon management rating by issuer + Other services on demand

What indicators do providers offer? (3/3)

	By issuer		By portfolio	Others
	Absolute	Intensities	Portfolio	
Oekom	See South Pole	See South Pole	See South Pole	- Fossil energy screening: an exclusion list for 3,700 companies to facilitate divestment from fossil energies - Risk management rating – 3,700 companies - Portfolio analysis
CDP	The scope, unit of measurement, gases included or not included etc. all depend on the companies' reporting choices	Depends on companies' reporting choices CO2eq / \$ of sales CO2eq / employee CO2eq / other specific indicator (according to the sector of the reporting company)	Total portfolio emissions (tCO2eq) Weighted emissions (depending on the percentage stake) Average emissions (vs. benchmark)	Transparency score Performance score Water Disclosure Project Supply Chain Programme



Allocating a portfolio's carbon performance

Regardless of the portfolio carbon performance indicator selected, it is useful to break down its origin in the same way as “performance attribution”

As such, a portfolio’s carbon performance can be interpreted according to different impacts:

- **Sector allocation:** to what extent does my portfolio’s exposure to different sectors increase or reduce its carbon intensity?
- **Stock-picking effect:** To what extent will my choice of stocks in each sector impact my portfolio’s carbon intensity?
- **Covariance effect:** a combination of these two effects (which can have an upward or downward effect)

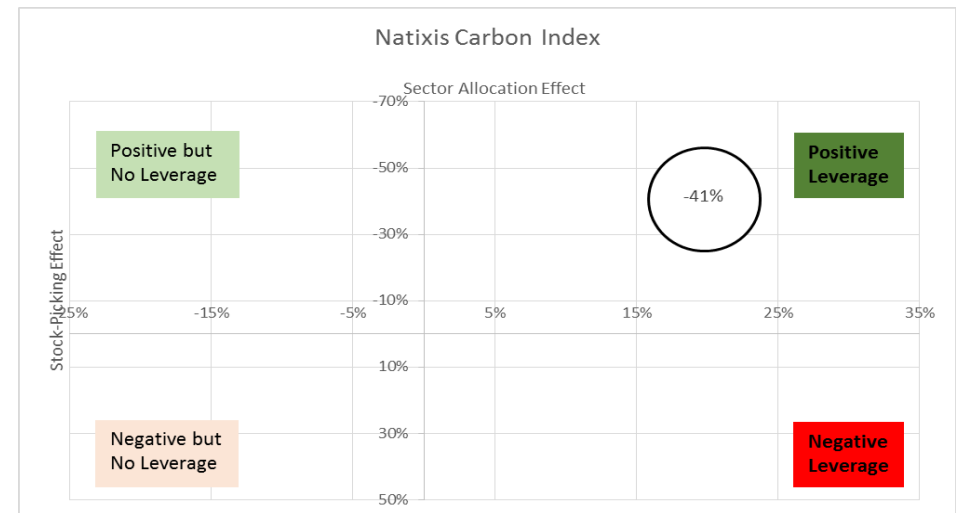
How to interpret a portfolio's carbon performance allocation?

Example: Lessons from our “proprietary” climate index: NXS COP

therefore

Performance Contribution	Q3 2015	Mean (2009/2015)
Carbon intensity of the NXS COP index	101.5	142.7
Carbon intensity of the STOXX 600® index	201.6	244.2
Carbon emission reduction	-100.1	-101.5
Emission reduction (%)	-49.6%	-41.0%
Stock-picking effect	-32.5%	-40.6%
Sector allocation effect	15.8%	19.8%
Covariance effect	-32.9%	-20.2%
Carbon intensity of the Euro STOXX 50® index	195.2	238.4

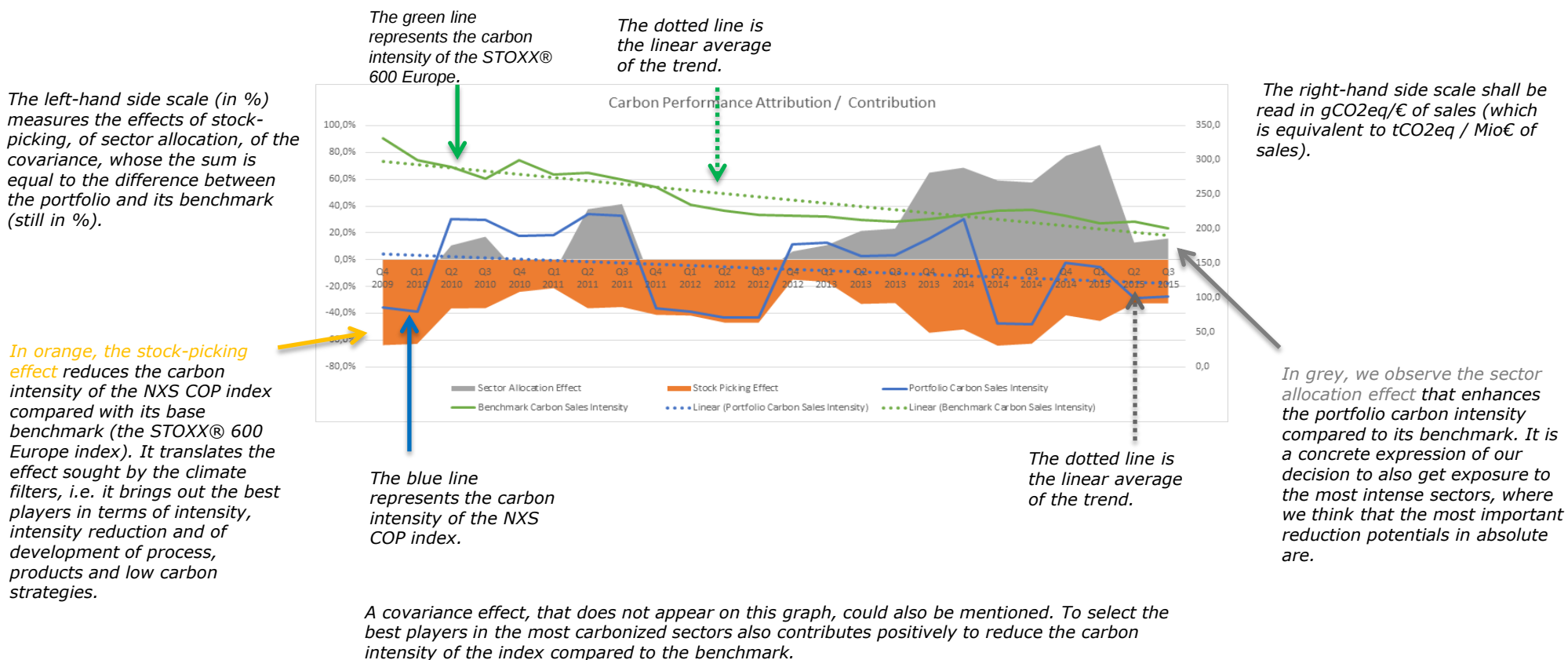
- The carbon footprint of the stocks making up the NXS COP index is **currently around half that of the STOXX Europe 600 and averaged 41% in 2009/2015.**
- The carbon performance of the **NXS COP is heavily based on stock picking** which makes up for **its deliberately balanced sector position**, including sectors with high carbon stakes.
- This sector diversification is in keeping with our wish to **reflect the carbon realities of European economies as a whole, which pushes us to overweight in industrial sectors, compared with the STOXX 600.**



How to interpret a portfolio's carbon performance attribution?

Example: Lessons from the NXSH COP

Carbon performance attribution of the NXS COP index: how the selection of stocks and sectors influence its carbon intensity.





Double counting: a non-issue?

Definition

Relevance differs depending on the strategy

How to avoid it: the Carbone 4 proposal

Definition

Double counting at portfolio level amounts to counting the same tonne of CO2 twice, when calculating its carbon footprint, by aggregating the indirect emissions of the companies in the same value chain.

- **Most of the time, double counting occurs when considering Scope 3 emissions.**
- **In other cases, at portfolio level it is limited to utilities' emissions in scope 1 and 2 reporting,**

Category	Relevant scope
Utilities vs. electricity consumers	Scope 1 (for the utility co.) and Scope 2 for the entity consuming the electricity
Supplier (finished product)/end-customer	The use of a product by an entity results in CO2 emissions (Scope 1) which equate to the Scope 3 emissions of the entity that manufactured the product
Supplier (spare parts)/Seller of finished product	Emissions tied to the use of spare parts (Scope 3) are included in emissions tied to the use of the end-product (Scope 3)
Manufacturer/distributor	Emissions tied to the use of the product manufactured by entity A (Scope 3) are also counted for the company that distributed the product (Scope 3)
Owner/manager	Emissions from the asset owned by entity A (Scope 1) are the same as those counted as entity B's Scope 1 emissions.
Financed emissions	Emissions tied to the asset that was debt-financed Accounting of emissions tied to underwriting activities.

Relevance differs depending on the strategy

Is it a non-issue?

Exposure to risk

Investing in two companies that have the same tonne of emissions in their scope of responsibility, doubles the exposure to regulatory risk.

In the case, counting this tonne twice therefore makes sense.

Impact

Double counting can be considered problematic in understanding the portfolio's impact on climate change.

Contribution to the transition

Double counting does not impact indicators of exposure to energy transition opportunities

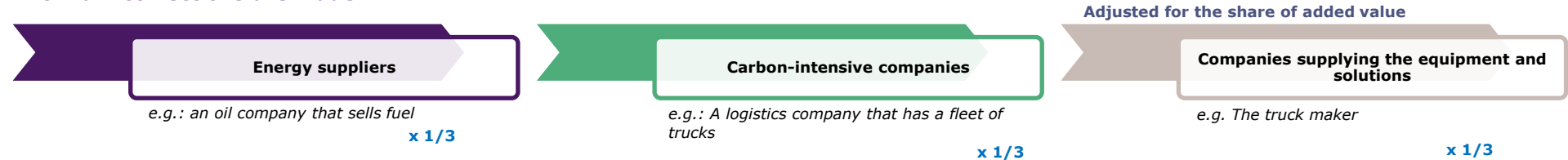
Double counting: how to avoid it?

An innovative proposal from Carbone 4, but based on very strong assumptions...

Double counting is eliminated with the aggregation of calculated volumes for each issuer

- For a methodology such as Carbone 4's, which focuses on assessing Scope 3 emissions for high-stake sectors, it is of vital importance.

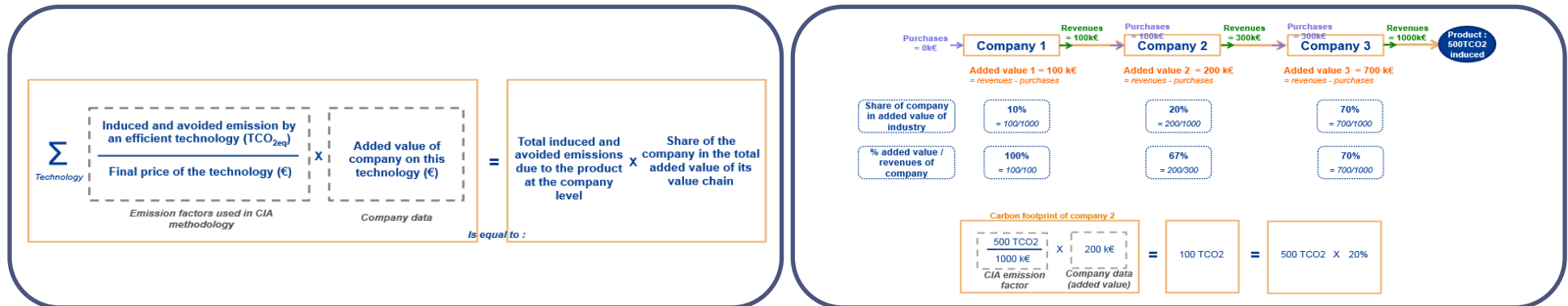
Two main corrections are made:



1/ Carbone 4 assumes that most double counting occurs between three categories of players in the value chain. For this reason, Carbone Impact Analytics adjusts the data of "induced" and "avoided" emissions of the three categories by multiplying them by 1/3.

2/ Because double counting is also possible within the "equipment supplier" category (several companies involved in manufacturing the same finished product, which provides an energy efficiency solution), Carbone 4 assumes that induced and avoided emissions that are produced during a product's manufacture are proportional to the share of added value the company contributes to the end product (which is far from obvious)

- As such, total induced and avoided emissions (previously quantified for each company) must be multiplied by the share of added value of the company in the value chain.
- This share in the added value of the value chain is estimated as "sales-purchases", to the extent that this data is unavailable.



Double counting: providers' positions

Providers' responses to the question "Do you factor in double counting?"

Bloomberg	 carbone 4	 inrate Sustainable Investment Solutions	MSCI	 SUSTAINALYTICS
Not taken into account.	See previous slide	Double counting of Scope 3 has not yet been eliminated. Assumptions can be made about groups of specific companies, but no general assumption is made in the standard model.	Not taken into account, especially as MSCI only provides Scope 1 & 2 estimates.	Not taken into account (the risk is considered low to the extent that Sustainalytics does not provide Scope 3 data)
 vigeo	 GRIZZLY RESPONSIBLE INVESTMENT	 south pole group	 TRUCOST	oekom research
Not taken into account.	Not treated specifically. Can depend on customer demand.	Possible upon special request. However, from a "Risk" perspective South Pole recommends it to keep it.	Not generally taken into account. However, certain assumptions are used at the request of certain clients.	See South Pole.

Very few providers factor in the doubling counting issue (apart from Carbone 4) in their general portfolio carbon footprint service.

Nevertheless, several of them can do so, upon request from their clients.

Conclusion

***Beyond Carbon Footprinting
Some focus areas...***

Available indicators and suitability with targets set (1/2)

Given the long list of imperfections but particularly the climate challenges not covered by carbon footprint data, as shown throughout this report, a simple and fairly consensual conclusion can be drawn:

- ⇒ Quantitative carbon indicators are an imperfect and at the very least incomplete proxy for the measurement of the different ways of addressing the climate issue in asset management.

This approach should be complemented with a series of other indicators, including:

	Risks	Impacts	Contribution	Availability
Avoided emissions			+	Average
Green share			+	Average
Brown share	+	+		
Evaluation of climate risk management	+	+		High
Transparency score	+			High
Exposure to fossil energies & stranded assets	+	+		Average
Potential emissions		+		Average
2°C compatibility	+	+	+	Low
Score showing exposure to physical risks	+			Low
Other environmental indicators		+		High

Available indicators and suitability with targets set (2/2)

	Other
Bloomberg	Over 100 other environmental data via Bloomberg ESG research
Carbone 4	Carbon Impact Ratio: avoided emissions /implied emissions Qualitative rating of the contribution to energy transition Qualitative rating of transparency and reporting quality
Inrate	ESG Data LCA evaluation of a company's products and services
MSCI	Portfolio exposure to fossil fuels vs. benchmarks Potential emissions related to fossil fuels Qualitative view on Carbon Risk Management Green share (Clean Tech Metrics)
Sustainalytics	ESG research Exposure to high-impact fossil energies Evaluation of the exposure to stranded asset risk
Oekom	- Fossil energy screening: an exclusion list for 3,700 companies to promote divestment of fossil energies - Carbon risk management rating – 3,700 companies - Portfolio analysis
CDP	Transparency score Performance score Water Disclosure Project Supply Chain Programme
Vigeo	Qualitative view on the Climate Change Strategy of each issuer Metrics on exposure to fossil energies and potential emissions are being developed.
Grizzly	Research efforts (customised evaluation using IDWI on R&D for sales) Reduced emissions Avoided emissions
South Pole	Screening of Climate Change strategies (custom services) + other climate change consultation services .
Trucost	Footprinting services on other environmental metrics - Green share - Brown share - Water use footprint - Waste use footprint - Global environmental footprint - Potential emissions of fossil reserves + Carbon management rating by emitter + other services on request

A lack of consensus on the definition

Most providers offer this indicator. When they do, the definitions vary. Here too, the scope needs to be defined

- **Does an effort towards energy efficiency in the production process (Scope 1) count as avoided emissions?**
 - This requires dating the growth rate of emissions up until the implementation of this effort
 - And establishing the differential
- **Avoided emissions in scope 2 are easier to gauge**
 - By looking at the energy mix used by the company
 - By assessing the choices made by the company to use greener energy sources, either directly or indirectly (through renewable energy certificates – such as the Green Cloud strategy at SAP).
 - But this requires a bottom up analysis on a case-by-case basis.
- **How to quantify avoided emissions with a product? (Scope 3 downstream and beyond)**
 - Can be achieved in terms of energy efficiency relative to a benchmark of similar products (for ex. automotive)
 - Can be achieved by examining pure player products (for ex: power management chips)
 - Emission reductions achieved through a product not intended for the end client are very hard to estimate (and therefore to allocate). This is the case with the technology sector: what level of avoided emissions to attribute to a semiconductor, *which is needed to operate a smartphone, whose applications in turn help reduce car travel? What to do if this same semiconductor can be used in other sectors (for ex. industry), without being able to trace the destination?*
- **It is easier to quantify avoided emissions for infrastructures / projects than for companies, but this depends on a bottom up methodology more akin to carbon accounting methodologies.**
- **When they are available, the calculation methods, time horizons or baselines used (geographic, time-based, static or dynamic, vs. Business as Usual, tailored to each sector, etc.) often make the data hard to compare**

Focus area 1: What about avoided emissions ?

An indicator dependent on the baseline choice



Carbone 4 provides avoided emissions for each company where the indicator is regarded as relevant, and systematically aggregates it at the portfolio level.

Avoided emissions are defined as those which are not produced by the activities of a company, relative to a benchmark scenario (where it is less favourable).

This scenario is defined differently depending on the sector

It can vary: benchmark / past performance / benchmark of efficient products when available, etc.

For example: for the electricity sector, avoided emissions will be the difference between the carbon intensity of the producing company (tCO₂eq/KWh produced) and world electricity intensity in 2025, in an IEA scenario of 2°C, multiplied by annual electricity production by volume.



Grizzly can provide an avoided emission figure, based on the emissions which the company would have produced if it had not improved its carbon performance (for example the carbon intensity of sales) from a precise date.

In this case, the benchmark is simply a comparison to past performance.



South Pole indicates that avoided emissions are available for some sectors & some projects.



Trucost provides partial information on avoided emissions

This indicator is available for Green Bonds and Green Equity.

The definition used: emissions of a project relative to a benchmark (e.g. vs. local energy mix // vs. best available alternative // vs. weighted sector average)

NB: other providers, such as MSCI, are examining the issue

At stake: identifying and singling out low-carbon solutions or activities, contributing to the transition as well as those responsible for climate destruction

The aim

- ⇒ **Portfolio construction**
 - ⇒ Bottom up: **thematic stock picking** focusing on issuers whose green share is greater than a certain sales threshold, physical production, etc.
 - ⇒ Bottom up: **Exclusions, divestment** by issuers whose brown share exceeds a certain threshold of sales, reserves, capex, etc.
 - ⇒ Top down: **optimising the green share, or the green share development** of a portfolio or **decarbonisation** approach (alongside carbon footprinting)
- ⇒ **Analysing exposure to competitiveness and “missing out on intrinsic developments in the business model” climate related risks**
- ⇒ **Defining engagement strategies based on these strategic positioning measures undertaken by issuers**
- ⇒ **Reporting**

The asset classes

Equities, bonds, Infra, private equities

The indicators

- ⇒ **Static: % of sales or EBIT or % kWh / m2 etc. (physical data)**
- ⇒ **Prospective: % of R&D, CAPEX, RESERVES**
- ⇒ **Dynamic: historical variations in static or prospective data**



Definition of green or brown share (sectors, activities, techno)?

- ⇒ **Green/Brown sales are rarely reported by companies, estimated by some providers (FTSE, Trucost),** with a certain number of assumptions to approximate it.
- ⇒ **Reasoning by sector is reductive but is a good start**
- ⇒ **Several attempts at green taxonomies: CBI, FTSE, MSCI, Trucost, SASB etc. An interesting basis for discussion but clearly imperfect**
- ⇒ **Significant contrast between an green activity or sector and the definition of “greenness” thresholds within these categories.** Most taxonomies stop at the definition of green categories (CBI publishes large category standards that attempt to go towards greenitude assessment).
- ⇒ **Applicability? Granularity of the information available? Ability of the investor to put in place taxonomies of this kind?**
- ⇒ **Several technologies/activities, integral part of the transition, do not draw any consensus:** large hydro, nuclear CCS, gas, cogeneration, waste to energy, etc.



How to complement the approach by activity techno (necessarily approximate)

- ⇒ **With a qualitative approach?** Based on ESG ratings supplied by extra-financial ratings agencies or as achieved by Carbone 4 (the climate strategy score)
- ⇒ **The level of contribution can be assessed on the basis of the notion of avoided CO2** (see slides 137/138)



Data providers

- ⇒ **Extra-financial ratings agencies in the context of their ratings** (flaring, % sustainable cars sold, electric production mix, energy mix, transport mix, % certified, etc.)
- ⇒ **Specialised or generalist sector databases (see Wood Mackenzie, Carbon Tracker, etc.)**
- ⇒ **Development of several adhoc offers (classifications, indices, etc.), from FTSE, MSCI, Bloomberg NEF, etc. but more green than brown**

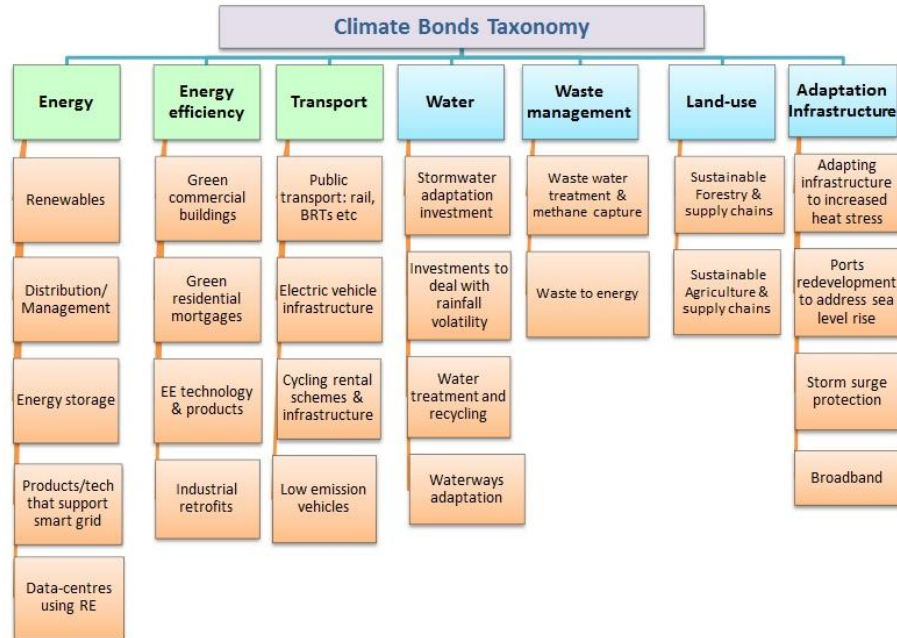
... but a persistent lack of source data, not provided by the issuers, to have reliable estimates and a minimum of prospective (R&D split, Capex, granularity of efficiency indicators based on activities, etc.)

