extantia
The Net-Zero Circle

Extantia Projected Impact Calculation

An Impact Measurement Framework for Climate Tech Venture Capital Funds

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Executive Summary

Background

Global warming and the resulting changes to our climate represent the most pressing threat to life as we know it, and the very existence of millions of people across the globe. Greenhouse gas (GHG) emissions must peak as soon as possible and then decrease at an unprecedented fast pace to meet the Net Zero target set for 2050.

To achieve this herculean task, humanity needs to act on two fronts at the same time: (i) reducing sources of emissions by switching to lower-carbon or zero-carbon products, and (ii) increasing the capacity of natural and engineered sinks to draw down from the atmosphere the carbon emitted already in previous decades.

Mobilising capital is imperative to achieve Net Zero. With capital shifting to climate-conscious investments, carbon-intensive products will experience lower profitability and show too high a risk to be confidently funded. The lower availability of carbon-intensive products in the markets will also shift behavioural patterns that will skew society towards sustainable consumption. While many low-carbon technologies are already on the market today (e.g. Electric Vehicles), they are vastly insufficient for the scale of the problem. We still need bold innovations from visionary founders to invent, develop, and scale what will be the make-or-break solutions when it comes to actually achieving the Net Zero target. This is the unique space where Venture Capital (VC) with a Climate Tech focus operates, and also the very birthplace of Extantia.

Extantia has a bold vision of gathering a herd of 'Gigacorns', companies with a unicorn potential as well as a demonstrated capability of 'moving the needle' in the climate crises, that is avoiding the emissions of, or removing, 1 Gt of CO_2. With such an ambitious goal, appropriate impact measurement is of the utmost importance. The climate crisis is so severe that there is no time for errors, and thus Extantia only aims to invest in companies with a high likelihood of achieving their Gigacorn potential. To assist us in this journey we developed EPIC, Extantia Projected Impact Calculation.

EPIC Methodology

As part of the development of EPIC, we reviewed and analysed key science and policy sources for impact assessment. A pre-eminent role in EPIC is played by life cycle assessment (LCA), the world's most authoritative, rigorous, and quantitative methodology for environmental impact assessment. LCA, however,

works very well for established technologies and products for which data exist. To effectively assess the 'life cycle' element, one needs information on all the phases of a technology from development and manufacturing through to end of life and disposal. This is intrinsically impossible for technologies and products that are being developed just today. A branch of LCA, called prospective LCA, is attempting to deal with this limitation but it remains as of now a niche conversation in academic circles. A unified methodology is not yet available, proposed methods are sometimes contrasting, with ongoing scientific debate on strengths and weaknesses of the existing ones, and data is for the most non-existent with the only available future datasets covering some areas of the energy sphere and few key metals.

Beyond strictly scientific approaches, we also analysed global guidance for GHG emissions monitoring and impact reporting. These include the Greenhouse Gas Protocol, the Global Reporting Initiative (GRI), the Science Based Target initiative (SBTi), the Global Impact Investing Network (GIIN) and IRIS+ and many more initiatives and schemes in the space of impact reporting. Lastly, we included best practice from the VC world through a deep analysis of widely used tools (e.g. CRANE) or market-leaders methodological proposition (e.g. Breakthrough Energy Ventures).

EPIC therefore represents a distilled and refined version of the best of science and impact assessment and reporting, tailored for the VC world within the Climate Tech space. Our proprietary Carbon Math methodology focuses on *three steps* that vary in *time*, *depth*, and *resource-intensity*.

Step 1 coincides with a deal entering Extantia's pipeline. In minutes we assess whether or not the company has a Gigacorn potential, i.e. if it passes Extantia's investment threshold. If such potential is not there we do not engage any further with the company.

Step 2 is a much more detailed assessment carried over weeks during the various stages of the deal flow development. We see it as an ESG and emissions reduction due diligence and with our unique approach we develop an accurate number of projected impact at scale through to 2050. We investigate technical data about the company's unique technology and use scientifically leading global databases to capture both local and global emissions savings. EPIC allows us to develop a market penetration curve tailored to each startup that defines their journey to a Gigacorn.

Step 3 begins with Extantia's decision to hand in a term sheet. We then insert an ESG clause to make sure the company is committed to integrate a climate policy and ESG best practices within their business. After the term sheet is signed, in the Investment Closing phase, we thoroughly assess the social and governance processes of the company to ensure best ESG practices. Key ESG KPIs, such as carbon footprint, diversity or employee satisfaction, are then regularly monitored.

The EPIC methodology is also linked to Extantia's Impact Carry. As part of Step 3, we engage in a discussion to develop ambitious and specific impacts that are to be achieved within the lifetime of the fund. Specifically, we defined six Impact Carry KPIs: one for the environmental sphere (GHG emissions reduction potential), three for social (staff turnover, nationalities diversity, gender diversity in the company) and two for the governance sphere (gender diversity in management and board of the company). The Impact Carry KPIs of each company feed into an impact assessment score for our whole portfolio which we entirely tie to 30% of our carry (i.e. if we don't achieve our impact goals, we will waive 30% of our carry).

Conclusion

We developed the EPIC methodology to serve both as a northstar for where to invest to achieve maximum long-term positive contribution to the world (steps 1+2) as well as an usher to secure dedication and interest alignment on the short-term (step 3).

We are aware that EPIC is not perfect and it still has potential for improvements, but it is a standing framework that we can apply to all our investments. We welcome suggestions for improvement.

Glossary

ESG	Environmental, Social & Governance criteria
Gigacorn	A company that is ultimately capable of saving more than 1Gt of CO2e emissions (and 100 Mt as an absolute minimum threshold) per year and is also commercially viable with scalable business models.
LCA	Life Cycle Assessment
EEMRIO	Environmentally extended multi regional input output