... but data often limited to certain sectors (oil & gas, power, auto, etc.)

Focus area: Green vs Brown share

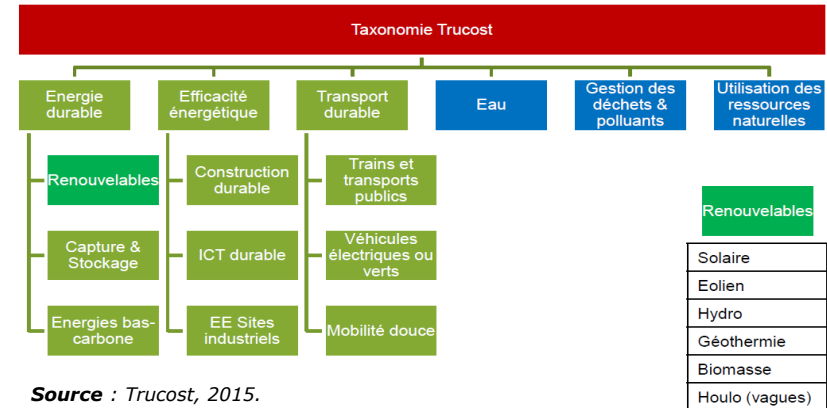
Several attempts at taxonomies

Climate Bond Initiative Taxonomy



Source : Climate bonds Initiative - <http://www.climatebonds.net/standards/taxonomy>

Taxonomy used by Trucost to estimate green share



Source : Trucost, 2015.

Example of indicators of green vs. brown exposure

	Brown	Green
Oil , Gas & Coal	- Share of high-cost capital expenditure - Share of unconventional (e.g. tar sands, deep water) oil in production mix	- Share of carbon capture and storage - Share of renewables in R&D and capital expenditure
Power sector	- Share of high-carbon electricity generation - Estimated remaining lifetime of power plants	Share of renewables in electricity generation, installed capacity, and capital expenditure
Automobile manufacturing	Average fuel economy of car fleet	Share of sustainable propulsion technologies in sales
Industry	Energy and carbon intensities	- Share of zero-carbon manufacturing - Relative investment levels in green manufacturing R&D or deployment
Cross-sector	- Share of oil & gas in sales / revenue - Share of coal in revenues	Share of green technologies (e.g. low-carbon economy) in sales / revenue

Source: 2° investing initiative, WRI, UNEP FI – Climate strategies & metrics

Several attempts at taxonomies

FTSE system of environmental classification (sectors & subsectors)

E1.0 Renewable & alternative energy	E2.0 Energy efficiency	E3.0 Water infrastructure & technologies	E4.0 Pollution control	E5.0 Waste management & technologies	E6.0 Environmental support services	E7.0 Food, agriculture & forestry
E1.1 Wind power generation equipment	E2.1 Power network efficiency	E3.1 Water infrastructure	E4.1 Pollution control solutions	E5.1 Waste technology equipment	E6.1 Carbon and other environmental assets trading	E7.1 Sustainable and efficient agriculture
E1.2 Solar energy generation equipment	E2.2 Industrial energy efficiency	E3.2 Water treatment equipment	E4.2 Environmental testing and gas sensing	E5.2 Recycling and value added waste processing	E6.2 Environmental consultancies	E7.2 Logistics, food safety and packaging
E1.3 Other renewables equipment	E2.3 Buildings energy efficiency	E3.3 Water utilities	E4.3 Public transportation	E5.3 Hazardous waste management	E6.3 Diversified environmental	E7.3 Sustainable forestry and plantations
E1.4 Renewable energy developers and IPPs	E2.4 Transport energy efficiency	E3.4 Diversified water infrastructure and technology		E5.4 General waste management		
E1.5 Biofuels	E2.5 Consumer energy efficiency			E5.5 Diversified waste and technology		
E1.6 Diversified renewable and alternative energy	E2.6 Diversified energy efficiency					

Source: FTSE

http://www.ftse.com/products/downloads/FTSE_Environmental_Markets_Classification_System.pdf

Themes eligible for Green & Social bonds according to Natixis Global Markets Research (list not exhaustive)

Energy - "Low Carbon" energy transition

Renewable energies (wind, solar, geothermal power, marine energies, small hydro, biomass, etc.)
Sustainable biofuels (as a priority 2nd and 3rd generations)
Smart grids/network infrastructure (particularly renewables connections)
Low carbon innovations/technologies: CCS, associated gas recovery
Decarbonising electricity generation: coal/gas switch, cogeneration, waste to energy, etc.
Energy storage solutions

Energy efficiency - Reducing the environmental footprint

Industry: Retrofitting & decarbonising industrial sites (cf. GHG emissions, atmospheric pollution), recourse to alternative fuel
Automation devices and optimisations/Green IT
Pollution control & measurements
Construction (existing & new): green buildings, renovations, heat insulation, lighting, air conditioning, environmental/sustainable development certifications, Efficient lighting solutions (cf. public lighting)
Smart Cities

Transport/Sustainable mobility

Low carbon public transport (cf. tramways, rail, etc.)
Alternative motor engines (electric, hybrid, plug-in hybrid, fuel cell, charging infrastructures, etc.) & reducing fleet carbon footprint

Circular economy/waste management innovations

Methanisation/networks for collecting waste for recovery or recycling, innovative recycling and waste sorting solutions
Waste-to-Energy

Energy transition financing/Carbon finance/climate financing

Financial institutions' solutions for financing green growth

Biodiversity/Natural resources

Decontamination of polluted and/or contaminated sites
Protection of natural resources (cf. water, protection & restoring carbon sinks and biodiversity, cf. reforestation/ afforestation)
Agro-ecology//Agroforestry/sustainable farming/Urban farming/organic farming
Chemicals/petrochemicals (as illustrated by the reconversion of industrial sites)
Land conservation & remediation /Managing land allocation
Innovative infrastructure and equipment for water management and treatment enabling:
- quantifiable incremental reductions in consumption
- improving water quality
- improving drinking water quality
- protection of water natural resources
Smart metering, rainwater recovery, desalination, etc.

Solutions for combating insecurity and poverty & their financing

Access strategies: Bottom of the Pyramid (North or South: access to energy, healthcare, water, nutrition, banking services, etc.)
Education/Return to employment
Social economy (micro finance, social business, local development, etc.)
Social or affordable housing
Social infrastructure for the most vulnerable

Healthcare

Home help
Vaccines
Public & private health infrastructure

Focus 3: Climate stress tests / climate impairment tests?

Stress tests on physical assets in sectors that are most exposed, based on a core scenario for:

- carbon prices
- energy demand
- climate regulations
- availability & prices of natural resources

Depending on the asset class concerned:

- Equity (Carbon Tracker, Bloomberg)
- Corporate bonds (S&P, Moody's)
- Sovereign bonds (Beyond Ratings, Global Footprint Network)

Example: a composite approach

The NXS COP index's climate filter

It is considering how crucial it appeared to combine various approaches in order to gauge climate performance, that we decided on how to build our in-house NXS Climate Optimum Prospective index.

We approached it from a climate stock-picking angle.

Our index had to deal with the constraints of being systematic, based on external independent data and minimum discretionality, so we set three main objectives:

- ⇒ **Address the climate problem wherever it is most relevant, in other words look for the greatest potential absolute carbon efficiency gains and thus take on a high level of industrial exposure (decarbonised as opposed to “non carbonated”)**
- ⇒ **Ensure that the notions of dynamic approach and progress are incorporated**
- ⇒ **Find a way to “capture” not only Scope 3 data but also the supply of low-carbon solutions, products and services with climate value-added.**

By combining our constraints and objectives, we chose the following criteria:

- ⇒ **The exclusion of companies that generate more than 10% of their sales from high-impact fossil fuels**
- ⇒ **Scope 1 and 2 carbon data: static and dynamic**
- ⇒ **Qualitative indicators to complement carbon data by incorporating physical data relating to production processes**
- ⇒ **Quantitative and qualitative indicators providing a proxy for Scope 3 data and beyond (a commitment to develop low-carbon solutions)**
- ⇒ **The construction of a scoring scale split into four main sector families so as to overweight sectors for which climate is an issue**

Example: a composite approach

The NXS COP index's climate filter

Ethical filter

Investment universe: STOXX® 600 EUROPE

Exclusion filter (tobacco, weapons)

Climate filter

Exclusion of companies involved in high-impact fossil fuels (more than 10% of their sales).

Analysis and ranking of stocks according to 6 criteria:

1. Carbon intensity of sales
2. Variation in the carbon intensity of sales
3. Efforts to tackle climate change in production processes
4. Commitment to tackling climate change
5. Efforts to tackle climate change in the use of products and services
6. R&D intensity / sales

Diversified weightings according to 4 sector families (depending on their carbon intensity and/or range of green products and services)

Financial filter

Exclusion of illiquid stocks / small caps

Selection of the top 100 stocks with the best *Climate* scores

Bi-annual review of the selection

Selection of the 50 least volatile stocks

Bi-annual review of the selection

Minimum Variance weightings

Stock weightings according to their volatility and correlation.

Diversification: maximum weighting per stock (10%), per sector (max 7 stocks), per region (35% per country)

Quarterly review of the selection

± 550 stocks

Stage 1

100 best 'climate' rated and most liquid stocks

Stage 2

50 least volatile stocks

Stage 3

Stage 4

50 weighted stocks

NXS COP index

Example: Infrastructures – a labelling approach: the SuRe® standard

*The Global Infrastructure Basel (GIB) foundation, together with Natixis, has developed **SuRe® - the Standard for Sustainable and Resilient Infrastructure**, a global voluntary standard that integrates sustainability and resilience aspects into infrastructure development and upgrades.*

Objectives of the standard:

- **Build a powerful tool to identify and flag infrastructure projects that offer positive environmental or social benefits and are responsibly managed.**
- Help the project developer to raise funds and easily communicate on the project's sustainability & resilience
- **Enable investors committed to integrating ESG issues into their investment strategy to choose infrastructure projects certified by SuRe® as a "green and/or social investment".**

Main features of the standard

- It incorporates about 47 criteria related to **responsible project management** and **15 performance criteria** that will measure the infrastructure's net contribution with regards to environmental, social and socioeconomic benefits.
- The projects will be certified according to the SuRe® standard by an **independent third party at the request of the project developer**
- Independent certifiers will be accredited to audit and verify compliance with the standard.

Example: Infrastructures – a labelling approach: the SuRe® standard

The Infrastructures asset class does not have many investment decision-making tools available to it as regards climate issues.

The scope of the standard goes beyond pure climate issues, but it is an essential and critical component.

⇒ **In this respect, it is an interesting tool that can help investors incorporate climate issues into their investment / financing decision-making processes.**

The Sure® standard will evaluate the infrastructure's compliance with several criteria directly related to the notion of **climate resilience management** by:

- **Integrating a life-cycle approach**
 - The utility of the infrastructure shall be considered beyond its operational lifespan.
- **Integrating a resilience target into the project design process**
 - The project shall be designed to withstand clear foreseeable hazards, taking into account the long-term effects of climate change.
- **Climate resilience and adaptability**
 - After carrying out a vulnerability assessment, the project shall incorporate adaptation measures into the project design process if the project is considered risky.
- **Emergency preparedness**
 - The project owner shall implement an emergency management plan that should cover disaster risk reduction and response and well as emergency preparedness

The SuRe® standard will also measure the infrastructure's low-carbon performance:

- **The project's GHG emissions**
 - Energy efficiency gains / Emissions avoided
 - Integration of renewable energies / Integration of durable building materials
- **Forest restoration and conservation**

Appendices

TEEC	Energy and Ecological Transition for Climate
ET	Energy transition
IPCC	Intergovernmental Panel on Climate Change
COP	Conference of the Parties
EU ETS	European Emission Trading System
Gt	Gigatonnes
CDP	Carbon Disclosure Project
UNEP	United Nations Environment Programme
AuM	Assets under Management
FSB	Financial Stability Board
IIGCC	Institutional Investor Group on Climate Change
GHG	Greenhouse Gases
UNEP-FI	United Nations Environment Program – Finance Initiative
TCFD	Taskforce on Climate-related Financial Disclosure
E&S	Environmental & Social
LTE	Energy Transition Law
UCITS	Undertakings for Collective Investment in Transferable Securities
CCS	Carbon Capture Storage
EV	Enterprise value
ICT	Information and Communication Technologies
MEDDE	French Ministry for Ecology, Sustainable Development and Energy
CBI	Climate Bond Initiative
REIT	Real Estate Investment Trust

ICB	Industry Classification Benchmark established by Dow Jones and FTSE
GICS	Global Industry Classification Standards established by Standard & Poor's and MSCI
BICS	Bloomberg Industry Classification Systems
CIA	Carbon Impact Analytics
ACWI IMI	All Country World Index Investable Market Index
EIO-LCA	Economic Input-Output - Life Cycle Assessment
SIC	Standard Industry Classification
Mcap	Market capitalisation
Stranded assets	Asset that could become obsolete or non-performing (and result in devaluations and write-downs) due to various factors (carbon constraints, a transformation in the business model, energy demand scenarios, etc.)

"Climate-related risks": a typology

Proposed by the Sustainability Accounting Standards Board (SASB)

During the conference held to launch the TCFD, the SASB, an American non-profit organisation, presented its tool for reporting non-financial information.

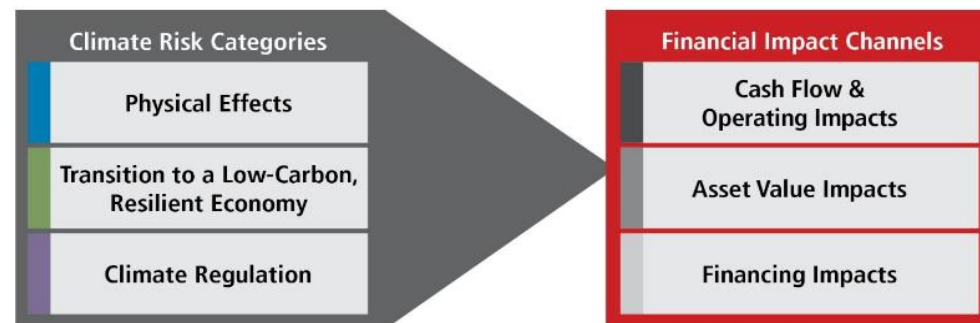
- The SASB's mission is to develop and promote "sustainable" accounting tools driven by the notion of materiality*, to help companies provide investors with the right information.
- The organisation is supported by working groups with 2,800 participants.

The SASB developed the "SICS™" system which classifies groups according to how intensively they use resources and how they impact on sustainability.

The SASB proposes a risk typology similar to that of Mark Carney and maps exposure by sector.

- Climate-related risks are one of the categories examined. The SASB says they affect 93% of the US stockmarket, i.e. \$33.8tn of market capitalisation (72 of 79 sectors in their classification system)
- Unsurprisingly, the impact of these risks differs from one industry to another (capacity to respond to an extreme weather event for the Pharma industry, carbon intensity of reserves for the Upstream Oil sector, refinery emissions for the Downstream Oil sector, etc.).

* NB. Materiality, according to the Global Reporting Initiative and the AA1000 Assurance Standard, is not limited to financial materiality alone. It includes "relevant topics... reflecting the economic, environmental and social impact of the organisation and its activities and /or influencing the evaluations and decisions of stakeholders".



Sector & Industries	Climate Risk Category			Sector & Industries	Climate Risk Category		
	Physical Effects	Transition To A Low-Carbon, Resilient Economy	Climate Regulation		Physical Effects	Transition To A Low-Carbon, Resilient Economy	Climate Regulation
Health Care				Transportation			
Biotechnology				Automobiles			
Pharmaceuticals				Auto Parts			
Medical Equipment & Supplies				Car Rental & Leasing			
Healthcare Delivery				Airlines			
Healthcare Distribution				Air Freight & Logistics			
Managed Care				Marine Transportation			
Financials				Rail Transportation			
Commercial Banks				Road Transportation			
Investment Banking				Resource Transformation			
Asset Management				Chemicals			
Consumer Finance				Aerospace & Defense			
Mortgage Finance				Electric & Electronic Equipment			
Security and Commodity Exchanges				Industrial Machinery & Goods			
Insurance				Containers & Packaging			
Technology & Communications				Services			
Hardware				Education			
EMS & ODM				Professional Services			
Semiconductors				Hotels & Lodging			
Software & IT Services				Casinos & Gaming			
Internet & Media Services				Restaurants			
Telecommunications				Leisure Facilities			
Non-Renewable Resources				Cruise Lines			
Oil & Gas - Exploration & Production				Advertising & Marketing			
Oil & Gas - Midstream				Media Production & Distribution			
Oil & Gas - Refining & Marketing				Cable & Satellite			
Oil & Gas - Services				Consumption I			
Coal Operations				Agricultural Products			
Iron & Steel Producers				Meat, Poultry & Dairy			
Metals & Mining				Processed Foods			
Construction Materials				Non-Alcoholic Beverages			
				Alcoholic Beverages			
				Tobacco			
				Household & Personal Products			

TEEC (“Energy and Ecological Transition for Climate”) label

Nomenclature used in TEEC labelling:

1. Energy

- 1.1. Solar Energy
- 1.2. Wind energy
- 1.3. Bioenergy
- 1.4. Hydro energy
- 1.5. Geothermal energy
- 1.6. Other renewable energies
- 1.7. Energy distribution and transmission
- 1.8. Energy storage
- 1.9. Carbon capture
- 1.10. Services

2. Building

- 2.1. Green buildings
- 2.2. Energy efficiency
- 2.3. Energy capture systems
- 2.4. Services

3. Waste management / pollution control

- 3.1. Circular economy leading to energy and GHG savings
- 3.2. Technologies and products
- 3.3. Carbon capture and storage
- 3.4. Discharged gas capture

4. Industry

- 4.1. Energy efficiency products
- 4.2. Energy efficiency systems and processes
- 4.3. Cogeneration, trigeneration, etc.
- 4.4. Heat recovery
- 4.5. GHG reduction not related to energy production
- 4.6. Eco efficient industrial processes
- 4.7. Services

5. Transport

- 5.1. Rail and freight systems
- 5.2. Urban rail transport systems
- 5.3. Electrical vehicle
- 5.4. Hybrid vehicles
- 5.5. Alternative fueled vehicles
- 5.6. Bus transportation
- 5.7. Bicycle transportation
- 5.8. Biofuels
- 5.9. Aviation biofuels
- 5.10. Transport logistics

6. ITC

- 6.1. Datacenters run on renewable energies
- 6.2. Low carbon infrastructure
- 6.3. Products and technologies running via a smart grid
- 6.4. Substitution technologies

7. Agriculture & forest

- 7.1. Agriculture
- 7.2. Low carbon forest activities and related to carbon sequestration
- 7.3. Low GHG agriculture, sequestering carbon and climate resilient

8. Adaptation

- 8.1. Adaptation to water
- 8.2. Infrastructures

% variation vs. average of forecasts (consensus)

Source: Natixis SRI Research, based on data sent by providers



Providers	Provider 2		Provider 3		Provider 4		Provider 5		Provider 6		Provider 6		Provider 6		Provider 7		Provider 8		Provider 9		Provider 10		Provider 7		Provider 7		
Type of model	EEIO 2	%var vs. reported data	Regression s 1	%var vs. reported data	Regression s 2	%var vs. reported data	Regression s 3	%var vs. reported data	Sector average 1	%var vs. reported data	Sector average 2	%var vs. reported data	Sector average 3	%var vs. reported data	Sector average 4	%var vs. reported data	Sector average 5	%var vs. reported data	IDWI	%var vs. reported data	Bottom up 1	%var vs. reported data	Bottom-up 2	%var vs. reported data	Prolongation	%var vs. reported data	Avg all models combined
PROVIDENT FINANCIAL	ND	ND	23,577	5%	14,783	-34%	10,322	-54%	105,016.21	369%	7,388.07	-67%	5,033.73	-78%	8,353	-63%	9,481	-58%	32,206	44%	NA	ND	NA	ND	7,633	-66%	22,379
GALENICA 'R'	ND	ND	108,061	50%	9,962	-86%	21,075	-71%	124,124.55	72%	149,035.03	107%	96,306.89	33%	126,707	76%	33,089	-54%	39,239	-46%	NA	ND	NA	ND	13,981	-81%	72,158.01
HALMA	ND	ND	131,476	266%	39,328	9%	32,116	-11%	21,870.47	-39%	10,913.22	-70%	28,086.05	-22%	19,429	-46%	26,862	-25%	23,558	-34%	NA	ND	NA	ND	25,536	-29%	35,918
GECINA	ND	ND	197,895	237%	43,346	-26%	50,820	-13%	54,555.32	-7%	54,555.32	-7%	51,017.45	-13%	58,759	0%	39,197	-33%	58,954	1%	211	-100%	NA	ND	35,698	-39%	58,637
KPN KON	ND	ND	524,982	37%	323,110	-16%	45,094	-88%	822,420.81	115%	340,970.98	-11%	334,700.36	-13%	470,132	23%	355,534	-7%	494,408	29%	NA	ND	NA	ND	119,425	-69%	383,078
PUBLICIS GROUP	ND	ND	150,554	83%	97,055	18%	95,834	17%	59,519.19	-28%	58,988.21	-28%	59,519.19	-28%	62,520	-24%	73,645	-10%	65,034	-21%	NA	ND	NA	ND	99,565	21%	82,223
VESTAS WINDSYSTEMS	ND	ND	224,906	-11%	92,052	-64%	157,620	-38%	548,498.21	117%	504,382.70	99%	181,804.52	-28%	175,689	-31%	575,620	127%	205,900	-19%	1,490	-99%	NA	ND	116,025	-54%	253,090
ENEL GREEN POWER	ND	ND	57,718	-96%	111,081	-93%	39,121	-98%	5,090,000.00	219%	4,200,000.00	163%	5,670,000.00	255%	1,066,006	-33%	1,509,228	-5%	223,080	-86%	1,014,700	-36%	18,235	-99%	158,626	-90%	1,596,483
GIVAUDAN	208161	-67%	1,112,775	76%	224,272	-65%	276,850	-56%	980,718.60	55%	372,690.99	-41%	848,409.12	34%	613,000	-3%	716,351	13%	1,365,225	115%	NA	ND	NA	ND	252,051	-60%	633,682
TECHNIP	ND	ND	2,075,367	123%	577,898	-38%	433,826	-53%	1,166,848.68	25%	738,568.84	-21%	886,998.55	-5%	1,334,429	43%	1,036,833	11%	1,009,517	8%	386,228	-59%	NA	ND	592,852	-36%	930,851
PHILIPS ELTN.KONINKLIJ KE	ND	ND	2,625,776	65%	868,640	-45%	1,179,515	-26%	2,142,015.11	35%	401,715.52	-75%	936,544.95	-41%	3,646,870	130%	2,072,116	30%	1,092,572	-31%	NA	ND	NA	ND	923,316	-42%	1,588,908
AIRBUS GROUP	1029079	-23%	319,956	-76%	1,196,854	-10%	1,611,155	21%	1,401,031.11	5%	1,123,299.11	-16%	1,396,040.05	5%	2,260,671	70%	1,817,406	37%	1,601,753	20%	940,492	-29%	NA	ND	1,266,706	-5%	1,330,370
STAGECOACH GROUP	ND	ND	1,279,443	15%	2,791,752	150%	1,214,708	9%	514,048.32	-54%	226,174.49	-80%	437,258.78	-61%	726,608	-35%	837,270	-25%	1,586,214	42%	NA	ND	NA	ND	1,556,809	39%	1,117,029
STMICROELECTRONICS (MIL)	ND	ND	798,808	-3%	910,711	10%	1,818,161	120%	133,380.46	-84%	361,067.86	-56%	501,665.05	-39%	942,521	14%	260,118	-69%	694,026	-16%	1,404,000	70%	NA	ND	1,264,245	53%	826,246
DSV 'B'	ND	ND	4,259,388	33%	3,066,545	-4%	2,202,433	-31%	4,452,547.11	39%	2,388,982.87	-25%	7,126,033.59	122%	1,238,393	-61%	1,973,965	-38%	1,590,455	-50%	3,433,000	7%	NA	ND	3,509,969	10%	3,203,792
CARREFOUR	ND	ND	5,144,747	29%	3,632,756	-9%	3,940,194	-1%	2,617,312.99	-34%	3,142,579.81	-21%	3,203,020.40	-20%	4,323,446	8%	4,193,186	5%	6,028,204	51%	NA	ND	NA	ND	3,728,983	-7%	3,995,443
GALP ENERGIA SGPS	ND	ND	9,098,088	44%	4,652,786	-26%	3,583,824	-43%	7,130,345.34	13%	6,362,665.00	1%	7,282,945.63	16%	9,488,486	51%	6,587,463	5%	7,452,795	18%	3,392,027	-46%	NA	ND	4,299,882	-32%	6,302,846
CENTRICA	ND	ND	431,562	-98%	9,841,344	-45%	10,542,340	-41%	11,853,243.39	-34%	9,575,521.47	-46%	37,518,108.52	110%	74,292,486	316%	10,611,685	-41%	14,834,379	-17%	5,648,142	-68%	NA	ND	11,401,834	-36%	17,868,240
NESTLE 'R'	7811701	18%	1,826,897	-72%	7,780,096	18%	7,168,539	8%	5,497,745.37	-17%	5,630,099.90	-15%	5,434,553.00	-18%	9,073,218	37%	8,633,302	31%	5,719,355	-14%	7,456,332	13%	NA	ND	7,340,065	11%	6,614,325
LAFARGEHOLCIM	ND	ND	95,360,735	17%	102,063,621	25%	90,802,877	11%	812,450.41	-99%	114,661,279.06	40%	72,461,255.49	-11%	97,784,968	20%	14,071,344	-83%	92,500,000	13%	110,100,000	35%	NA	ND	107,174,614	31%	81,617,558
Average % in absolute value		72%		72%		40%		41%		73%		49%		48%		54%		35%		34%		51%	Non pertinent		41%		

% variation vs. median of forecasts



Source: Natixis SRI Research, based on data sent by providers

Providers	Provider 2		Provider 3		Provider 4		Provider 5		Provider 6		Provider 6		Provider 6		Provider 7		Provider 8		Provider 9		Provider 10		Provider 7		Provider 7		
Type of model	EEIO 2	%var vs. reported data	Regression s 1	% var vs. reported data	Regression s 2	%var vs. reported data	Regression s 3	%var vs. reported data	Sector average 1	%var vs. reported data	Sector average 2	%var vs. reported data	Sector average 3	%var vs. reported data	Sector average 4	%var vs. reported data	Sector average 5	%var vs. reported data	IDWI	%var vs. reported data	Bottom up 1	%var vs. reported data	Bottom-up 2	%var vs. reported data	Prolongation	%var vs. reported data	Avg all models combined
PROVIDENT FINANCIAL	ND	ND	23,577	138%	14,783	49%	10,322	4%	105,016.21	961%	7,388.07	-25%	5,033.73	-49%	8,353	-16%	9,481	-4%	32,206	225%	NA	ND	NA	ND	7,633	-23%	9,901
GALENICA 'R'	ND	ND	108,061	59%	9,962	-85%	21,075	-69%	124,124.55	83%	149,035.03	120%	96,306.89	42%	126,707	87%	33,089	-51%	39,239	-42%	NA	ND	NA	ND	13,981	-79%	67,772.78
HALMA	ND	ND	131,476	402%	39,328	50%	32,116	23%	21,870.47	-17%	10,913.22	-58%	28,086.05	7%	19,429	-26%	26,862	3%	23,558	-10%	NA	ND	NA	ND	25,536	-3%	26,199
GECINA	ND	ND	197,895	288%	43,346	-15%	50,820	0%	54,555.32	7%	54,555.32	7%	51,017.45	0%	58,759	15%	39,197	-23%	58,954	16%	211	-100%	NA	ND	35,698	-30%	51,017
KPN KON	ND	ND	524,982	51%	323,110	-7%	45,094	-87%	822,420.81	136%	340,970.98	-2%	334,700.36	-4%	470,132	35%	355,534	2%	494,408	42%	NA	ND	NA	ND	119,425	-66%	348,253
PUBLICIS GROUP	ND	ND	150,554	117%	97,055	40%	95,834	38%	59,519.19	-14%	58,988.21	-15%	59,519.19	-14%	62,520	-10%	73,645	6%	65,034	-6%	NA	ND	NA	ND	99,565	44%	69,340
VESTAS WINDSYSTEMS	ND	ND	224,906	24%	92,052	-49%	157,620	-13%	548,498.21	202%	504,382.70	177%	181,804.52	0%	175,689	-3%	575,620	217%	205,900	13%	1,490	-99%	NA	ND	116,025	-36%	181,805
ENEL GREEN POWER	ND	ND	57,718	-91%	111,081	-82%	39,121	-94%	5,090,000.00	722%	4,200,000.00	579%	5,670,000.00	816%	1,066,006	72%	1,509,228	144%	223,080	-64%	1,014,700	64%	18,235	-97%	158,626	-74%	618,890
GIVAUDAN	208161	-66%	1,112,775	82%	224,272	-63%	276,850	-55%	980,718.60	60%	372,690.99	-39%	848,409.12	38%	613,000	0%	716,351	17%	1,365,225	123%	NA	ND	NA	ND	252,051	-59%	613,000
TECHNIP	ND	ND	2,075,367	134%	577,898	-35%	433,826	-51%	1,166,848.68	32%	738,568.84	-17%	886,998.55	0%	1,334,429	50%	1,036,833	17%	1,009,517	14%	386,228	-56%	NA	ND	592,852	-33%	886,999
PHILIPS ELTN.KONINKLIJKE	ND	ND	2,625,776	131%	868,640	-24%	1,179,515	4%	2,142,015.11	89%	401,715.52	-65%	936,544.95	-18%	3,646,870	221%	2,072,116	82%	1,092,572	-4%	NA	ND	NA	ND	923,316	-19%	1,136,044
AIRBUS GROUP	1029079	-23%	319,956	-76%	1,196,854	-10%	1,611,155	21%	1,401,031.11	5%	1,123,299.11	-16%	1,396,040.05	5%	2,260,671	70%	1,817,406	37%	1,601,753	20%	940,492	-29%	NA	ND	1,266,706	-5%	1,331,373
STAGECOACH GROUP	ND	ND	1,279,443	25%	2,791,752	172%	1,214,708	18%	514,048.32	-50%	226,174.49	-78%	437,258.78	-57%	726,608	-29%	837,270	-18%	1,586,214	55%	NA	ND	NA	ND	1,556,809	52%	1,025,989
STMICROELECTRONICS (MIL)	ND	ND	798,808	0%	910,711	14%	1,818,161	128%	133,380.46	-83%	361,067.86	-55%	501,665.05	-37%	942,521	18%	260,118	-67%	694,026	-13%	1,404,000	76%	NA	ND	1,264,245	58%	798,808
DSV 'B'	ND	ND	4,259,388	39%	3,066,545	0%	2,202,433	-28%	4,452,547.11	45%	2,388,982.87	-22%	7,126,033.59	132%	1,238,393	-60%	1,973,965	-36%	1,590,455	-48%	3,433,000	12%	NA	ND	3,509,969	14%	3,066,545
CARREFOUR	ND	ND	5,144,747	34%	3,632,756	-5%	3,940,194	3%	2,617,312.99	-32%	3,142,579.81	-18%	3,203,020.40	-16%	4,323,446	13%	4,193,186	9%	6,028,204	57%	NA	ND	NA	ND	3,728,983	-3%	3,834,589
GALP ENERGIA SGPS	ND	ND	9,098,088	38%	4,652,786	-29%	3,583,824	-46%	7,130,345.34	8%	6,362,665.00	-3%	7,282,945.63	11%	9,488,486	44%	6,587,463	0%	7,452,795	13%	3,392,027	-49%	NA	ND	4,299,882	-35%	6,587,463
CENTRICA	ND	ND	431,562	-96%	9,841,344	-7%	10,542,340	-1%	11,853,243.39	12%	9,575,521.47	-10%	37,518,108.52	254%	74,292,486	600%	10,611,685	0%	14,834,379	40%	5,648,142	-47%	NA	ND	11,401,834	7%	10,611,685
NESTLE 'R'	7811701	8%	1,826,897	-75%	7,780,096	7%	7,168,539	-1%	5,497,745.37	-24%	5,630,099.90	-22%	5,434,553.00	-25%	9,073,218	25%	8,633,302	19%	5,719,355	-21%	7,456,332	3%	NA	ND	7,340,065	1%	7,254,302
LAFARGEHOLCIM	ND	ND	95,360,735	0%	102,063,621	7%	90,802,877	-5%	812,450.41	-99%	114,661,279.06	20%	72,461,255.49	-24%	97,784,968	3%	14,071,344	-85%	92,500,000	-3%	110,100,000	15%	NA	ND	107,174,614	12%	95,360,735
Average % in absolute value		81%		95%		38%		34%		134%		67%		78%		70%		42%		41%		50%	Non pertinent			33%	

Carbon data providers

Provider by provider analysis

BLOOMBERG

COMPANY-RELATED DATA

Date of the first carbon audits?	The carbon footprinting tool was launched in September 2015. It is part of Bloomberg ESG Research, which was launched in 2009.
Credentials:	N/A.
Track record (AuM audited / footprinted)	N/A.
Dedicated team	Members from the ESG team and Application Specialists - Equities
Skills	The Bloomberg ESG team comprises 42 full-time analysts. Of these, 30 are responsible for initial data collection. 10 senior analysts are responsible for workflow management, data quality, analysis of field definitions and field expansion. These 10 senior ESG analysts are located in New York, London, Hong Kong, Tokyo and Seoul. They also have 2 senior Bloomberg Industry ESG analysts located in New York.
Carbon audit / footprinting service provided	Two different tools: 1/ FA ESG<GO> page: give investors access to companies' related ESG data, including their reported GHG emissions (covering about 3,000 companies (2,500 report publicly, 500 report to Bloomberg) 2/ Portfolio Carbon Footprint Tool (PCFT) where estimated data are also available + estimated data (with a model that can be applied to any other company)
Contact	Yiannis Bartzilas ybartzilas@bloomberg.net
Website	N/A.

CARBON FOOTPRINTING
TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		Bloomberg provides Scope 1, 2 and Total GHG data that can be normalised by any fundamental company factor available on Bloomberg. For example, for Total SA, users can chose between GHG/barrel of oil equivalent produced, CO2/revenue, CO2/assets etc. Sample list of ratios is available on example of Total by running {FP FP Equity FA ESGR <GO>} on the Terminal. However, only intensity/sales and intensity/assets are available at the Carbon Footprint Tool Bloomberg does also provide carbon efficiency ratios: t CO2 / Market cap of the benchmark, or size of portfolio Total carbon footprint is available. Total GHG is here defined as Scope 1 + Scope 2 emissions.
GHG absolute footprint		
Other ESG metrics available at portfolio level		100+ environmental metrics available on the Terminal and integrated into their flagship portfolio management function views - {PORT <GO>} on the Terminal
Frequency of updates		Annually (based on company reporting). As reporting dates differ from one company to the next, the entire universe is being constantly updated.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		Scope 1 data available and provided by CDP via a direct feed + estimates
Scope 2		Scope 2 data available and provided by CDP via a direct feed + estimates
Scope 3		Not provided by CDP
"Positive carbon value" / avoided CO2		Not provided by CDP

COVERAGE

	Yes	No
Equities		10,000+ companies globally (the estimation model can be applied to an unlimited amount of companies)
Corp. bonds & loans		At this stage the Portfolio Carbon Footprint Tool supports only equity. A Fixed Income version is under way and will be launched shortly.
Sovereign bonds		
Private equity		
Infrastructure debt		
Real estate		300 REITs covered for ESG data

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	The carbon footprinting tool uses several data sources. The source waterfall for the data is (in order of preference): 1. Bloomberg-collected Total GHG emissions; if not available 2. Bloomberg-collected Total CO2 emissions; if not available 3. CDP collected Total GHG emissions; if not available 4. Estimated data						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	No	No	No	Yes	No	No
Order of use	(1)				(2)		

GHG / CO2 data used to calculate footprint when no reporting available

Estimation based on **peer groups' average GHG intensity normalised by assets or revenues**.

The users are given the ability to turn on estimates where reported data is not available (either from company reports or from CDP).

The estimates are calculated using peer carbon/GHG intensity medians, normalised either by assets (i.e. total assets on the balance sheet) or revenue.

The user can select peer group (ICB/BICS/GICS levels 1-3) and normalisation method (revenues or assets).

After identifying the relevant peer median, the tool scales it up using the normalising figure: e.g. For Total, if the user chose ICB Level 3 = Integrated Oil&Gas and normalised emissions by revenue, the tool would identify relevant peers, calculate peer median CO2/GHG emissions per \$1m of revenue, then multiply this number by total revenue in \$m to arrive at the total GHG/CO2 emissions figure.

Simple regressions based on Subsectors.

No.

No. But this improvement may be integrated into version 2.0 of Bloomberg's service.

No.

Low granularity. Max level 3 of ICB/BICS/GICS

No.

Proprietary calculation modelling vs. standardized / well-known models used
Adaptation to sectors
Geographical correction
Treatment of conglomerates
Sector vs. activity granularity
Special treatment for Utilities & Energy sectors (based on physical data)

DATA QUALITY ASSURANCE

Bloomberg employs various logic and statistical checks to make sure ESG data is standardised and consistent.

These checks are applied as data is being entered into the system and are designed to detect outliers and abnormal patterns in the data. Identified outliers are reviewed individually by a senior member of the ESG team.

However, it does not seem as though Bloomberg specifically corrects carbon data reported from CDP.

When Bloomberg tests a portfolio with and without estimates, the difference in allocation is not significant (the delta is less than 5%). However, if the quantity of estimates used is too high (>20%-25%), this delta becomes too high. As they have data on over 2,000 companies, cases where they have to use more than 25% of estimates are rare.

Where data provided by the company is suspected to be partial or erroneous, Bloomberg will contact the companies directly and confirm the data provided before it reaches the client facing screens.

This is the case for approximately 5% of the companies and approximately 40% of them then respond.

Verification system

Uncertainty reduction measures & processes

AGGREGATION PRINCIPLES

Rule of allocation per asset class

Equity share based (reflecting the carbon ownership) and calculated as below:

(#shares of company A in the portfolio / #shares of company A outstanding) * Total GHG emissions of company A.

Management of multiple accounting of CO2 emissions

Not managed.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No	
Online tool			Tools (FA ESG<GO>, PORT, PCFT) are available to all Bloomberg users within the Bloomberg Terminal interface
Customized portfolio report			Users are able to plug in their portfolio data directly from Bloomberg, perform the footprinting/other ESG analysis and generate charts and reports.
Stock / unitary asset-based report			To be noted: Bloomberg will launch a tool (PORT) to optimize the carbon performance of a portfolio (carbon gap vs. benchmark, explained by relative under / over exposure to sectors; Carbon Gap with a selection of stocks) However, the tool does not give carbon data (Abs / Intensity) on a stock by stock basis, hence preventing users from constructing the portfolio from scratch.
			Bloomberg does not provide stock ratings on the Terminal, though various tools are available to users who wish to score and compare companies on ESG metrics. For example, our ESG Scorecard, an Excel-based tool, allows users to select relevant industry KPIs, define company peers and perform scoring analysis of company performance on ESG metrics.

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			No. Some indicators can potentially be built on Bloomberg's ESG research
Type of indicators			N/A.

FOSSIL FUEL RESEARCH

Yes	No	
		Users are able to calculate the carbon content of the fossil fuel reserves for Energy companies based on the Oil, Gas and Coal reserves data Bloomberg collects from company filings.

OTHER SERVICES

Bloomberg's full ESG research.

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock-picking tool (granularity & realism of CO2 volumes assessed)			Rather not. Unreported data are based on peer groups' (ICB/BICS/GICS level 1-3) GHG intensity normalised by assets or revenues. They vary widely from reported data.
Universe filtering tool			Yes. More than 10,000 companies covered
Reporting tool			Yes.

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No	
Risks			Allows identification of the most carbon-intensive sectors, hence helping to map the transition risks. However, at a company level, the estimated data varies strongly from the reported emissions of the company.
Impact			Allows identification of the most carbon intensive sectors, hence helping users to see how a change in sector allocation could reduce the GHG impact of the underlying portfolio. However, at a company level, the estimated data varies strongly from the reported emissions of the company. Data limited to Scope 1 and 2.
Contribution			No "avoided emissions calculated" Lack of realism of the estimations at a company level.

MAIN BIAS

	Low	Med.	High	
Complexity				Simple median calculation conducted on a rather wide sector family (ICB / GICS / BICS, level 1 to 3)
Main bias / assumptions				Low granularity of underlying sector classifications Sector classifications not built based on their carbon profile Heterogeneous underlying data set (CO2 data when total GHG non available) Based on reported data (hence biased geographically)

CARBONE 4

COMPANY-RELATED DATA

Date of the first carbon audits?	September 2015
Credentials:	Mirova, MAIF (Sponsors of the methodology), Euronext, CNP
Track record (AuM audited / footprinted)	CIA database under construction (contact them for more details)
Dedicated team	Yes. 20 analysts. 8 people are dedicated full-time to the project.
Skills	Consultants, specialised in energy and climate transition. Considerable expertise in quantifying companies' carbon emissions. Considerable experience in all sectors of activity (finance, transportation, building, food, luxury, telecoms, etc.).
Carbon audit / footprinting service provided	Carbon Impact Analytics makes it possible both to report on carbon impact (induced and avoided emissions) and to pilot investment strategy to limit carbon risks and seize low-carbon opportunities.
Contact	carbonimpactanalytics@carbone4.com
Website	www.carbone4.com

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		
GHG absolute footprint		
Other ESG metrics available at portfolio level		
Frequency of updates		

GHG intensity per € of revenues, € of market cap, € of enterprise value
Induced and avoided emissions, over a large perimeter (scope 1+2+3 upstream and downstream of the value chain, including product use when relevant).
- Carbon impact ratio: ratio of avoided emissions divided by induced emissions
- Qualitative rating of the company's tendency to contribute to the climate transition
- Qualitative rating of the company's transparency and reporting quality
1 update per year (annual analysis of corporate GHG emissions)

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		
Scope 2		
Scope 3		
"Positive carbon value" / Avoided CO2		

(Upstream and downstream when relevant), based on proprietary models

Avoided emissions are emissions that are not emitted by the activities of the firm, compared to a reference case (when less favourable).
Avoided emissions are quantified on the same perimeter as induced emissions (scope 1+2+3 upstream and downstream of the value chain, including product use when relevant).
The reference case is defined on a case-by-case basis for each subsector (i.e. for each model). All choices are detailed at the end of the methodology documents. (e.g. reference scenario / past performance / benchmark of product efficiency when available, etc.)
For example: in the electricity sector, avoided emissions are the difference between the actual carbon intensity of a company's production (tCO2eq/Kwh produced) and prospective world electricity carbon intensity in 2025 in a 2° scenario (IEA 2DS) x total annual electricity production volumes.

COVERAGE

	Yes	No
Equities		
Corp. bonds & loans		
Sovereign bonds		
Private equity		
Infrastructure debt		
Real estate		

All companies can be evaluated. The database is currently under construction. As of April 2016, the Stoxx 600 and SP 100 US are covered. S&P 500 coverage scheduled for September.
All companies can be evaluated. The database is currently under construction. . As of April 2016, the Stoxx 600 and SP 100 US are covered. S&P 500 coverage scheduled for September.
Could be included in future developments of the methodology, which would measure a country's "Energy & Climate Risk"
Upon request
Upon request
Could be included in future developments of the methodology

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	Carbone 4 collects Scope 1+2 data published by the company when available (annual reports, sustainability reports, CDP, etc.), and after checking the data's consistency. Activity data published by the company (revenue, m2 of surface area, tonnes produced, nb units sold, etc.) is used to calculate scope 3 emissions (and scope1+2 if needed)						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	No	No	No	No	Yes (all models for high stake sectors)	N/A.
Order of use	(1)					(2)	

GHG / CO2 data used to calculate footprint **Step 1:** Digging into detailed activity reporting in addition to group reporting, each company's activities will be distributed

when no reporting available

according to CIA's subsectorial split.

Step 2: Based on sectorial principles, induced and avoided emissions are calculated.

Step 3: Aggregation of quantitative indicators

Step 4: Qualitative assessment of the carbon impact trend (based on capex and R&D + strategy and positioning).

The methodology is designed to make it possible to differentiate between companies depending on their carbon impact, rather than on sector averages which do not enable this.

This bottom-up approach implies that analysts conduct an in-depth analysis of each underlying firm.

The methodology developed by Carbone 4 is proprietary and based on its extensive experience in carbon accounting.

The methodology is tailored sector by sector in order to provide the best estimate of scope 1+2+3 induced and avoided emissions.

**Proprietary calculation modelling vs.
standardised / well-known models used
Adaptation to sectors**

High stakes sectors:

CIA methodology provides a detailed analysis (scope 1, 2, 3) for sectors with "high stakes" regarding the energy and climate transition:

1. Energy sectors (fossil and electricity) → 2 subsectors.
2. Suppliers of equipment with low-carbon potential (for the energy, building, transport, industry & IT sectors) → 4 subsectors.
3. Carbon-intensive sectors (heavy industry, real estate, transport operators, forest and paper, agriculture and agribusiness). → 40 subsectors.

For each of the 46 subsectors, the energy and climate challenges they face have been studied and the major sources of emissions identified. (e.g. indirect upstream and downstream emissions are taken into account whenever they represent a large share of a sector's emissions and mitigation levers, for instance deforestation in the wood and paper industries)

For each subsector, Carbone 4 has selected what they consider to be the most relevant sources of emissions on which the company has a lever for change, based on their extensive experience in the field of corporate carbon footprinting. They identify which data are available, consistent and homogeneous, and which are relevant but not reported.

The various models are, as far as possible, linked to physical indicators (tCO₂ per product, etc. - wherever possible), as they consider this more relevant than sector averages.

For example, for suppliers of equipment with low-carbon potential, they will have to measure induced and avoided emissions due to products sold, hence they have to estimate a company's turnover generated from efficient products.

Low-stake sectors

The analysis for other "low-stake" sectors (media, finance, health, etc.) is simplified (reported scope1+2 only)

The model does not include a geographical adjustment.

Yes (analysts delve into a company's detailed activity data, to distribute it according to CIA's subsectorial split).

46 subsectors, with an analysis at the activity level

Yes.

**Geographical correction
Treatment of conglomerates
Sector vs. activity granularity
Special treatment for Utilities & Energy
sectors (based on physical data)**

DATA QUALITY ASSURANCE

**Verification system
Uncertainty reduction measures &
processes**

The analysis goes through an internal validation process within Carbone 4. Raw data consistency is being checked.

The methodology is designed to be iterative, in order to adapt in time to improvements in the data being published by companies (activity and GHG data)

AGGREGATION PRINCIPLES

Rule of allocation per asset class

Step 1: calculation of carbon emissions (induced and avoided separately) per euro of enterprise value for each underlying stock. The EV is the firm's average EV during the reporting period.

(EV is calculated as: market cap. + preferred stock + (interest-bearing) short-term and long-term debt - cash and cash equivalents)

Step 2: multiplication by the portfolio's exposure to this underlying company (in €m).

Step 3: sum of all underlying companies at portfolio level (induced and avoided separately, as they should not be aggregated).

**Management of multiple accounting of CO₂
emissions**

Multiple accounting of GHG emissions arises when the same ton of GHG emissions is counted more than once within a portfolio, due to the aggregation of indirect emissions of companies within the same value chain. While consolidating a portfolio's carbon impact, Carbon Impact Analytics reprocesses results (induced and avoided emissions) to eliminate most double-counting without tampering with the portfolio's "carbon impact score".

The methodology has defined three categories of actors in the value chain, with the assumption that double-counting occurs mainly between them:

1. energy suppliers
2. energy and carbon-intensive companies
3. companies supplying equipment and solutions

Therefore, each category in the methodology is allocated one-third of the emissions (induced and avoided), which makes it possible to eliminate most of the double-counting at portfolio level.

For the third category (equipment producers), another level of double-counting occurs (as equipment production implies a lot of suppliers).

To reprocess this, CIA considers that the contribution of each supplier within the value chain to the induced and avoided emissions generated by the final products is proportional to the share of the company's added value in the final product. It

multiplies total induced and avoided emissions quantified at company level by the company's share in the total added value of its value chain. As "share in added value" is rarely known, the CIA has a methodology based on revenues and sales.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No
Online tool		Online tools are under development
Customised portfolio report		Customised reports are available at portfolio level to summarise the key outputs of the analysis
Stock / unitary asset-based report		Detailed results of the analysis are available at company level

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No
Part of the service?		This methodology was designed to go beyond simple carbon footprinting
Type of indicators		CIA Methodology provides: 1. A measure of avoided emissions (and the carbon performance ratio) 2. A forward-looking analysis (based on an evaluation of R&D expenditures that help to decrease carbon emissions and an analysis of the firm's positioning and strategy regarding the low-carbon transition) As stated in "indicators produced", the analysis delivers a: - qualitative rating of the company's tendency to contribute to the climate transition - qualitative rating of the company's transparency and reporting quality A tool to report and pilot the investment strategy (as it makes it possible to differentiate at company level)

FOSSIL FUEL RESEARCH

Yes	No
	Tailored analysis is possible

OTHER SERVICES

- Assistance to define a climate strategy (screening of portfolios by asset class)
- Hosting of seminars and training
- Quantification of climate vulnerability (including physical risk) by asset class
- Quantification of climate impact (induced and avoided emissions) for equity and infrastructure portfolios

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No
Stock-picking tool (granularity & realism of CO2 volumes assessed)		Yes. The methodology is based on a bottom-up approach and was designed by carbon footprinting experts and SRI analysts.
Universe filtering tool		Yes (but the database is currently under construction and has limited coverage at the moment)
Reporting tool		Yes.

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		The carbon footprinting of each company tries to be as close as possible to the company's real activities, hence better reflecting its exposure to transition risk, at both company and portfolio level. Moreover, the qualitative ratings of the company's quality of reporting can be considered a proxy to measure how climate-related risks are managed based on the assumption that "what is measured is managed". Allows for forward-looking management of the portfolio.
Impact		Extensive footprinting for high-stake sectors, with Scope 3, both up and downstream when relevant: makes it possible to assess GHG impact at both company and portfolio level. Qualitative ratings of the company's quality of reporting can be considered a proxy to measure how climate-relative impacts are managed based on the assumption that "what is measured is managed". Moreover, the qualitative rating of the company's strategy for a low-carbon transition is a proxy to measure how the company intends to manage its impact dynamically. Allows for forward-looking management of the portfolio's climate impact
Contribution		- Quantification of Avoided Emissions - Qualitative Energy Transition Rating

MAIN BIAS			
	Low	Med.	High
Complexity			The number of hypotheses made by this methodology is very high (see, for example, the rules to eliminate double-counting). However, the methodology's principles are transparent (publicly available), even if the details of each model for high-stake sectors are not disclosed and remain very dependent on Carbone 4's extensive experience in corporate carbon footprinting.
Main bias / assumptions			- Each model for high-stake sectors includes a lot of choices / hypotheses made by Carbone 4 experts (e.g. Carbone 4 focuses on emission sources on which the company has leverage) which, by definition, are debatable. - The calculation of avoided emissions involves choosing a reference scenario which, again, can be debated. - Rules to eliminate double-accounting (e.g. in equipment sectors) based on "added value" relies on estimations as data are often not disclosed with that level of detail. - Given the level of details of the answer to our questionnaire, the robustness of the quality checks is difficult to assess.

CDP

COMPANY-RELATED DATA

Date of the launch of CDP Corporate GHG Emissions dataset:	2003
Credentials:	CDP investors initiatives was backed in 2015 by more than 822 institutional investors, representing more than US\$95tn in assets.
Number of responding companies	2,443 through the investor-backed program in 2015, representing approximately US\$38tn of market cap.
Dedicated team	CDP has 150 staff worldwide; approximately 20% work on questionnaire development, scoring, research and data.
Skills	There are 3 FTE working on the 'Technical - Data Team', specifically on quality assessment of reported GHG emissions and emissions estimations. Investor initiatives research staff's backgrounds include: - Engineering MScs; - Sell side equity sales; - Sell side equity research; - Project finance; - Hedge fund managers; - M&A analysts - Development bank analysts. The Data Team has educational backgrounds in engineering, mathematics and policy and years of combined related work experience in databases, risk analyses, and energy systems.
Carbon audit / footprinting service provided	• Carbon footprinting of portfolios isn't the core activity of the CDP, as they are an NGO encouraging companies to better report and manage their carbon emissions. • However, they do provide carbon footprinting services for some of their signatories for a fee. The first one was in 2012. • Moreover, in 2015, CDP launched an open source methodology for quality assessing and estimating corporate GHG emissions, available from: https://www.cdp.net/en-US/Programmes/Pages/ghg-emissions-dataset.aspx
Contact	info@cdp.net
Website	+44 (0) 20 3818 3900" www.cdp.net

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		Questionnaire: Within CDP Questionnaire, various options given to companies to choose the denominator used for reporting emissions intensities: 1. tCO₂e per unit of total revenue in company-selected currency (CC12.2) 2. tCO₂e per full time eq. employee (FTE) (CC12.3) 3. Companies may choose to disclose one or more intensities using a denominator most relevant for their specific business (e.g. unit hour worked, passenger kilometer, barrel of oil equivalent, etc.) (CC12.4)
GHG absolute footprint Other ESG metrics available at portfolio level		tCO₂e. (See "allocation rules" for metrics available at portfolio level.) • Average emissions of the portfolio compared to benchmark's average emissions • Qualitative ratings (cf. "Beyond Carbon Footprinting")
Frequency of updates		Climate change program: Annual. CDP sends out its annual information request to companies worldwide on 1 February, after which the online response system is open for data input from disclosing companies. Deadline for reporting is June 30. Publicly disclosed data will be published on their website in October.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		• Questionnaire: 2,194 non-zero responses through the investor-backed program in 2015 with an additional 1,738 unique non-zero disclosures through the 2015 Supply Chain program. There may be instances where a disclosure of zero is legitimate, which would increase the figures. • Open source estimation methodology (see Methodology "core items" for more details) An open-source estimation methodology has been developed and applied to ~1,300 companies from energy-intensive industries, covering accounting years 2009-2014. Estimates were applied only when the company did not disclose or the response quality was drawn into question (for 2014 Scope 1, N=714).
Scope 2		• Questionnaire: 2,198 non-zero responses through the investor-backed program in 2015 with an additional 1,669 unique non-zero disclosures through the 2015 Supply Chain program. There may be instances where a disclosure of zero is legitimate, which would increase the figures. • Open source estimation methodology (see above)

Scope 3		Questionnaire: Moreover, the CDP questionnaire includes a question on Scope 3 emissions (CC14.1) where companies are requested to report on the evaluation status, the weight of emissions (if relevant), and the methodology used (if relevant) of different Sources of Scope 3 emissions (based on the 15 Scope 3 Categories from the GHG Protocol Scope 3 Standard with 2 additional up-/down-stream) and provide an explanation as to why a source has been identified as relevant or not, and which methodology was applied. To be noted: CDP tries to highlight to investors in which sectors Scope 3 is material. This can be done with either quantitative or qualitative elements. Open source estimation methodology (see above) The methodology and models also cover accounting year 2014 Scope 3 emissions across Categories that could be modelled.
"Positive carbon value" / Avoided CO2		The CDP questionnaire includes a question requiring details around products and services determined to be low carbon or that enable a third party to avoid GHG emissions (CC3.2a). Companies are asked to provide descriptions, taxonomies/methodologies used, % revenue from these product/services and % R&D in low carbon products.

COVERAGE

	Yes	No	
Equities			Questionnaire: CDP respondents for reported data (see number of answers by scope) Estimation methodology: An open-source estimation methodology has been developed and applied to ~1,300 companies from energy-intensive industries, covering accounting years 2009-2014. Estimates were applied only when the company did not disclose or the response quality was drawn into question (for 2014 Scope 1, N=714).
Corp. bonds & loans			
Sovereign bonds			
Private equity			Through their Supply Chain Program, CDP has also an extensive database of emissions reported by non-listed companies. If public, they can use it.
Infrastructure debt			
Real estate			

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	- Most of the data are reported directly by the companies through CDP's online reporting system - Additional data are collected from CSR reports/annual filings - Some data may be estimated following its open source methodology, available from https://www.cdp.net/en-US/Programmes/Pages/ghg-emissions-dataset.aspx.						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Others
Yes / No	Yes	No	Yes	Yes	No	No	No
Order of use	(1)		(3) For scope 3	(2) For scope 1, 2 and certain scope 3 categories			

GHG / CO2 data used to calculate footprint when no reporting available

In 2015, CDP launched an open source methodology for quality assessing and estimating corporate GHG emissions, available from: <https://www.cdp.net/en-US/Programmes/Pages/ghg-emissions-dataset.aspx>

This methodology has been applied to scopes 1-3 emissions for ~1,300 companies from high emitting industries for 2014. The model results have been shared with impacted companies for review and feedback. It is CDP's intention to expand the company coverage of this work moving forward.

Regression modelling was conducted in R. IO modelling (Scope 3 only) was done in Matlab. Data was extracted using SQL.

Table 1: Summary of approaches for each category of corporate GHG emissions. "X" designates the primary prediction method and "o" designates a supporting method.

	Multiple Linear Regression	Input-output method	Bottom-up Estimates
Scope 1	X		
Scope 2	X		
Purchased energy (electricity, heat, steam & cooling)	X		
Purchased goods and services	X	o	
Capital goods	X		
Fuel- and energy-related activities	X	o	
Upstream transportation and distribution	X	o	
Waste generated in operations	X		
Business travel	X	o	
Employee commuting	X		
Downstream transportation and distribution	X	o	
Use of sold products	o		X
End of life treatment of sold products	X		
All other Scope 3 categories	N/A	N/A	N/A

Source: CDP – Open source estimation methodology

Proprietary calculation modelling vs.

CDP's questionnaire is proprietary. The emissions estimation methodology is publicly available and may be used for non-

Standardized / well-known models used	commercial purposes. For scope 3 emissions estimations, the EIO-LCA model developed by Carnegie Mellon University has been used as a fall-back when regression models did not provide sufficient results.
Adaptation to sectors	Questionnaire: Specific sector modules, requesting granular detail for salient metrics in key industries, have been developed for: 1. Oil & Gas, 2. Electric Utilities, 3. Auto & Auto Component Manufacturers, 4. ICT, 5. Food, Beverage and Tobacco.
Geographical correction	Questionnaire: A company has the possibility to report on the breakdown its Scope 1 & 2 emissions by country / region. This is considered as a best practice by CDP for its usefulness to investors; this is often the level at which emissions-related legislation is introduced. Estimation methodology In CDP estimation methodology, some detailed regression models developed include a geographic dummy variable which attempts to capture the regional variability of CO2 emissions.
Treatment of conglomerates	Questionnaire: The companies have the choice to report their emissions: - by business division (scope 1 & 2) - by facility (Scope 1 & 2) - by GHG type (Scope 1) - by activity (Scope 1 & 2) - by legal structures (Scope 1 & 2)
Sector vs. activity granularity	Estimation methodology: In CDP's scope 1 & 2 emissions estimation methodology, revenue is segmented by industry based on Bloomberg's BICS data, but adapted to fit with carbon estimation purposes. Questionnaire: Depends on reporting choices from corporates.
Special treatment for Utilities & Energy sectors (based on physical data)	In estimation methodology: Sector classification adapted from BICS to fit carbon footprinting purposes EIO-LCA from Carnegie Mellon Questionnaire: DP has issued specific guidance to assist companies in responding in five sector modules (Oil & Gas, Electric Utilities, Auto & Auto Component Manufacturers, ICT, Food Beverage and Tobacco) Estimation methodology: Nameplate capacity by fuel type has been integrated into the scope 1 and 2 regression models for companies with electricity generation assets. Scope 3 category 11 'use of sold products' methodology is based on company production data for fossil fuel producers (upstream and/or refiners).

DATA QUALITY ASSURANCE

Verification system	Questionnaire: As the data is self-reported, the quality can vary from a company to another. On a part of the data set, CDP has cleaned and estimated numbers. Two layers verification process: 1. External verification of disclosed data is highly recommended (CDP provides companies with a list of the verification standards that can be used) See the list: https://www.cdp.net/en-US/Respond/Pages/verification-standards.aspx 2. Check of data if figures are identified as outliers vis-à-vis industry peers
Uncertainty reduction measures & processes	Questionnaire: The CDP questionnaire is accompanied by very detailed guidance outlining the reporting process on a step by step basis to help companies deliver the most accurate reporting possible. (see details on: https://www.cdp.net/Documents/Guidance/2016/CDP-2016-Climate-Change-Reporting-Guidance.pdf) Within the Emissions module guidance, companies are asked to provide their: - base year, - the standard, protocol or methodology used to collect activity data and calculate Scope 1 and 2 emissions, - the sources of global warming potentials (GWP) used for the different GHG - the activities' emissions factors used, etc. - the boundary used for Scope 1 & 2 - details on relevant sources in the company boundary that have been omitted - level of uncertainty in Scope 1 & 2 calculations and reasons therefore - details on the verification / assurance status of scope 1 & 2 emissions

Estimation methodology:

Cleaning of data set for regressions: Outliers are removed before cross-sectional model construction. Through regression analysis, responses with high standardized residuals (>2.8) or Cook's distance $>4/(n-k-1)$ are manually reviewed accounting for boundary, omissions, verification and breakdowns to determine response legitimacy. If the disclosure is deemed erroneous, it is flagged and supplemented with the model estimate.

AGGREGATION PRINCIPLES

Rule of allocation per asset class	- Total emissions of a portfolio (tCO₂e) - Weighted emissions (weighted by percentage of ownership)
Management of multiple accounting of CO ₂ emissions	Not applicable.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No	
Online tool	Yes	No	Access to companies' publicly available CDP data (requires registration): https://www.cdp.net/en-US/Results/Pages/responses.aspx . A data analytics platform is also available for investor members.
Portfolio customized report	Yes	No	As part of a bespoke service. - Total emissions of a portfolio - Weighted emissions (weighted by % of ownership) - Average emissions of the portfolio compared to benchmark average emissions + engagement ideas for the portfolios based on these KPIs
Stock / Unitary asset based report	Yes	No	Companies' and cities' publicly available responses can be seen for free on the website. CDP also has an Open Data Portal hosting relevant data that is accessible to all stakeholders: http://data.cdp.net

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?	Yes	No	The CDP questionnaire captures companies' answers on: - Climate change governance - Climate change strategy - Targets and initiatives - Climate change risks & opportunities
Type of indicators	Yes	No	Based on this data, CDP calculates final scores on: - Extensiveness of reporting / transparency - Performance This final scores includes both quantitative and qualitative elements, with (non-public) sub scores like: - Emissions management - Verification - Governance of climate change - Risk and opportunities

FOSSIL FUEL RESEARCH

Yes	No	
Yes	No	In the reporting part dedicated to "Risks" linked to Climate change, Oil & Gas companies are advised to consider the potential for changing consumer behaviour as awareness increases about the effect of fossil fuels, and the ones linked to the increased competition from renewable energy.

OTHER SERVICES

Additional to the "Climate Change" reporting, CDP conducts following activities:

- CDP reporting on water (for companies): help them drive more sustainable water use.
- CDP reporting on forests (for companies): help them address exposure to deforestation risks.
- CDP reporting on supply chain: help mitigate environmental risks in their supply chain.
- CDP reporting (for cities): help them understand the risks and opportunities of climate change for their citizens and the business community.

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock picking tool (granularity & realism of CO ₂ volumes assessed)	Yes	No	Yes (especially reported data) + Very transparent estimation methodology
Universe filtering tool	Yes	No	
Reporting tool	Yes	No	

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		CDP carbon data is relevant for the assessment of transition risk exposure, both at company and portfolio level. The treatment of companies responses CDP questionnaire includes a lot of information on how a company perceive its risks related to Climate (including physical risks). Moreover, CDP also provide aggregated score on climate "transparency" and "performance" which includes subscores on risk and opportunities aspects, climate strategy & governance of climate change (a way to assess how the risk is managed).
Impact		CDP carbon data is relevant for the assessment of climate impact, both at company and portfolio level. The treatment of companies responses CDP questionnaire include a lot of information on how a company manages its climate impact and reports on it. Moreover, CDP also provide aggregated score on climate "transparency" and "performance" which includes subscores on emissions management, climate strategy & governance of climate change (a way to assess how the impact is managed)
Contribution		Responses to CDP questionnaire include question on technologies that a company produces that helps other sector reduce their emissions. Moreover, the treatment of companies responses CDP questionnaire includes a lot of information on how a company perceives opportunities related to Climate. CDP also provide aggregated score on climate "transparency" and "performance" which includes subscores on risk and opportunities aspects, climate strategy & governance of climate change, this also may imply a "contribution".

MAIN BIAS

	Low	Med.	High	
Complexity				Both questionnaire and methodology are complex. However, CDP is a key player of reported carbon data collection, and offers full transparency of the underlying questionnaire and its open-source methodology.
Main bias / assumptions				Reported data: For a list of potential bias, see "Verification & uncertainties reduction" The CDP methodology is designed to assist companies in reporting on their GHG emissions in a fully transparent and well detailed manner. It combines a good level of flexibility regarding the framework / metrics / etc. that can be used by respondents while ensuring a high level of data quality. Estimated data: - Basically, bias applicable to regressions and EIO-LCA models apply to CDP estimations based on these models. - Note that the assumptions made as part of the Estimating Corporate GHG Emissions project are elucidated in the publicly available methodology.

GRIZZLY RI

COMPANY-RELATED DATA

Date of the first carbon audits	June 2015
Credentials:	Valéry Lucas-Leclin, founder of Grizzly RI, has been instrumental at SocGen for the launch of SG Index carbon as well as developing the CREAM (Carbon Risk Exposure Assessment Model) in 2007, using at that time Inrate data. Also offered first carbon footprint services on request. Arriving at BofA Merrill Lynch in 2010, developed a first carbon footprint model based on a consensus approach between various data providers. Developed a second and proprietary model by 2012 in partnership with CAMRADATA, a leading financial consulting firm based in London.
Track record (AuM audited / footprinted)	6 funds, €2bn
Dedicated team	1 person
Skills	A dedicated, experimented SRI analyst with 8 years of practice on carbon data, carbon footprint and carbon services
Carbon audit / footprinting service provided	Analysis of footprint with respect to many metrics: - absolute emissions - sector contributions / sector performances - intensity (sales, MV, EV, etc.) - stock-picking effect, sector allocation effect & activity effect - reduced emissions / avoided emissions - dynamic analysis since 2009"
Contact	Valéry Lucas-Leclin (valery.lucas-leclin@grizzly-ri.com)
Website	Grizzly-ri.com

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No	
GHG intensity data	Yes	No	Denominator: • Sales • MV • EV • Total Liabilities + Shareholder equity
GHG absolute footprint	Yes	No	Numerator: CO2eq
Other ESG metrics available at portfolio level	No	Yes	
Frequency of updates			

GHG SCOPES INVESTIGATED

	Yes	No	
Scope 1	Yes	No	
Scope 2	Yes	No	
Scope 3	No	Yes	Only car makers (downstream emissions: fleets)
"Positive carbon value" / avoided CO2	Yes	No	Avoided carbon calculated as carbon that would have been emitted if the company had not improved its performance (carbon sales intensity) since a specific baseline.

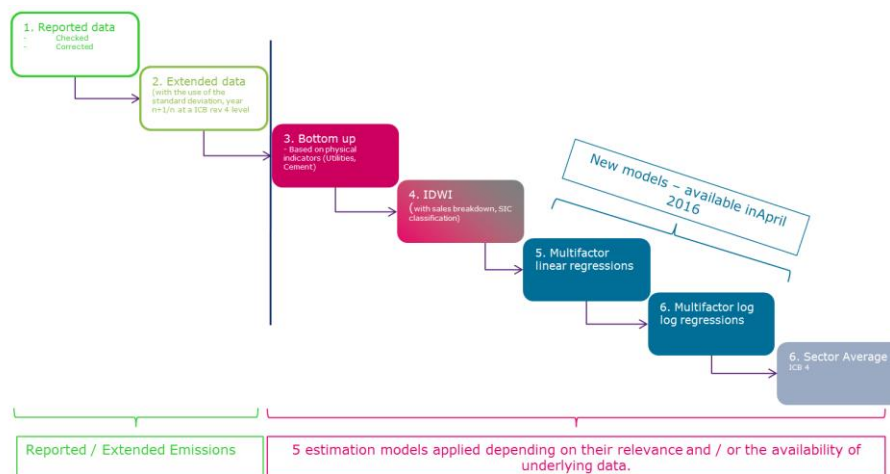
COVERAGE

	Yes	No	
Equities	Yes	No	c. 10,000 listed stocks (global)
Corp. bonds & loans	Yes	No	Work in progress
Sovereign bonds	No	Yes	
Private equity	No	Yes	
Infrastructure debt	No	Yes	
Real estate	No	Yes	

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	Reported and collected by Through Thomson Reuters / Datastream, or data derived from customized benchmarks used by default						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom up	Other
Yes / No	Yes	Yes	No	Yes	Yes	Yes	No
Order of use	(1)	(2)		Oui Mod. (5) & (6) – avril 2016	(7) ICB4	(4) IDWI	

Focus on Grizzly "staircase" approach



Source: based on Grizzly RI.

GHG / CO2 data used to calculate footprint when no reporting available

Escalating models

1. Data as reported (after verification)
2. Data as reported but extended if missing
3. Emission factors based on physical data when available (power generation, cement, steel, car fleet)
4. Emission factors based on interpolation (Inverse Distance Weighted Interpolation) derived from reporting companies and using a very granular activity framework: US SIC (987 activities). Corporate sales breakdown mapped with SIC activities so as to allow consolidation.
5. From April 2016: estimation based on multifactor linear regressions
6. From April 2016: estimation based on multifactor log-log regressions
7. Emission factors based on ICB rev 4 medians

Focus on IDWI

Grizzly adopts the view that a company is a portfolio of activities and not the specific representative of a specific cluster or sub-sector of companies.

Therefore, instead of using a unique emission factor based on the average or median of such a cluster or subsector, various activity-linked emission factors will be applied proportionally to the sales derived from each activity in which the company is involved.

Those activity-linked emission factors are calculated using a specific bottom-up interpolation method, called IDWI (Inverse Distance Weighted Interpolation). Contrary to the traditionally-used carbon intensity of sectors (sum of the emissions of CO2 of each companies divided by the sum of sales), the IDWI delivers carbon intensity average for each activity).

The calculation will overweight pure players to make the estimation more accurate).

For the step 3 when data are missing but sales breakdown is available, use of the Inverse Distance Weighted Interpolation For step 2, data are prolonged based on $n+1/n$ variation observed over the last 5 years.

Factor emissions based on physical indicators when data available at companies (electric power generation, cement production, steel, car fleet).

Yes.

On scope 2 data, based on energy mix.

For all stocks covered, geographical breakdown of sales or assets is extracted from Thomson Reuters (Worldscope) and matched with geographic breakdown of electricity production mix as provided in World Bank database (for each country / regional area the proportion of carbon-free electricity is calculated).

The use of this correction assumes (rather strong assumption) that assets (or sales by default) figures match the geography where the company has its production. A carbon-free factor is applied to company's emissions, to determine how much the company would have emitted if it had not benefited from a partially carbon free electricity mix. These hypothetical emissions are then used for IDWI calculations, to determine emission factors without carbon-free electricity.

If the company has not reported data previously and can't be modelised based on physical indicators, the conglomerate's emission will be estimated on an activity basis (987 activities) with the IDWI model.

Activity (cf. IDWI model)

Yes. cf. model 3: Emission Factors based on physical data when available (power generation, cement, steel, car fleet)

Proprietary calculation modelling vs. standardized / well-known models used
Adaptation to sectors

Geographical correction

Treatment of conglomerates

Sector vs. activity granularity
Special treatment for Utilities & Energy sectors (based on physical data)

DATA QUALITY ASSURANCE

Verification system

Initial data (carbon data & financial data) are collected from Thomson Reuters / Datastream

1. First warning Indicators based on abnormal carbon sales intensity (sector average + standard deviation)
2. Second warnings based on abnormal variations in time

Uncertainty reduction measures & processes

Manual verification according to warnings

AGGREGATION PRINCIPLES

Rule of allocation per asset class

Emissions fully allocated to shareholders as owners of the company
Emissions allocated according to gearing for "financed" emissions

Management of multiple accounting of CO2 emissions

No specific treatment. Depends on client preferences: separated scopes, or amalgamated scopes, etc.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No	
Online tool			In progress
Portfolio customized report			15 page report including all metrics mentioned above
Stock / Unitary asset based report			

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			
Type of indicators			However, Grizzly delivers a quantitative analysis of ESG factors.

FOSSIL FUEL RESEARCH

Yes	No

OTHER SERVICES

Grizzly analytics: quantitative analysis of ESG factors

Grizzly for enterprises: quantitative benchmarking & analysis of positioning

Grizzly for investors: database & carbon footprinting

Benchmarks on other metrics: currently customized benchmarks on R&D efforts (using IDWI applied to R&D / sales ratio)

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock-picking tool (granularity & realism of CO2 volumes assessed)			Yes. Grizzly uses 5 different models based on the level of availability of data, with extended data being the first method after reported data. Whenever possible, estimations are based on physical indicators. If not, emissions are evaluated on an activity basis, via the IDWI method, with a very granular framework (987 activities). Worst case: Grizzly will use emissions factors based on ICB rev 4 medians.
Universe filtering tool			
Reporting tool			

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No	
Risks			Grizzly carbon footprinting service can be used as a measurement of the exposure to transition risk at a company and portfolio level.
Impact			Grizzly carbon footprinting service can be used as a measurement of the impact of portfolio and underlying companies, and allows this to be benchmarked / monitored dynamically.
Contribution			As Grizzly does not provide "avoided emission" vs. a reference scenario, and doesn't provide qualitative rating, the service is less suited to the measurement of contribution to positive impact / energy transition. However, further indicators based on R&D over sales can be explored in that regard.

MAIN BIAS

	Low	Med.	High	
Complexity				Principles of Grizzly staircase approach are easy to understand, however some of the models, especially IDWI are very complex and imply a degree of uncertainty when it breaks down company sales.

Main bias / assumptions

- Bottom-up: the quality of the result will depend on the availability of physical indicators, as the reporting varies among companies
- IDWI: using this model involves breaking down the sales of each company to make it match with the US SICs. Uncertainties may be associated with this exercise.
- The outcome of the calculation of emissions factors based on the IDWI method will depend on the quality of the underlying data set of reported data.
- For regression models, the outcome will depend on the quality of the underlying data set of reported data and the statistical methods used to reduce regression errors
- NB: Grizzly is one of the few providers that introduces a geographical correction in its calculation of emission factors, which is very relevant to us. However the assumption made is that a company's sales match geographic production.

INRATE

COMPANY-RELATED DATA

Date of first carbon audits	Inrate has provided Carbon testing services since 2008
Credentials:	Inrate is member of ARISE and several of the funds they advise on sustainability have won awards.
Track record (AuM audited/footprinted)	
Dedicated team	Inrate has a dedicated team totalling 30 people, 3 of whom work on carbon assessment
Skills	Life-cycle assessment Model based on EIO-LCA (Input-Output tables)
Carbon audit/footprinting service provided	Inrate provides scope 1, 2 and 3 carbon data for the MSCI Developed and Emerging Market Index
Contact	Inrate AG Patrick Fankhauser Head Sales & Business Development Patrick.fankhauser@inrate.com Tel. +41 58 344 00 26 / +41 76 334 78 45 Binzmühlestrasse 23, 8045 Zurich, Switzerland www.inrate.com
Website	

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No	
GHG intensity data			Data are expressed in CO ₂ eq/\$ of revenue or market capitalisation. For fixed income portfolios, debt adjusted intensities are used.
GHG absolute footprint			Inrate can deliver data normalised to any standard financial matrix. GHG emissions volumes are based on GHG-intensity figures multiplied with turnover of companies. Data are expressed in CO ₂ eq.
Other ESG metrics available at portfolio level			Inrate provides the full set of ESG data and especially also an assessment of the impact of the services and products of the companies over their life cycle on environment and society.
Frequency of updates			Yearly update, with the general rating update cycle.

GHG SCOPES INVESTIGATED

	Yes	No	
Scope 1			Yes, based on company data and internal verification/estimates
Scope 2			Yes, based on company data and internal verification/estimates NB: for the moment, Inrate does not provide a split between Scope 2 and Scope 3 upstream.
Scope 3			Upstream + downstream Based on Inrate's estimate with verification if reported
"Positive carbon value" / avoided CO₂			

COVERAGE

	Yes	No	
Equities			MSCI Developed and Emerging Market
Corp. bonds & loans			MSCI Developed and Emerging Market
Sovereign bonds			Currently not covered
Private equity			
Infrastructure debt			
Real estate			InRate provides an ESG assessment for real estate but it does not focus on carbon data.

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	No use of companies' reported emissions data within the model. However the model was tested against reported data to ensure the consistency of its results.						
Type of estimate methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom up	Other
Yes / No	No	No	Yes	No	No	No	No
Order of use			(1)				

GHG/CO₂ data used to calculate footprint when no reporting is available	Inrate captures reported data and uses a proprietary methodology (EIO-LCA) to calculate GHG /CO ₂ emissions based on the turnover of companies split into individual sectors (actual turnover of companies is tracked to Inrates' service sectors) A verification of reported data with calculated data is conducted.
Proprietary calculation modelling vs. standardized/well-known models used	Model based on the methodology of the Carnegie Mellon Institute and further developed by Inrate. Based on EIO-LCA (Input-Output tables)
Adaptation to sectors	Inrate calculates carbon intensity based on a sector model with carbon differentiation for different sectors. The model has 330 subsectors.

The turnover of companies is split manually into these subsectors as part of our sustainability assessment. The split is done based on publicly available data from the companies, especially additional information on products and services, but contains a certain level of estimates.

Geographical correction

No. The EIO-LCA Model is applied on a global scale.

Treatment of conglomerates

NB: the EIO-LCA tables from Carnegie Mellon are based on the economic exchanges of the US economy.

Sector vs. activity granularity

Company turnover is split into 330 subsectors. (Inrate's proprietary version of the EIO-LCA model)

Special treatment for utilities & energy sectors (based on physical data)

Activity (cf. 330 sub-sectors)

For the utilities sector, where Scope 3 represents a significant amount of total emissions, the model is fine-tuned, also based on physical indicators.

DATA QUALITY ASSURANCE**Verification system**

Inrate's researchers check the model as well as the results individual companies.

Extreme values are checked once a year.

Splitting turnover into categories is sometimes associated with uncertainties.

Part of the review process is to check the correct turnover split for companies with large differences between their calculated and actual reported carbon emissions.

Uncertainties, reduction measures & processes

Additionally for estimated emissions, company specific efficiency differences are not assessed if the companies do not report data.

NB: Inrate has put together a comparison of its modelled data with actual reported data. Overall, their data is very close to actual reported data. In a standardized comparison with other providers, their Scope 1 numbers are within the range of differences of their competitors working with actual numbers. Statistically they are in the range of above 85% match.

AGGREGATION PRINCIPLES**Rule of allocation per asset class**

Inrate normally reports the carbon assessment of portfolios based on their actual shareholding in the company.

If required, a net calculation for the carbon share of the equity or debt components of total capital can be conducted.

Management of multiple accounting of CO2 emissions

Double counting of GHG emissions in scope 3 is currently not eliminated.

On demand, general assumptions can be conducted for double counting but on a specific sample of companies.

In general Inrate cannot provide data on double counting.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No
Online tool		
Portfolio customized report		
Stock / Unitary asset based report		

BEYOND CARBON FOOTPRINTING**PROSPECTIVE / DYNAMIC APPROACH**

	Yes	No	
Part of the service?			However, Inrate provided other type of CSR Research.
Type of indicators			N/A.

FOSSIL FUEL RESEARCH

Yes	No	
		Based on current emissions the exposure of portfolios is calculated. Carbon intensive inventories (e.g. oil reserves) are not incorporated in Inrate's models as they are focused on carbon emissions over the lifecycle of the services of a product.

OTHER SERVICES

Inrate provides a full range of sustainability solutions for MSCI Developed and Emerging Markets as well as for country and governmental entities.

Inrate's methodology is not only based on a CSR assessment but to a large extent on a product impact assessment of the services of companies to assess their real impact on environment, society and labour.

OUR OPINION**MAIN OBJECTIVES OF THE TOOL**

	Yes	No	
Stock-picking tool (granularity & realism of CO2 volumes assessed)			Estimates based on the EIO-LCA model are not based on actual reported data and there are many limits to the methodology (cf. main bias/assumptions). Moreover, Inrate only uses EIO-LCA (with the exception of certain Utilities)
Universe filtering tool			Relevant, with the advantage of taking Scope 3 (up and downstream) into account
Reporting tool			Yes, with the advantage of taking Scope 3 (up and downstream) into account

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No	
Risks			Not at company level Yes at sector level Makes it possible to manage sector allocation to reduce the exposure to carbon risks
Impact			Not at company level Yes at sector level, with the advantage of taking Scope 3 into account
Contribution			No (no calculation of the emissions avoided) and no qualitative metrics available.

MAIN BIAS

	Low	Med.	High	
Complexity				The EIO-LCA model is very complex, and the direct emissions factors attributed to each of the 330 sectors are based on academic research + products' LCA expertise that cannot be verified.
Main bias/assumptions				- Inrate never uses reported data to deliver a figure on a company!!! (but back-tests its model against reported data) EIO-LCA: - EIO-LCA estimates are not based on reported data and hence do not reflect the efforts that could be made by a given player. This is an even a bigger problem for Inrate, which does not use reported data at all. - EIO-LCA tables are based on economic exchanges within a certain geography (USA) at a certain time (2007 being the most recent available), but applied to companies from different geographies - The calculation of emissions factors for each sub-sector is very blackbox - The emission factors are applied on globally (and do not reflect specific geographies) - The categories of sub-sectors (activities) imply a certain level of discretion which could include activities with a different carbon impact in the same group (however, providers often "adapt" the sub-sector classification to make it fit with their carbon logic) - Economic exchanges from an "old" Input-Output table have to be deflated

MSCI

COMPANY-RELATED DATA

Date of the first carbon audits	MSCI ESG Research has offered carbon-focused portfolio analytics reports since 2011 (Carbon Beta Portfolio Analytics). In May 2015, MSCI rolled out an enhanced carbon portfolio analysis tool called Carbon Portfolio Analytics.
Credentials:	MSCI ESG Research Inc. through its legacy firms Innovest, KLD, and IRRRC have a long history of analyzing climate change strategies and performance: • MSCI ESG Research has incorporated risks from climate change as a key component of its ESG company rating methodology since 1997. • MSCI ESG Research, through Innovest, wrote the global report analyzing the climate change strategies and performance of the world's 500 largest companies for the first Carbon Disclosure Project (now CDP) survey in 2003 and through 2007. In 2003, Innovest also launched its Carbon Beta company analysis tool. • In 2007 KLD launched a suite of Global Environmental Indexes, featuring companies with a focus on climate change and clean tech solutions. • In 2011 MSCI ESG Research began offering Carbon Beta Portfolio Analytics reports to clients. • In 2014 MSCI ESG Research launched its CarbonMetrics dataset and Low Carbon Indexes. • In 2015 MSCI ESG Research launched its enhanced carbon portfolio analysis and footprinting product, Carbon Portfolio Analytics, and made the CarbonMetrics and CleanTechMetrics datasets available via BarraOne and Barra Portfolio Manager. • In addition, IRRRC, a legacy MSCI ESG Research company, covered climate change shareholder resolutions beginning in 1990. MSCI ESG Research has also authored sector-based reports for Ceres and the Investor Network on Climate Risk on Corporate Governance and Climate Change, rating companies based on a 14-point checklist.
Track record (AuM audited / footprinted)	MSCI provided ESG data to approximately 125 Asset Owner clients and over 800 Asset Managers worldwide.
Dedicated team	Not available (it is against MSCI's client confidentiality policies to report on this.)
Skills	MSCI ESG Research has 100+ analysts collecting and analysing carbon and clean tech data globally. MSCI research team has a wide range of climate change expertise encompassing carbon emissions modelling, carbon footprinting and thematic investing.
Carbon audit / footprinting service provided	MSCI offers Carbon Portfolio Analytics, a tool for understanding, measuring and managing carbon risk at the portfolio, sector and company level. Carbon Portfolio Analytics reports include a carbon footprint, as well as analysis of an extensive set of carbon risk management and exposure metrics, sourced from sophisticated in-house research, from stranded assets to clean technology investments.
Contact	Nancy Diard, ESG Research Sales nancy.diard@msci.com +33 1 5679 4070"
Website	www.msci.com

CARBON FOOTPRINTING
TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		MSCI provides GHG absolute footprint and GHG intensity. Intensity denominator is 'dollar of revenues' at the company level.
GHG absolute footprint		
Other ESG metrics available at portfolio level		The report also offers portfolio level measures of fossil fuel reserves and potential emissions from reserves. (See below)
Frequency of updates		The underlying CarbonMetrics dataset is updated annually, as noted above.
		MSCI's Carbon Portfolio Analytics reports are provided as a managed service, meaning that a client sends them a portfolio to analyze, and they produce a report and send it back via email or ftp. As such, the frequency of update is mutually agreed - most clients choose an annual or quarterly frequency.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		Reported and estimated
Scope 2		Reported an estimated
Scope 3		MSCI ESG Research provides Scope 3 emissions when reported by the companies, however they do not estimate Scope 3 emissions
"Positive carbon value" / Avoided CO2		They are currently not providing this metric, but MSCI ESG Research expects to continue investing resources and developing tools to aid in the analysis of carbon risks over the coming years, including broadening its coverage of additional metrics like this one.

COVERAGE

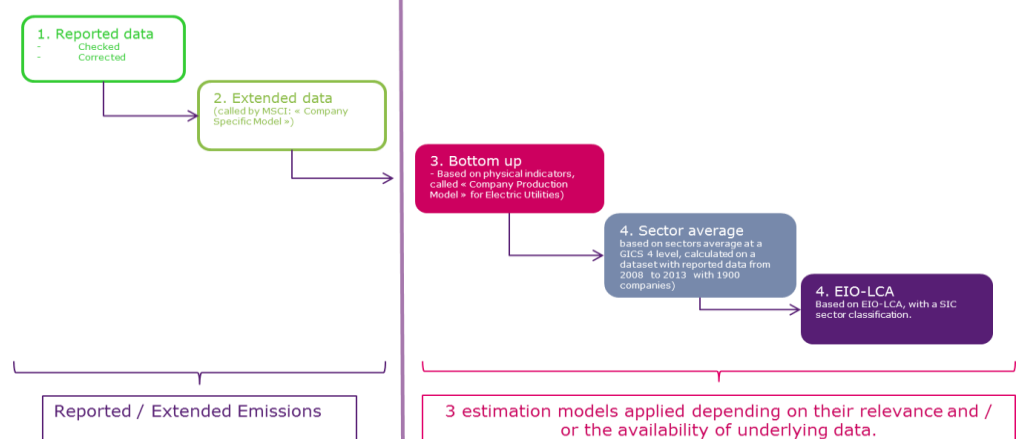
	Yes	No
Equities		The MSCI ESG CarbonMetrics product (which includes carbon emissions, reserves, and potential emissions data) covers the MSCI ACWI IMI universe, i.e. about 8,500 companies. MSCI's Carbon Portfolio Analytics reports draw on this dataset.
Corp. bonds & loans		Leveraging MSCI's subsidiary mapping capabilities, the ACWI IMI coverage can be extended to include 90% of the market value

			of the Barclays Global Corporate Index (i.e. this includes market value for securities that are not directly researched).
Sovereign bonds			MSCI ESG Research's methodology for allocating carbon emissions to Sovereign entities is currently in development and not immediately available through the Carbon Portfolio Analytics report. Through their ESG Government Ratings they collect data including carbon emissions per capita, total country carbon emissions and trend, and country carbon emissions as a share of world totals. They also assess countries' proven fossil fuel reserves, energy imports and exports, energy intensity, and proportion of energy consumption fuelled by renewable energy sources. MSCI ESG Research is currently evaluating different options of allocating carbon emissions of sovereign entities and to aggregate emissions in a way that enables cross asset class comparisons. Some of the questions they are currently evaluating include a) whether carbon emissions should include total country emissions vs. only government sector emissions; b) how to avoid double counting in multi-asset class portfolios; c) whether carbon intensity should be determined per capita, per unit of GDP (real vs. nominal), or per USD million in government revenues; d) how to allocate an investor's share of sovereign emissions (proportion of public debt outstanding, vs. total country assets). Consistent with the ESG Ratings model, MSCI ESG Research would apply the 'corporate' allocation model to sub-sovereigns and supranationals that exhibit 'corporate-like' characteristics (e.g. national oil companies, utilities, public sector banks, multilateral development banks, etc.), and the 'sovereign' model to other government agencies"
Private equity			
Infrastructure debt			
Real Estate			

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources		MSCI ESG Research has a dedicated team of analysts responsible for collecting Scope 1, Scope 2 and Scope 3 carbon emissions data and identifying companies with fossil fuel reserves. Analysts collect greenhouse gas emissions data where relevant for companies in the MSCI All Country World Index IMI (ACWI IMI) Universe. Data is collected once per year from most recent corporate sources, including Annual Reports, Corporate Social Responsibility Reports or websites. In addition, MSCI ESG Research uses the greenhouse gas (GHG) data reported through the Carbon Disclosure Project or government databases when reported data is not available through direct corporate disclosure. When companies do not disclose data, MSCI ESG Research uses a proprietary methodology to estimate both direct (Scope 1) and indirect (Scope 2) GHG emissions.						
Type of estimation methodology		Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	Yes	Yes	Yes	No	Yes	Yes (Utilities only)	No
Order of use	(1)	(2)	(5)			(4)	(3)	

Focus on MSCI "staircase approach"



GHG / CO2 data used to calculate footprint when no reporting available

When there is no reported data, MSCI uses one of four models.

1. They start with the Company Specific Intensity Model, which is based on data previously reported by the particular company and therefore already reflects the specifics of the businesses that the company is in and its own production processes.
2. If the company has not reported data previously, for certain industries which are particularly carbon intensive, MSCI use a Company Production Mode. For Electric Utilities for example, they use data such as electric generation by fuel mix, often reported by companies, to provide a good estimation of emissions.
3. If production data is not available or usable for estimation, MSCI uses the Global Industry Classification Standard⁴ (GICS) Sub-Industry Model, which draws on their own emissions database to calculate average carbon intensities for each GICS Sub-Industry, from which they derive carbon emissions estimates for each company. In order to refine these models, they built a data set of reported emissions for the years 2008 to 2013 for companies in their research universe (reported data on about 1900 global companies).
4. Lastly, for those companies that did not report data and whose GICS Sub-Industry is not represented in their data

Proprietary calculation modelling vs. standardized / well-known models used Adaptation to sectors

set, they use the Economic Input-Output Life-Cycle Assessment Model, a generalized model based on Standard Industrial Classification (SIC) codes.

This model is used as a last resort as, according to MSCI, EIO-LCA suffers from a strong country bias since it uses intensities which are very specific to the US economy. Moreover, these estimates are time dated.

To be noted: A more detailed carbon estimate methodology is available upon request at MSCI.

Proprietary (but adapted from well-known models)

MSCI has adapted its carbon estimate model for certain industries that are particularly carbon intensive such as Electric Utilities. This industry is highly variable in terms of emissions, ranging from zero for Nuclear or Hydro generation to highly intensive for Coal generation, it is possible to determine the fuel mix of a company if available and then apply emissions factors to each type of fuel.

Geographical correction

Not specifically relevant, given all models:

- Production based model used for Power generating utilities: based on fuel mix data, on which the geography has no substantial impact.
- Company specific intensity model: based on previous reported data, so already reflects the specificities of the businesses and geographies that the company is in and has its own production process.

For the GICS based estimation model that is derived from data from all companies within a subindustry from the MSCI ACWI IMI universe. MSCI considers it as reflecting already the global energy and electricity mix.

However, as reported data is more available in developed countries, an estimate for a company from an emerging country based on those reported data would be geographically biased, and likely underestimated.

Treatment of conglomerates Sector vs. activity granularity Special treatment for Utilities & Energy sectors (based on physical data)

No.

Depends on the model.

Yes.

DATA QUALITY ASSURANCE

Verification system

MSCI ESG Research's quality review process includes:

- **Peer Review:** fossil fuel reserves and carbon emissions data is cross-checked by peers
- **Industry Leads Review:** data is reviewed by senior analysts covering the Energy, Utility and Materials sectors.
- **Ratings Analysts review:** sector analysts who assess the full ESG performance of companies review the carbon data as part of their review of companies in their sectors
- **Company Data Verification:** companies reporting fossil fuel reserves and / or carbon emissions data have been invited to confirm the data.
- **Automatic triggers:** in addition to the review process outlined above, they have incorporated automatic triggers which prompt a review when there is a significant year on year increase or decrease in a company's carbon intensity for example

Reported data:

1. MSCI ESG research collects the carbon emissions data from sources such as CDP, CSR reports and government sources. In case of discrepancies found in the carbon emissions data from such various sources, they select the data which most comprehensively cover the company's operations and are reported on the basis of GHG protocol.
2. MSCI ESG Research through its Data Verification (DV) process also invites companies to confirm the Carbon Emissions data.

Uncertainty reduction measures & processes

Estimated data:

1. While arriving at the industry (GICS SI) specific intensity, the estimation model excludes the outlier values (i.e. company reported carbon intensity values which are more than 10 times or less than 0.01 times the GICS SI average.).
2. For estimated data based on GICS SI intensity model, MSCI ESG research also provides 'Confidence Levels'."

AGGREGATION PRINCIPLES

Rule of allocation per asset class

MSCI headline portfolio level metrics include:

- a) Normalized Carbon Footprint (tons of CO₂e/\$M invested)
- b) Total carbon emissions (tons of CO₂e): = Sum of ((\$investment / issuers full mcap)*Issuers emissions), for all issuers.
- c) Portfolio carbon intensity (tons of CO₂e / \$M of sales): ratio of portfolio carbon emissions (based on the investor's ownership share) normalized by the investor's claim on sales.
- d) Weighted average carbon intensity (tons of CO₂e / \$M sales): sum product of the portfolio weights and carbon intensity of each issuer.

MSCI ESG Research's carbon allocation methodology for equities is based on an ownership perspective. As such, the market value invested in a company is divided by the issuer's total market cap to determine an equity ownership percentage. That percentage is multiplied by the issuer's Scope 1 and 2 Emissions to determine the investor's allocation.

MSCI ESG Research's carbon allocation approach for bonds issued by corporate entities is still a work in progress.

Currently, they assess portfolio exposure to carbon risk of corporate entities using a Weighted Average Carbon Intensity (scope 1 + 2 emissions per USD million in sales) to have the most comparable figure across asset classes.

They have also compiled significant client feedback and are currently evaluating calculating "financed emissions" based on an investor's share of Enterprise Value or Total Capital."

Management of multiple accounting of CO₂ emissions

No.

However, MSCI notes that the main source of multiple-counting of CO₂ emissions in a portfolio carbon footprint is Scope 3 emissions. MSCI ESG Research calculates Carbon Footprint based on the scope 1 and scope 2 GHG emissions (reported or

estimated).

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No
Online tool		MSCI's Carbon Metrics dataset is available via the following online applications: ESG Manager, BarraOne, and Barra Portfolio
Customized portfolio report		MSCI's Carbon Portfolio Analytics reports are based on a standard, set template, however some clients have wished to subscribe to a supplemental custom report where MSCI ESG Research summarizes and highlights key findings from Carbon Portfolio Analytics analysis.
Stock / unitary asset-based report		MSCI's CarbonMetrics dataset contains company-level data on carbon emissions, fossil fuel reserves, and potential emissions. In addition, MSCI's ESG Ratings model assesses companies' carbon risk management practices, looking at whether companies have GHG emissions reduction targets and how aggressive those are. Under this model each company is awarded a Carbon Emissions Score on a 0-10 scale.

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No
Part of the service?		
Type of indicators		In addition to featuring analysis on a portfolio's carbon emissions, carbon intensity and fossil-fuel reserve exposure, Carbon Portfolio Analytics provides assessments of carbon risk management practices, energy initiatives, and clean tech investments, in an effort to indicate possible exposure to environmental legislation and preparedness for transition to a low carbon economy.

FOSSIL FUEL RESEARCH

Yes	No
	Carbon Portfolio Analytics reports feature extensive analysis on a portfolio's fossil fuel reserve exposure in comparison to benchmarks. This includes an assessment of exposure to thermal coal, gas and oil; to potential emissions from fossil fuel reserves; and a further breakdown on exposure to unconventional (e.g. oil sands, shale gas etc.) and other high impact reserves like thermal coal.

OTHER SERVICES

Beyond its Carbon Portfolio Analytics (which is the focus of this document), MSCI ESG Research now offers a comprehensive suite of tools and analyses designed to help institutional investors understand exposure to carbon asset risk and incorporate fossil fuel free and low carbon investment strategies into their investment processes.

These tools include

- **MSCI ESG CarbonMetrics** (equivalent to "brown share research")
MSCI ESG CarbonMetrics provides oil, gas and coal reserves and emissions data to institutional investors looking to identify exposure to carbon asset risk posed by 'stranded assets'.
- **CleanTechMetrics** (equivalent to "Green Share Metrics")
MSCI ESG Research CleanTechMetrics provides the percentage of revenue derived from activities in alternative energy, energy efficiency, sustainable water, green building and pollution prevention.
- **ESG Ratings analysis of carbon exposure and management:**
MSCI ESG Ratings analysis provides research, ratings, and analysis of companies' potential risks and opportunities arising from environmental, social, and governance factors.
This analysis includes an assessment of companies' exposure to carbon risk, and their efforts to reduce exposure through comprehensive carbon policies and implementation mechanisms, such as carbon reduction objectives, production process improvements, installation of depollution or emissions capture equipment, and/or switch to cleaner energy sources.
- **MSCI ESG Environmental Indexes.**
The MSCI ESG Environmental Indexes provide Low Carbon, Fossil Fuels Exclusion and Thematic data and benchmarks for institutional investors. The MSCI Low Carbon Indexes are intended to help identify potential risks associated with the transition to a low carbon economy while representing the performance of the broad equity market - the first benchmarks designed to address two dimensions of carbon exposure: carbon emissions and fossil fuel reserves.

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No
Stock-picking tool (granularity & realism of CO2 volumes assessed)		MSCI uses 4 different approaches to estimate carbon emissions and tries, wherever possible, to be as close as possible to reported data. For utilities, the estimation based on physical indicators (fuel mix). Only the last two models (Sector average) and EIO-LCA makes some of the estimates less relevant for stock-picking.
Universe filtering tool		
Reporting tool		

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		Relevant for the exposure to transition risks, both at a company level (except for the last two models) and at a sector level. Further risks can be assessed via MSCI Fossil Fuel Research, MSCI Carbon Metrics & MSCI ESG ratings

Impact		Relevant for the measurement of the GHG impact of the portfolio, both at a company level (except for the last two models) and at a sector level
		Further impacts can be assessed via MSCI Fossil Fuel Research, MSCI Carbon Metrics
Contribution		Contribution can be assessed with MSCI CleanTechMetrics and MSCI ESG Ratings
		Performance vs. transition scenario can be benchmark with MSCI environmental Indices

MAIN BIAS				
	Low	Med.	High	
Complexity				Apart from EIO-LCA, which is a highly complex method "per se", MSCI staircase approach is easy to understand and based as much as possible on reported data and / or physical data.
Main bias / assumptions				- Extended: Based on the answers to our questionnaire, it's unclear how reported data is extended from one year to another - Physical data: the possibility to apply this model will depend on physical data availability (varies from a company to another) - Sector average: outcomes depends on the quality of the underlying data set (but MSCI excludes outliers and extends this data set from 2008 to 2014) - EIO-LCA: Unclear if MSCI would split companies turnover into the SIC categories or simply allocate a company to a SIC subsector.

OEKOM

COMPANY-RELATED DATA

Date of the first carbon audits
Credentials:

2015 (Oekom Carbon Services is a new research product)

- **Specifically to carbon footprinting:**

The Oekom carbon services are a relatively new product, commercialisation started in September 2015. Approximately 15 customers have opted since then to use the Oekom carbon services.

- **In general:**

Oekom is a recognized ESG data provider (Best in class rating and Controversy assessment) on corporates (shares & bonds for 3,700 companies) and countries (56 countries + EU, representing 94% of outstanding sovereign bonds) and since April 2015 also green/sustainability bonds (a new rating service for investors)

- Partner of more than 120 asset managers and asset owners worldwide
- Basis for about 50 retail funds
- Advising funds and mandates with a total volume of EUR600bn (December 2014)

Track record (AuM audited / footprinted)
Dedicated team

N/A.

Specifically to carbon footprinting:

- A team of 4 analysts have implemented and will update the fossil fuel screening
- A new Research Services Team of 4 is now in charge with carrying out portfolio analyses based on Oekom's carbon data (among other client services).

In general:

- 7- strong team, of whom 55 analysts, including 9 analysts at GES (marketing and research partner)
- independent scientific advisory board
- commercial experience since 1993
- complete independence
- 50 shareholders, predominantly private persons

Skills

As Oekom has been analysing corporate CSR performance for over 20 years with a sector-specific approach focusing on the key issues of a sector, a deep expertise of the CSR challenges, impacts and future trends of the sectors is rooted in Oekom's team. Besides Oekom's sector specific approach, Oekom's research team has specific topic specialists. These analysts have expertise in a specific ESG topic, like supply chain issues, human rights issues or labour rights issues (split into several subtopics). Corporate governance and environmental issues such as biodiversity, water or climate change are other domains of expertise. While all analysts are of course strongly concerned by climate change related issues because this is a topic relevant to all business sectors, some analysts are particularly skilled in this domain:

- sector analysts in utilities, oil & gas, transport & logistics, ...;
- climate change topic specialists;
- analysts in charge of fossil fuel screening;
- research services team in charge of carbon services.

Carbon audit / footprinting service provided

Assessment of carbon impact and performance of companies.

Oekom offers:

- **Oekom Fossil Fuel Screening:** a detailed exclusion criteria for over 3,700 companies worldwide on Carbon & fossil fuel divestment
- **Oekom Carbon Risk Rating:** a qualitative assessment of carbon management for over 3,700 companies worldwide
- **Oekom Carbon Risk portfolio analysis:** a comprehensive analysis of the carbon risk and the carbon performance of a portfolio, incorporating carbon footprinting data from the South Pole for at least 3,500 listed companies

Contact

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Website

CARBON FOOTPRINTING
TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		See South Pole
GHG absolute footprint		See South Pole
Other ESG metrics available at portfolio level		Core input from Oekom; See "Beyond Carbon Footprinting"
Frequency of updates		All Oekom data are updated at least annually.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		Through South Pole Group "Climate Impact Data" (cooperation announced in September 2015)
Scope 2		Through South Pole Group "Climate Impact Data" (cooperation announced in September 2015)
Scope 3		Through South Pole Group "Climate Impact Data" (cooperation announced in September 2015)

"Positive carbon value"
/ Avoided CO2



See South Pole.

COVERAGE

	Yes	No	
Equities			1. Fossil Fuel Screening - Exclusion criteria: 3,700 listed stocks 2. Carbon Risk Analysis Score: 3,700 listed stocks 3. Climate Impact data: 3,500 Listed Companies worldwide 4. Carbon Risk. However, a wider coverage is possible on demand.
Corp. bonds & loans			See South Pole.
Sovereign bonds			See South Pole.
Private equity			See South Pole.
Infrastructure debt			See South Pole.
Real estate			See South Pole.

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	See South Pole.						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Others
Yes / No	See South Pole.	See South Pole.	See South Pole.	See South Pole.	See South Pole.	See South Pole.	See South Pole.
Order of use							

GHG / CO2 data used to calculate footprint when no reporting available
Proprietary calculation modelling vs. standardized / well-known models used
Adaptation to sectors
Geographical correction
Treatment of conglomerates
Sector vs. activity granularity
Special treatment for Utilities & Energy sectors (based on physical data)

See South Pole.
See South Pole.
See South Pole.
See South Pole.
See South Pole.
See South Pole.
See South Pole.

DATA QUALITY ASSURANCE

Verification system
Uncertainty reduction measures & processes

See South Pole.
See South Pole.

AGGREGATION PRINCIPLES

Rule of allocation per asset class
Management of multiple accounting of CO2 emissions

See South Pole.
See South Pole.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No	
Online tool			See South Pole.
Portfolio customized report			See South Pole.
Stock / Unitary asset based report			See South Pole.

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			
Type of indicators			Oekom Carbon Risk Rating: a positive screening of proactive corporate issuers (Performance assessment) - General carbon-related impact of a company in a particular industry - Company's performance concerning the measures to reduce this impact - Company's strategy to shift its product portfolio to be less carbon intensive This performance assessment is based on Oekom's corporate rating and extracts the different carbon-related performance elements. The analysis includes more than 100 1. Cross-sectors indicators (such as: Energy management, Climate change, Eco-efficiency, etc...); 2. Sector-specific indicators (e.g. the in the automotive sector: CO2 emissions of cars, alternative fuels, fuel efficient driving, etc... // in the Food and Beverages sector: Policy on sustainable agricultural practices in the company and supply chain, ratio of raw materials from certified organic farming, etc..)

The results show both the carbon impact of companies across the various industries as well as the benchmarking of climate strategies and performance of companies within a given industry)
 ➔ Provide a final Carbon Management Score.

FOSSIL FUEL RESEARCH

Yes	No
	Fossil fuel screening Oekom provides a detailed exclusion criteria for over 3,700 companies worldwide: - Coal (Producer, User, Trader, Services Providers, Total coal-related activities) - Oil (Producer, User, Trader, Services Provider, Total oil-related activities) - Natural Gas (Producer, User, Trader, Services Provider, Total oil-related activities) - Fossil fuels (Producer, User, Trader, Services Provider, Total fossil-fuel-related activities) ➔ All activities are classified regarding their share of net sales (thresholds: >0%, >5%, >10%, >20%; >30% etc. up to 100% of net sales) and - regarding the producer dimension - the company's market share (using two thresholds : >0.5% and >1%). When these data are not available, they are estimated by Oekom's analysts and submitted to companies. ➔ In addition, Oekom provides data on company activities in the field of unconventional oil and gas in order to enable clients to exclude such technologies ➔ High-volume hydraulic fracturing (already offered by Oekom): Yes / No ➔ Oil sands operations: Yes / No

OTHER SERVICES

Oekom ESG research (Companies' shares and bonds + country research)

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No
Stock picking tool (granularity & realism of CO2 volumes assessed)		See South Pole for quantitative data. Oekom Risk Rating & Oekom Fossil Fuel research are relevant for Stock picking approach.
Universe filtering tool		See South Pole for quantitative data. Oekom Risk Rating & Oekom Fossil Fuel research are relevant for Universe filtering
Reporting tool		See South Pole for quantitative data. Oekom Risk Rating & Oekom Fossil Fuel research are relevant for reporting purposes

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		Quantitative data captures the exposure to the legal / regulatory aspect of transition risk.
Impact		Quantitative data captures the exposure to the legal / regulatory aspect of transition risk. Impact dimension is captured by the two following dimension of the Carbon Risk Rating: - General carbon-related impact of a company in a particular industry - Company's performance concerning the measures to reduce this impact
Contribution		Dimension of contribution to the energy transition is captured as part as "Company's strategy to shift its product portfolio to be less carbon intense" within the carbon risk rating.

MAIN BIAS

	Low	Med.	High
Complexity			Sector-specific approach for each rating.
Main bias / assumptions			"Traditional" bias of ESG rating: e.g. underlying hypothesis and choices (weightings, limits of indicators, choice of indicators, availability of data).

SOUTH POLE GROUP

COMPANY-RELATED DATA

Date of the first carbon audits	2010
Credentials:	One of the largest market shares (approximately 40 / 45%)
Track record (AuM audited / footprinted)	Approx. USD 2 trillion AuM audited to date (January 2016)
	Clients:
	1. Asset owners: AP4 to AP7, Church of Finland, UN
	2. Pension Plan;
	3. Banks: Credit Suisse, Julius Baer, SEB;
	4. Asset Managers: Hermes, Steyler, Oerman;
	5. Govts/ Agencies: World Bank, EU, Swiss Government
Dedicated team	100+ professionals, based in 17 offices spanning 6 continents.
Skills	6 FTE dedicated to carbon footprinting, with access to South Pole Group overall research (130 FTE)
Carbon audit / footprinting service provided	Environmental engineers, finance professionals, sustainability specialists, economists, data specialists and consultants
	1. Raw data delivery;
	2. Highly bespoke and customised screenings with forward-looking, impact and sector analysis;
	3. Online "do it yourself" screeners on Bloomberg, YourSRI.com and Cleancapitalist.com
Contact	Dr. Maximilian Horster m.horster@thesouthpolegroup.com
Website	http://www.thesouthpolegroup.com/sectors/financial-industry

CARBON FOOTPRINTING
TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		Depending on client needs.
		- Emissions per \$ invested (carbon intensity) → allows portfolio comparison - Emissions per revenues of underlying companies → to compare companies
GHG absolute footprint		GHG in CO ₂ e
Other ESG metrics available at portfolio level		- Weighted emissions / weighted sales: (weighted by portfolio share) ==> This metric is not a "footprint metric" but a way to identify the most carbon-intensive companies in a portfolio while agnostic to an ownership bias. - Emissions per owned revenues: i.e. similar to emissions per revenue but allowing for ownership logic to arrive at a footprint (% of company ownership is applied to revenue) - For certain sectors, they can also provide emissions levels by physical indicators.
Frequency of updates		Possibility to create new metrics, combining data points. Carbon data are constantly corrected throughout the year and the models are recalculated once a year. They recommend using "per year" data sets rather than taking the latest reported data in order to avoid mixing operational years.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		
Scope 2		
Scope 3		No use of self-reported data. Modelling of the typical supply chain of a sector (upstream) and products (downstream). Bottom-up modelling for certain companies / sectors. - For upstream emissions, they use Input / Output tables to describe supply chain emissions. - For downstream emissions, they use Lifecycle Assessments (LCAs) of typical products.
"Positive carbon value" / avoided CO ₂		Yes (for certain sectors and projects)

COVERAGE

	Yes	No
Equities		Entire investable public equity domain (30,000+ companies)
Corp. bonds & loans		For all listed issuers. Non-listed issuers available on request
Sovereign bonds		With Global Footprinting Network
Private equity		Part of a bespoke service (see case Study with AP6) Top-down analysis of the portfolios + bottom-up analysis of the sector where the companies are active.
Infrastructure debt		Part of a bespoke service Large portfolio of low-carbon-emission projects (data base on 400 projects bringing energy efficiency benefits).
Real estate		Part of a bespoke service (reference client: Credit Suisse) Detailed universe of coverage / benchmarks

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	Collection of reported data
----------------------	-----------------------------

	1. CDP 2. CSR Reports 3. Websites The data are cleaned and turned into quality data (25% of reported data is discarded)						
Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	No	No	Yes	No	Yes	Yes
Order of use	Used first when available for Scope 1+2		(for Scope 3 up)			For specific sectors	LCA on specific products for Scope 3 down

GHG / CO2 data used to calculate footprint when no reporting available

Regression-based model (Scope 1+2)

For non-disclosing companies, South Pole Group extrapolates GHG emission data based on 200 subsectors (groups of companies based on their carbon profile)

They have 4 different models (regression features on various variables):

- employees
- revenues
- cost of products sold
- geography

For each sub-sector. In total there are 800 models.

Bottom-up for specific sectors (e.g. utilities)

EIO-LCA for Scope 3 upstream

Products LCA for Scope 3 downstream

All proprietary models: South Pole Group pioneered most of the commonly-used approaches.

South Pole Group operates a proprietary sector classification system that is based on company greenhouse gas profiles. South Pole Carbon has an elementary corrective element to capture companies in emerging markets to apply a different coefficient to the one used in the developed companies.

They can fine-tune geographical exposure at a facility level for a bespoke deep-dive analysis.

Break-down by activities

Depends on model / scope calculated.

On utilities, they do not use regressions at all but model the companies "bottom up" based on production mix and reserves data.

Proprietary calculation modelling vs. standardized / well-known models used
Adaptation to sectors
Geographical correction

Treatment of conglomerates
Sector vs. activity granularity
Special treatment for Utilities & Energy sectors (based on physical data)

DATA QUALITY ASSURANCE

Verification system

Assessment of the quality of reported data:

1. Historic analysis
2. Verified data
3. Difference with peers.
4. Difference between reported data and estimated data is assessed. If less than 2%, the data is considered as very good.

Different parameters result in an uncertainty score, both for the reported and modelled data points.

The data validation process is very thorough and combines models with manual research.

Example: they back-test modelled data against reported data. They use models with and without constants to account for scale effects within larger companies.

Uncertainty reduction measures & processes

South Pole Group delivers

- a trust metric (1-100%) for each self-reported data point;
- a model-quality metric for every modelled data point (1-100%)

AGGREGATION PRINCIPLES

Rule of allocation per asset class

Depends on client needs.

Recommended approaches:

- They would recommend allocating the same CO2 to equity and bond holders but this clearly induces double counting. This is OK for carbon risk management purposes.
- EV could be a way, but can be negative.

Problem of comparability between high-leverage companies and low-leverage companies.

Management of multiple accounting of CO2 emissions

Accounting for 3 sources of multiple-counting possible. However, they recommend allowing for double-counting when the purpose is risk assessment.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

Yes No

Online tool		APPS CARBON <GO>: Investment Carbon Screener on Bloomberg allows users to assess GHG emissions for a portfolio and download a report. In the terminal for the last 3 years. Used / tried by 400 to 500 investors. yourSRI Web-based solutions provided with partners from "yourSRI", gives a detailed overview of portfolio GHG emissions. One more solution (with Capital Knights): Cleancapitalist.com Offers GHG footprinting for a portfolio, with the possibility to decarbonize it, to exclude stocks with the highest carbon exposure, and then backtest what the portfolio's performances would have been in the last 5 years. + Data integration into clients' systems
Customized portfolio report		Highly bespoke with a wide range of extra features/ analysis Premium Climate Impact Assessment: State-of-the-art assessment, covering GHG Footprint of the portfolio + company by company assessment and interpretation of results + forward-looking examination conducted with CDP and/ or oekom research, taking in account the investee's climate strategy. Investment GHG Footprint Company by company assessment of GHG emissions, including analysis (benchmarks, quartiles, attribution) Look-through to individual holdings. GHG breakdown by source possible.
Stock / unitary asset-based report		Look-through to individual holdings via all online tools.

BEYOND CARBON FOOTPRINTING PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			Cross-sectorial and sector-specific qualitative assessments provided together with the CDP and oekom research. See oekom's profile for more information.
Type of indicators			- 2 degree compliance checks for portfolios - Fossil reserves (Coal, Gas, Oil) - Transparency of disclosure - Trustworthiness of disclosure - Climate strategy KPIs, - Risks / opportunities - Water risk / stewardship. - Company-specific climate change/ legislation risks; - Avoided emissions - Engagement advice.

FOSSIL FUEL RESEARCH

Yes	No	
		Exclusive partnership with FFI o screen for Carbon Underground 200™ and Tar Sand 20™ and all other reserves, Utility energy production mix, revenue from coal-related products (see study for KLP)

OTHER SERVICES

South Pole Group is a not a data provider but originally a Climate Change specialist, helping companies to measure and reduce their environmental impact. South Pole Group also offers professional resources on an ongoing basis as well as training services.

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock-picking tool (granularity & realism of CO2 volumes assessed)			South Pole Group provides the widest coverage, with regression models based on a proprietary subsector classification based on carbon profiles. The subsector classification was designed on a proprietary basis, to adapt to specific carbon profiles. Moreover, they can conduct an in-depth analysis of a portfolio on demand.
Universe filtering tool			
Reporting tool			

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		South Pole group carbon footprinting methodology is relevant to assess exposure to transition risk both at a company and portfolio level. Further indicators & research "beyond carbon footprinting" complete GHG data and allow investors to assess dynamically how climate-related risks are managed and reported by the company (see oekom's Carbon Risk Rating and Fossil fuel screening)
Impact		South Pole group carbon footprinting methodology is relevant to assess climate impacts both at a company and a portfolio level. Further indicators & research "beyond carbon footprinting" complete GHG data and allow a more in-depth analysis of certain sectors (e.g. fossil fuel research)
Contribution		South Pole group offers a wide range of research going "beyond carbon footprinting", together with oekom research and other partners, which seems to include avoided emissions, 2°C compliance of a portfolio, and Climate "risks / opportunities" analysis.

MAIN BIAS

	Low	Med.	High	
Complexity				Medium to high complexity depending on the models used.
Main bias / assumptions				Regressions - The quality of the regression is influenced by the quality of the underlying data set; however, South Pole seems to have a robust quality-check process in place for reported data. - Geographical bias in underlying geographical data (based on availability); however, South Pole introduces a geographical correction for companies in emerging countries. - The quality of the regression depends on the granularity of the subsector; however, South Pole has a broad number of subsectors (200) based on the carbon profiles of companies, and operates a breakdown of company sales (activity approach) Bottom-up (utilities) - Depends on the availability of underlying physical data. EIO-LCA - EIO-LCA estimates are not based on reported data. - EIO-LCA tables are based on economic exchanges within a certain geography (USA) at a certain time (2007 being the most recent available). - The calculation of emissions factors for each sub-sector is very black box. - The categories of sub-sectors (activities) imply a certain level of discretion, which could include activities with different carbon impacts in the same group (however, providers often "adapt" the sub-sector classification to make it fit with a carbon logic). - Economic exchanges from an "old" Input-Output table have to be deflated. Product LCA - Depends on the availability of underlying product data. - Implies defining a perimeter, which can only be extended or reduced (should the climate impact of the supply chain for the iron machine used to produce a cardboard coffee cup be taken in account in the LCA of this cup?)

SUSTAINALYTICS

COMPANY-RELATED DATA

Date of the first carbon audits	Sustainalytics Carbon Solutions is a new research product. However, Sustainalytics has been assessing carbon performance for many years, - looking at both management practices and performance.
Credentials:	Approx. 350 clients.
Track record (AuM audited / footprinted)	Total clients represent approximately €5tn in AUM. The Sustainalytics Carbon Solutions suite is an enhancement of carbon related coverage and indicators already available as part of its ESG research. (1,850 companies are currently covered in ESG research since 2009).
Dedicated team	Yes. Sustainalytics employs over 200 staff, including over 120 analysts.
Skills	Carbon Footprinting expertise, machine learning professionals, mathematics and regression experts. Broader industry specific ESG experts.
Carbon audit / footprinting service provided	Portfolio footprinting, Portfolio Intensity, Carbon Analytics + Stranded Carbon assets Research and High-Impact Fossil Fuel Research (see bottom of table)
Contact	Vikram Puppala Product manager vikram.puppala@sustainalytics.com
Website	www.sustainalytics.com

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data	Yes	CO2 eq. emissions per million dollars of revenue. Sustainalytics does this on a CO2-equivalent basis and do not isolate each GHG individually. This includes the 6 Kyoto gases
GHG absolute footprint	Yes	Yes. Data are available at a company and portfolio level.
Other ESG metrics available at portfolio level	Yes	Sustainalytics full ESG research.
Frequency of updates		Annually.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1	Yes	2014
Scope 2	Yes	2014
Scope 3		No. Uncertainty about the accounting of Scope 3 emissions remains a challenge for Sustainalytics, which is the reason for its omission.
"Positive carbon value"/avoided CO2		

COVERAGE

	Yes	No
Equities	Yes	14,000 companies. (constituents of the S&P Global BMI) This includes coverage of the Developed Market (Standard) index, the Emerging Market (Standard) index and other international indices. Reported data: about 1,850 companies after data quality checks - 1,500 companies derived from CDP (after removing data with a low confidence level) - Own research of emissions data for 350 companies from developed and emerging markets
Corp. bonds & loans	Yes	
Sovereign bonds		
Private equity	Yes	Estimated in most cases.
Infrastructure debt		
Real estate		

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	1. Reported Scope 1 & 2 based on CDP (~1500, after removal of outliers) 2. Company-Reported Emissions data (annual reports, sustainability reports, regulatory filings, data from companies' feedback) (~350 companies) 3. Estimates According to Sustainalytics, approximately 50% of companies listed in the MSCI Developed Market Index disclosed their GHG emissions in 2014.
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Type of estimate methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	No	No	Yes	No	No	No
Order of use	(1)			(2)			

GHG/CO2 data used to calculate footprint when no reporting is available

For non-reporting companies, Sustainalytics modeled Scope 1 and Scope 2 emissions, with a model based on **regressions**:

The model is based on a regression between reported greenhouse gas emissions and variables such as revenues, market capitalisation, employees and the Sustainalytics Environmental Score, conducted for each industry.

Various tests (cf. Uncertainty reduction measures & processes) are conducted to determine the strongest possible correlations between various combinations of regression features and GHGs for each industry (in all models, the r^2 value is greater than 0.80)

The estimate model is developed through the use of 2013 CO2 data, in addition to 3 years of historical data.

Sustainalytics uses its vast database of carbon emissions data, classified by industry, to generate emission estimate models for each industry we cover.

This provides Sustainalytics with 80 Industry Specific emissions estimate models (one for each scope: 40 Scope 1; 40 Scope 2), currently estimating for FY2013 carbon intensities. They are all error-tested, and can generate company-specific estimates for absolute Scope 1 and Scope 2 GHG, and also carbon intensity (normalized by revenue)

Sustainalytics specifies whether carbon intensity is company-reported or estimated.

Proprietary. For companies that do not report carbon data, Sustainalytics has developed a comprehensive model that provides robust estimates to evaluate a portfolio's carbon intensity (Scope 1 and Scope 2 emissions). (see above)

Sustainalytics uses a specific emissions estimate model for each emissions scope (1 and 2) for each industry (with specific relationships between GHGs and regression features at industry level)

No.

Conglomerates are classified as a separate peer group and has a specific regression model

Sector (40 sub-sectors, 80 regression models)

No.

Proprietary calculation modelling vs. standardized / well-known models used Adaptation to sectors

Geographical correction

Treatment of conglomerates

Sector vs. activity granularity

Special treatment for utilities & energy sectors (based on physical data)

DATA QUALITY ASSURANCE

The Sustainalytics carbon team performs extensive quality management on its emissions dataset and estimate models.

Processes include outlier management, data quality monitoring (e.g. elimination of non group-wide reporting), and back-testing emission models for accuracy.

Internal thresholds are set for each industry estimate model, requiring a goal to be achieved before a model is finalized.

Verification system

• Correction of outlier data:

1. Data scrubbing on all GHG emission data and regression features, to measure dataset-wide quality assurance;
2. Remove top / bottom 10% of industry data (to remove extreme high / low values) ;
3. Removal of high error companies after initial regression is performed ;
4. Introduce polynomial terms and regularization parameters to smooth out each model and address over and under fitting (see below), to fine-tune the model and improve it statistically;
5. Re-run of regression and execute each model after outlier and high error data is removed (to generate the highest quality model possible after implementing extensive data quality measures)
6. After emissions data are generated, all carbon intensities that are +/- 2.5 standard deviations from the industry means are substituted with the average industry carbon intensity, in order to manage extreme high and low values that may be result of a regression-related error (less of 1% of universe is impacted).

• Reducing regression-related errors:

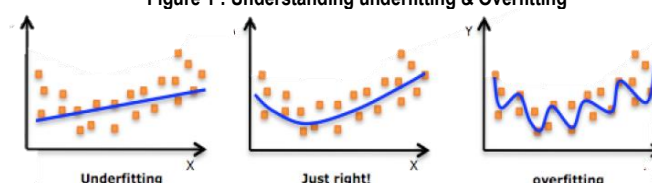
Data are organized into 3 different sets (training set, test set, cross-validation set) for each industry, to allow Sustainalytics to train and back-test their estimate models while considering the industry specific relationships between features and GHG.

• Correction of underfitting and overfitting errors for each industry model.

- Polynomial terms: The estimate model generates polynomial terms to create the best-fitting regression possible and to address errors around underfitting (under sensitivity to the variability of the data set). This is done with the cross-validation set, which identifies the best polynomial degree from the data set.
- Regularization parameters: To address errors associated with overfitting, The Sustainalytics model introduces regularization parameters that smooth out the model and help overfitting (over-sensitivity to the variability of the data set). This is done with the Test set.

Uncertainty reduction measures & processes

Figure 1 : Understanding underfitting & Overfitting



Source: Sustainalytics, Carbon Emissions Estimate Methodology

• Statistical accuracy: 3 kind of tests:

- Industry correlation R^2 Value: illustrates the degree to which model outputs (GHGs) are influenced by regression

features

- Industry mean error: reflects the average rate of error between known and estimated emissions in each industry
- Industry median error: reflects the midpoint rate of error between known and estimated emissions in each industry.

Scope specific estimates: Estimates are in line with the GHG Protocol Corporate Accounting and Reporting Standard. "

AGGREGATION PRINCIPLES

Rule of allocation per asset class

Uses company-level emissions data and company revenues to calculate carbon intensity.

This provides CO₂e tons/million invested.

This is then weighted based on the weights of the holding in the portfolio.

Assets that cannot be linked to a company or companies that are not covered are excluded from analysis. Weights are not adjusted, but information about what % of the portfolio was analyzed is provided (e.g. if 5% of the portfolio is cash, then the Carbon Footprint will be conducted on only 95% of the portfolio).

Management of multiple accounting of CO₂ emissions

Considering Scope 3 emissions are not included in Sustainalytics' intensity calculations; they consider the risk represented by double counting as relatively low.

DELIVERY/TOOLS AVAILABLE FOR INVESTORS

	Yes	No	
Online tool			
Customized-portfolio report			Sustainalytics' Carbon Portfolio Analytics tool supports clients to measure and benchmark the carbon intensity of their holdings at portfolio, sector and peer-group levels.
Stock/unitary asset-based report			Yes. This is a different research product: Sustainalytics company full ESG research.

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			However, can be compiled based on Sustainalytics ESG Research.
Type of indicators			Wide least of environmental indicators, activated depending on their relevance for each subsector.

FOSSIL FUEL RESEARCH

Yes	No	
		Sustainalytics' High-Impact Fossil Fuel Research. Sustainalytics identifies companies that are involved in thermal coal and oil sands, the most carbon-intensive fossil fuels. Those sources are evaluated on a life cycle basis. Company involvement in thermal coal extraction is based on % of revenue; Thermal Coal: For Utilities companies, they estimate the percentage of coal in the company's energy generating capacity. They cover more than 10,000 issuers, which includes the average of the Developed Market (Standard) index, the Emerging Market (Standard) index and other (inter)-national indices. Oil sands: Degree of involvement in oil sands is based on % of reserves and/or production. The oil sands research universe comprises the oil & gas producers among the constituents of: the Developed Market (Standard) index; the Emerging Market (Standard) index; and the largest 1000 US companies.

OTHER SERVICES

Stranded Carbon Assets Assessment

Sustainalytics assesses a company's stranded asset risk by considering a company's exposure to stranded assets (measured by Lifecycle carbon intensity of production mix + Involvement in high-cost projects) and its ability to manage carbon-related risks (Operational emissions management + Climate Risk management).

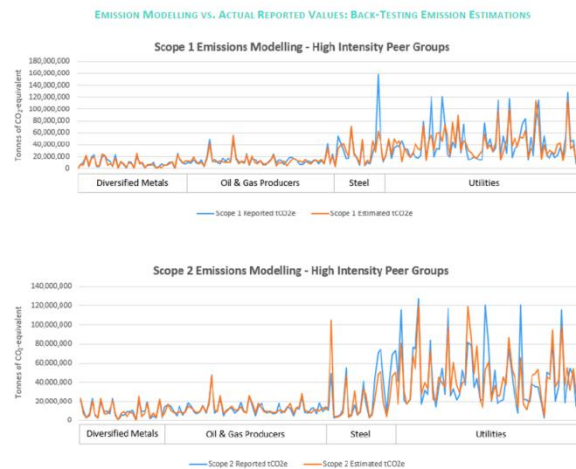
This research provides investors with stranded asset risk scores, exposure scores and management scores. The Stranded Carbon Analysis universe comprises Oil & Gas Producers among the constituents of: the Developed Market (Standard) index; the Emerging Market (Standard) index; and the largest 1000 US companies.

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock-picking tool (granularity & realism of CO ₂ volumes assessed)			Large amount of reported data within the data set. Regression methodologies based on previously reported data. Sustainalytics has strong expectations regarding the coefficient of determination of each regression and uses an underlying data set corrected from outliers, with 4 years of data. Comparisons with reported data provided by Sustainalytics shows a strong level of correspondence (see below).

Figure 2: Emissions modelling vs. actual reported values: back-testing emission estimates



Source: Sustainalytics, Carbon Emissions Estimations Methodology.

Universe filtering tool

Reporting tool

Yes (about 14,000 companies under coverage, mainly constituents of the S&P Global BMI)

Yes.

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		Yes at sector level to assess carbon intensive sectors within the portfolio. Further research on specific risks linked to the energy sector can be carried out with the Fossil Fuel Research and the Stranded Carbon assets assessments.
Impact		Yes, at a sector level for estimated data. Further research on impacts can be carried out with Fossil Fuel Research.
Contribution		The methodology does not provide a metric such as avoided emissions and / or scope 2 downstream emissions. However, Sustainalytics' services include the monitoring of the performance vs. a benchmark. Moreover, indicators available via Sustainalytics ESG research makes it possible to devise "contribution" indicators & climate strategy.

MAIN BIAS

	Low	Med.	High
Complexity			
Main bias / assumptions	Very mathematical approach, with a limited number of sub-sectors. - Scope 1 & 2 data only (as the dataset for scope 3 is insufficient to conduct satisfactory regression analyses). - Geography of the underlying data set can influence the outcome of the regression and introduce a geographical bias. - The quality of the regression is influenced by the quality of the underlying dataset (however, Sustainalytics demonstrates and details strong statistical checks to obtain the best regression possible). - As regressions are based on a multi-year dataset of reported data, technological changes in a group of companies can take time to be reflected in the regressions. - 40 sub-sectors is a limited number of sectors and applies to groups of companies with different carbon profiles. - Sustainalytics does not break down the sales of companies to apply different regressions to different activities.		

TRUCOST

COMPANY-RELATED DATA

Date of the first carbon audits	2005 (Henderson Global Investors); in the field since 2004.
Credentials:	They have conducted 1,000+ carbon footprints and 200+ environmental footprints since then. #1 Carbon Footprint providers worldwide (in terms of global market share). Carbon footprint clients all over the world (North America, Europe, Japan, Australia, India, China). More than 300 clients around the world: asset owners, asset managers, insurance companies, banks, financial services. Examples of asset owners using Trucost carbon footprint: - In France-Belgium-Switzerland: ERAFP, FRR, AXA, Amundi, BNP Paribas, Ethos, Vescore, etc. (25 clients) - In the UK: EAPF, Aviva, etc. - In the Netherlands: PGGM, Aegon, etc.
Track record (AuM audited / footprinted)	Trucost has conducted portfolio audits to manage carbon and climate change liabilities for funds representing \$18 trillion AUM.
Dedicated team	50 analysts focusing on carbon footprint/performance of companies as well as on life cycle assessment and other environmental research (supply chain analysis, natural capital accounting, green share/technology analysis, assessment of green bonds impact, carbon and environmental engagement research and carbon management ratings)
Skills	Trucost's research team is composed of accounting, sector and country specialists to allow for the supply of the best carbon quantitative data.
Carbon audit / footprinting service provided	Typically, this includes environmental economists, engineers - Web-based platform allowing for detailed Portfolio Carbon Analytics (carbon footprint report downloadable in Excel or PDF format). - For non-subscribers to the platform: Standalone Portfolio Footprint reports in PDF for all asset classes (equity, corporate fixed income, green bonds, infrastructure, real estate and private equity). - Other footprint-related services: Green Share/Brown share Footprint, Water Footprint, Waste Footprint, Environmental Footprint. Trucost's portfolio audits include Environmental Impact options (Carbon emissions (standards), embedded carbon emissions from fossil fuel reserves, water, air / land / water pollutants, waste. Moreover, additional analysis can be conducted (on a customized base): carbon savings / benefits of green investments, carbon hedge analysis, legislation / regulation implications, water impact region risk weighting, power company progress on RNW, recommendations for engagement.
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Website	www.trucost.com

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data		
GHG absolute footprint		
Other ESG metrics available at portfolio level		
Frequency of updates		

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1		
Scope 2		
Scope 3		
"Positive carbon value" / avoided CO2		

COVERAGE

	Yes	No
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Equities		Total: 10,000. 6,000 issuers (listed and non listed corporates). 25 indexes are covered, among which MSCI World, MSCI EM, Stoxx600, IboxxEUR Corporates, S&P 500, FTSE All World. The coverage can be extended on demand. - Moreover, Trucost estimates emissions data for 4,000 more companies, although without asking for feedback from these companies. - Finally, coverage of 150 countries
Corp. bonds & loans		300 entities including all constituents of Iboxx EUR Corporates and Barclays EUR Corporates. Coverage of green labelled and non labelled bonds.
Sovereign bonds		Currently under discussion with a partner, but no footprinting at the time.
Private equity		Client-specific coverage – carbon footprint on demand
Infrastructure debt		Client-specific coverage – carbon footprint on demand
Real estate		Client-specific coverage – carbon footprint on demand
Other assets		Forestry & farmland

METHODOLOGY CORE ITEMS & ADJUSTMENTS

Waterfall of sources	- Company Reporting (Annual Report, Factbook, Environmental Report, etc.) - Systematic Annual Company Feedback - CDP and National GHG Inventory Sources - Modelled data via Life Cycle Analysis/Emission factor-based model (to validate, adjust or scale-up the other sources) For some of this data, Trucost has to standardise the data and correct it if it was wrong (perimeter issues, missing GHG in the reporting, etc.) All data types are transparent for clients in the reports provided by Trucost, with different labels depending on their origin. (See "verification process" and "uncertainties reduction")						
Type of Estimation methodology	Reported	Extended	EEIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	Yes	Yes	Yes	No	Yes	No
Order of use	(1)	(2)		To enhance EEIO		To enhance EEIO-LCA	

GHG / CO2 data used to calculate footprint when no reporting available

Proprietary LCA + econometric-based model

- Trucost's model is based on a proprietary EEIO (Environmentally Extended Input Output Model) and the US classification NAICS, with 531 subsectors.
- "EE" stands for "Environmentally Extended", as the subsector classification has been adapted by Trucost to fit with the carbon profile of activities.

The model is enhanced with:

- Statistical/regression analysis of intensity data/peer information; and
- Bottom-up analysis (i.e. assessment of each company by an analyst)

To take a closer look

A team of expert accountants reviews each company's annual report to estimate the share of revenues derived from each sector (based on revenues, production & energy data) (Output).

The model is both bottom-up (evaluation of each company based on its sector of activity) and top-down (a typical supply chain is attributed to each sector (INPUT) ==> correlation table, to which emission factors are applied).

- Sources for the correlation table are Trucost LCA, BEA. They are reviewed approximately every 5 years.
- Emissions factors are attributed based on academic literature, or sources like DEFRA, IEA. They are updated yearly.

Proprietary calculation modelling vs. standardized / well-known models used

Trucost invested \$10m in its proprietary model, based on EEIO and LCA.

They refer 100% to the Scope 3 investment standards (from the GHG Protocol). These standards recommend the use of enhanced EEIO models.

They are also in line with UNEP FI standards for calculating portfolio carbon footprints.

Adaptation to sectors

- Each sector is unique in terms of supply chain (Life Cycle Analysis component of the EIO-LCA).

- Variation of intensity factors per sector.

However no such thing as a specific intensity indicator based on physical indicators for relevant sectors is used.

Geographical correction

No.

Treatment of conglomerates

By definition, in EIO-LCA; a team of expert accountants reviews each company's annual report to estimate the share of revenues derived from each sub-sector of the Trucost classification

Sector vs. activity granularity

Activity (531 subsectors)

Special treatment for Utilities & Energy sectors (based on physical data)

No. But since September 2015 Trucost offers specific GHG emissions figures based on production data (GWh, tonnes of coal etc.)

DATA QUALITY ASSURANCE

Collected data are compared to modelled expectations.

Data are standardised according to the GHG protocol.

Trucost engages directly with companies to verify its research and collect the latest non-disclosed data.

These steps are subject to a Quality Management System based on:

- Statistical analysis and tools to spot potential errors
- Two quality checks by their analysts

Correction of reported data when needed. Around 33% of data is used directly as reported. Around 33% needs to be corrected / standardised.

Uncertainty reduction measures &

Around 33% are only estimated through the model

processes	- EEIO model allowing for sector average comparison - Uncertainty assessment per sector
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AGGREGATION PRINCIPLES

Rule of allocation per asset class	Equity: Share of equity Corporate Fixed Income: Share of enterprise value Infrastructure/Green Bonds/Real Estate Projects: Share of enterprise value or debt
Management of multiple accounting of CO2 emissions	EEIO allows for complete oversight of a sector/company supply chain but most of the time, multiple accounting is not taken in account, as clients agree not to do it. However, for certain clients, some correction methods are used.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No
Online tool		Online platform (Eboard) + distribution through FactSet, Style Research, S&P Capital IQ, and FTP. The Eboard data base includes 6 tools: 1. Screening tool: tool to extract all carbon data for a portfolio or specific universe (Scope 1, 2 & 3, GWh data etc.) 2. Company Briefing: tool to extract Company-specific Carbon Reports (PDF). Annual Briefings since 2005 (cf. below) 3. Company analysis: tool to compare a company versus peers, generate sector analysis and prepare buy-side analyst presentations 4. Calculator tool: tool to calculate carbon, water and waste costs based on customised price sets 5. Portfolio analyser (cf. below): tool to upload portfolios, select specific footprint settings (scope, currency, etc.) and compare performance versus benchmark. Allows for detailed analysis (performance attribution, sector allocation effect analysis, green share exposure, etc.) 6. Fossil fuel exposure (provides research on fossil fuels) - cf. "Fossil fuel research" 2 more tools are under development: 1. Green Bonds module 2. Green / Grey share of portfolios: currently under development. It aims to provide investors with a % of their portfolio invested in green activities / projects (using existing taxonomies to define such projects).
Customized portfolio report		Standalone Portfolio Footprint reports in PDF (available in 24 hours). Possibility to customize and add water/environmental/green share/brown share/stranded asset risk/engagement analysis.
Stock / unitary asset-based report		• Company Briefing: Detailed Carbon Report in PDF format for each company • Carbon Management Ratings (governance, targets, momentum, etc.)

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No
Part of the service?		Trucost's portfolio audits include Environmental Impact options (Carbon emissions (standards), embedded carbon emissions from fossil fuel reserves, water, air / land / water pollutants, waste). Moreover, additional analysis can be conducted (on a customised base): carbon savings / benefits of green investments, carbon hedge analysis, implications of legislation / regulation, water impact regional risk weighting, power company progress on RNW, recommendations for engagement.
Type of indicators		Green / Brown share metrics • Green Share: Percentage of the portfolio derived from "Green activities" (according to the Trucost taxonomy) • Brown share Footprint: Percentage of revenues from brown activities (fossil-fuel related share) – See "Fossil Fuel research" Some dynamic indicators such as: • Alignment with 2 degree scenario (2050) - Several scenarios used • Analysis of future "embedded" emissions • Carbon Risk Management/Strategy qualitative indicators Further environmental impacts such as: • Water Footprint; • Waste Footprint; • Environmental Footprint Metrics are systematically converted into financial metrics, to be able to price these externalities (e.g. as % of EBITDA or % of revenues).

FOSSIL FUEL RESEARCH

Yes	No
	This tool was delivered in July 2015 and was supplemented by a Portfolio Analysis tool in December 2015. It provides a large amount of data on reserves, capex and other key indicators related to fossil fuels for the 6,000 stocks covered. The aim of this

tool is to provide the percentage of a portfolio that is involved in fossil fuels.

- Fossil fuel-related revenue and % of total revenue per fossil fuel type for all companies (incl. extractive and utilities)
- Reserves data for all extractive companies broken down per fossil fuel type and sub-category (thermal coal, tar sands, oil, etc.)
- Potential GHG emissions from reserves data per fossil fuel type and aggregated and stranded asset risk measurement
- Power generation data for all utilities companies (GWh) per energy type and sub-category
- Fossil-fuel exposure ratio per sector (thanks to Life Cycle Analysis)
- Etc.

OTHER SERVICES

- Environmental audits of portfolios
- Environmental screening (screening based on environmental criteria such as coal, palm oil, nuclear, etc.)
- Engagement support
- Montreal Carbon Pledge Support Service
- Fund & Index advisory
- Reporting support
- Education services (carbon footprints, green funds, SRI, environment, etc.)

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No
Stock-picking tool (granularity & realism of CO2 volumes assessed)		Based on EEIO-LCA, we do not think that estimated data are fit for stock picking. However, Trucost enhances its EEIO-LCA approach with bottom-up analysis and regressions (e.g. using the electricity bills of a company to estimate Scope 2 when available) and also systematically seeks feedback from companies. Moreover, they stated that ~33% only of data are estimated data. Based on this, Trucost data may be used for stock picking.
Universe filtering tool		
Reporting tool		

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No
Risks		Carbon footprinting data from Trucost may be used at both company and portfolio level to assess exposure to transition risks. Furthermore "Beyond carbon footprinting metrics" are available to assess other types of risks: e.g. legal / regulatory risk, stranded assets risk, disruptive technology risk (cf. Green Share metrics).
Impact		Carbon footprinting data from Trucost may be used at both company and portfolio level to assess climate impact (and further environmental impacts.) Further "Beyond carbon footprinting metrics" allows users to conduct more in-depth analysis on sectors with high carbon challenges (e.g. fossil fuel exposure, brown share, embedded emissions)
Contribution		Trucost offers / develops further indicators to assess the contribution of the company / portfolio to the energy transition such as: power company progress on RNW; carbon savings; green share; alignments with 2°C scenario for certain sectors. Some of these metrics are, however, only available on demand and / or may not apply to an entire portfolio.

MAIN BIAS

	Low	Med.	High
Complexity			Proprietary version of EIO-LCA + regressions / bottom-up enhancement. Some lack of clarity on what this enhancement includes or does not include.
Main bias / assumptions			EIO-LCA: - EIO-LCA estimates are not based on reported data and hence do not reflect the efforts that could be made by a specific actor. However, Trucost delivers reported data (after consistency checks) when available, and enhances its EIO-LCA models with bottom-up modelling. - EIO-LCA tables are based on economic exchanges within a certain geography (USA) at a certain time (2007 being the most recent available), but applied to companies from different geographies. - The calculation of emissions factors for each sub-sector is very black box. - The emission factors are applied on a global scale (do not reflect specific geographies). - The categories of sub-sectors (activities) imply a certain level of discretion, which could include activities with different carbon impacts in the same group (however, here Trucost has "adapted" the sub-sector classification to make it fit with a carbon logic). - Economic exchanges from an "old" Input-Output table have to be deflated.

VIGEO

COMPANY-RELATED DATA

Date of the first carbon audits	2015 (new product)
Credentials:	Longstanding experience of ESG ratings
Track record (AuM audited / footprinted)	N.A.
Dedicated team	It is difficult to compute a specific number of members since the Energy Transition analysis is integrated in our ESG research activities. VIGEO's 80 rating experts assess the energy transition challenges and opportunities on a sector basis and collect and analyse a company's emission data as well as economic indicators to generate normalised ratios
Skills	In addition to the work undertaken by the research team, there is a specialist team that contributes on a more regular basis with more thorough expertise in the topic including engineers, economists, environmental experts and members accredited by ADEME for carbon footprinting.
Carbon audit / footprinting service provided	Portfolio audits, including 1. Carbon footprint (scope 1 + 2) 2. Energy Transition Strategy (forward-looking indicators). Access to Vigeo's Carbon Footprint & Energy Transition Database is also available, including: Issuer name, ISIN and sector; emission data for scopes 1, 2, and 3 (scope 3 when reported by the issuer); source of emission data and year; emission normalisation ratio per employee, capitalisation and revenue; emissions grade; Energy Transition score per criterion, overall score and date of data production.
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Website	www.vigeo.com

CARBON FOOTPRINTING

TYPE OF INDICATORS PRODUCED

	Yes	No
GHG intensity data	Yes	Available. However, Vigeo has opted to categorise companies by absolute volume of emitted GHG and is very careful with normalised data (as comparisons between stocks based on these data do not reflect the companies' actual activities)
GHG absolute footprint	Yes	Yes (tCO2eq)
Other ESG metrics available at portfolio level	Yes	Yes. This is a key aspect of Vigeo's methodology. (See "Beyond carbon footprinting" for more details on indicators and ratings provided)
Frequency of updates		Carbon data: As soon as CDP has published its new data. Low-carbon rating: every 18 months.

GHG SCOPES INVESTIGATED

	Yes	No
Scope 1	Yes	Reported + Modelled
Scope 2	Yes	Reported + Modelled
Scope 3	Yes	Vigeo has Scope 3 data in its database (based on CDP reported data) but does not model it. Moreover, management of Scope 3 emissions is analysed and factored into the Energy Transition Score.
"Positive carbon value" / Avoided CO2	Yes	No. However, this metric is factored within their sector specific analysis into the Energy Transition Score.

COVERAGE

	Yes	No
Equities	Yes	World coverage (excl. emerging markets): approx. 2,300 stocks. Vigeo's goal for 2016 is to extend our coverage to Emerging Markets alongside additional coverage extensions that will result in worldwide coverage of around 4,300 issuers.
Corp. bonds & loans	Yes	
Sovereign bonds	Yes	Not available yet, but currently under development.
Private equity	Yes	Technically feasible thanks to Vigeo's enterprise expertise. However, this would require a bespoke approach with the company, to build up a reporting tool adapted to its sector.
Infrastructure debt	Yes	Ditto.
Real estate	Yes	Ditto.

METHODOLOGY: CORE ITEMS & ADJUSTMENTS

Waterfall of sources	Vigeo has developed a three-step methodology: 1. Data collection based on the data reported by CDP (Scope 1 & 2 well covered for the Stoxx 600 universe, only 50% for Stoxx 1800) + other data sources are screened (annual reports, CSR reports, corporate websites, etc.) 2. Direct engagement with companies to get the most recent datapoints: gathers an additional 10% of companies. 3. Modelling of missing data
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Type of estimation methodology	Reported	Extended	EIO-LCA	Regressions	Sector average	Bottom-up	Other
Yes / No	Yes	No	No	Yes	No	Yes	Yes
Order of use	(1)			(2)		(2) (cf. utilities)	(based on sector peers)

GHG / CO2 data used to calculate footprint when no reporting available

Regression model, with 38 subsectors

Regressions are conducted on reported data for all 38 subsectors to determine which variables offer the best regression features.

Regression tests are conducted on:

- market cap
- number of employees
- revenues

Bottom-up

For certain sectors, for which specific treatment is advised due to the nature of their activities, carbon footprint estimations will rely on specific sector indicators.

Other

If none of these variables offers a suitable regression feature, Vigeo will estimate the emission level based on the reported emissions of peers of similar size and activities. They will then apply the carbon intensity of the reporting company to the non reporting one. In case that the company's activities are very heterogeneous they will look for pure players for each one of them.

Focus on Vigeo's "penalty rule"

Based on their estimated level of emissions, companies can be classified into 4 categories:

- A. <100,000 t CO2eq → Moderate
- B. >=100,000 and < 1,000,000 → Significant
- C. >= 1,000,000 and < 10,000,000 → High
- D. >=10,000,000 → Intense

By convention, a non-reporting company will systematically receive the highest volume of emissions in its category (i.e. the same emission volume of the company with the highest emission in its category).

This rule is applied systematically.

Proprietary calculation modelling vs. standardised / well-known models used Adaptation to sectors

Proprietary regression based model + qualitative opinion

Yes (based on the different regression features for all 38 sectors)
+ use of physical indicators for certain sectors.

No.

If the company is an aggregate, a pure player peer will be found for each segment of activity.

38 subsectors – no breakdown of sales for regressions.

Estimation methods for the Electric & Gas Utilities sector incorporate additional indicators such as carbon factors, heat-power generation mix and specific thermal carbon factors. Similarly, the production of barrels of oil is included for the Energy sector.

Notably, including these indicators enables us to deal with different reporting standards for diverse industries within these sectors.

Geographical correction Treatment of conglomerates Sector vs. activity granularity Special treatment for Utilities & Energy sectors (based on physical data)

DATA QUALITY ASSURANCE

Two types of controls are applied to ensure that reported data are consistent:

1. Qualitative:

- Reporting boundaries, scopes and coherence of data are checked for disclosed emissions.
- In addition, highest and lowest values for each sector are revised. Moreover, Vigeo engages with companies and asks for feedback on their emission data.

Verification system

2. Quantitative:

- Reported data are backtested against our estimation model's output and analysed where pertinent.
- Treatment of outliers: when reported data are too different from the sector average and are neither consistent with reporting standards nor linked to the company's activities or sector, modelled data will be used. The percentage of cases where modelled data have to be used because of inconsistent reported data represents around 3%.
- The coefficient of determination (R^2) is calculated to assess the quality of their linear regression model.
- Standard deviations are calculated for all their ratios for each sector and regressions are tested on reported data to choose which estimation is the most consistent for each sector.
- As mentioned above, in certain sectors where specific treatment is required, estimation models will not be applied and carbon footprints will be determined by specific sector indicators.
- In addition, highest and lowest ratios and estimations for each sector are revised.

Uncertainty reduction measures & processes

AGGREGATION PRINCIPLES

Rule of allocation per asset class

- **Equity:** financed emissions (level of shareholding in each company)
- Carbon footprint per € invested (can be applied to **fixed income**)

Management of multiple accounting of CO2 emissions

Not managed.

DELIVERY / TOOLS AVAILABLE FOR INVESTORS

	Yes	No
Online tool		Access to database.

Customised portfolio report		PDF version. Includes overview (carbon footprint + energy transition strategy of the portfolio against benchmark), investment distribution (by category), sector distribution of the carbon footprint and energy transition strategy of sectors, mapping of most weighted issuers + engagement focus on key fund issuers.
Stock / unitary asset-based report		Yes (through database)

BEYOND CARBON FOOTPRINTING

PROSPECTIVE / DYNAMIC APPROACH

	Yes	No	
Part of the service?			This is a key aspect of Vigeo's methodology. Recognising the implicit limits of modelling (quality of data, loopholes in reporting, etc.), Vigeo also provides investors with a qualitative opinion of the Climate Change Strategy of companies (how they are engaged in the transition toward a low-carbon economy). This data (Energy Transition Performance) are included in the carbon audit reports of portfolios.
Type of indicators			This data are more qualitative (albeit including a lot of quantitative KPI - i.e. physical indicators) and come directly from Vigeo's ESG rating expertise. All 38 subsectors have been allocated a set of criteria that fit with what has been identified as the sector's most relevant challenges regarding the energy transition. Final scores from 0 to 100 are given. This provides a very dynamic / forward-looking opinion on how companies see their Scope 3 emissions and manage them (allows for stock-picking differentiation).

FOSSIL FUEL RESEARCH

Yes	No	
		However, fossil fuel exposure and potential emissions are under development.

OTHER SERVICES

Vigeo ESG research

OUR OPINION

MAIN OBJECTIVES OF THE TOOL

	Yes	No	
Stock-picking tool (granularity & realism of CO2 volumes assessed)			Even if Vigeo uses reported data when available, the modelled data are the emission levels of the highest emitter in one of the four categories defined by Vigeo. This "penalty" rule for non-reporters implies a deliberately bullish bias in terms of CO2eq estimates.
Universe filtering tool			Yes.
Reporting tool			Yes.

RELEVANCE FOR THE 3 CLIMATE STRATEGIES

	Yes	No	
Risks			Vigeo's carbon footprinting methodology makes it possible to assess exposure to transition risk, which can be monitored at both company (for reported data) and sector level. Its qualitative rating on Energy Transition performance can also be seen as a proxy to assess how potential "technology" risk is managed.
Impact			Vigeo's carbon footprinting methodology makes it possible to assess the impact of a portfolio, both at sector level and company level, bearing in mind that estimated data imply a bullish bias (see penalty rule).
Contribution			Contribution towards the energy transition is assessed at company and portfolio level with the qualitative rating.

MAIN BIAS

	Low	Med.	High	
Complexity				Regression-based models take a very "mathematical" approach to carbon footprinting, based on reported data. Vigeo uses a limited number of subsectors (38); however, for certain subsectors where regressions are not satisfactory, they will use a more bottom-up approach based on physical data that are relevant. The estimation based on the emission factor of sector peers is quite simple to understand, but implies to find a company with similar activities which, is easier said than done.

Main bias / assumptions

- Carbon Data on Scope 1 + 2 only (however Scope 3 based on CDP available + and qualitative assessment of energy transition performance compensate this)

Traditional bias of all regression models:

- Quality of the regression is influenced by the quality of the underlying dataset & the statistical tests put in place to achieve the best regressions possible

- As regressions are based on a multi-year dataset of reported data, technological changes in a group of companies can take time to be reflected within the regressions.

- 38 subsectors are a limited amount of sectors, so companies with different carbon profiles have to be grouped together (however, Vigeo also uses bottom-up approaches for certain sectors).

Sector peers:

- potential bias in the choice of the peers by the analysts.

This document may mention valuation methods, which are defined as follows:

- 1/ Peer comparison method: valuation multiples for the company in question are compared with those of a sample of companies in the same sector, or with a similar financial profile. The sample average acts as a valuation benchmark, to which the analyst can, where necessary, apply discounts or premiums resulting from his/her perception of the company's specific features (legal status, growth outlook, profitability, etc.).
- 2/ NAV method: Net asset value is an assessment of the market value of the assets on a company's balance sheet using the method that the analyst deems most relevant.
- 3/ Sum of the parts method: this method involves valuing each of the company's businesses separately using the most appropriate valuation methods for each, and then adding them together.
- 4/ DCF method: the discounted cash flow method involves assessing the current value of cash that a company will generate in the future. The analyst draws up cash flow projections based on his/her assumptions and models. The discount rate used is the average weighted cost of capital, which equates to the company's cost of debt and the theoretical cost of equity as estimated by the analyst, and weighted by the proportion of each of these two components in the company's financing.
- 5/ Method based on transaction multiples: with this valuation method, the company's multiples are compared with those seen in transactions involving groups with a similar business profile.
- 6/ Dividend discount method: with this method, the analyst establishes the present value of dividends to be paid to shareholders by the company, using a projection of dividend payments and an appropriate discount rate (generally the economic cost of equity).
- 7/ EVA method: with the Economic Value Added method, the analyst determines the additional level of profitability generated annually by a company on its assets relative to its cost of capital (difference also known as value creation). This additional profitability can then be discounted over the coming years using a rate corresponding to the weighted average cost of capital, and the resulting amount is added to the net asset value.

Natixis ratings cover the next six months and are as follows:

Buy	upside over 10%
Neutral	upside between +10% and -10%
Reduce	downside of more than -10% and/or high risks on business and financial fundamentals.
Present shares	favorable response to a public offer (takeover, delisting,...)

At 04/11/2016, Natixis ratings and the proportion of total stocks for which its parent company Natixis has provided investment services over the past 12 months break down as follows:

	Companies covered	Corporate companies
Buy	36.53%	3.75%
Neutral	49.77%	3.67%
Reduce	13.70%	0.00%

Reference prices are based on closing prices.

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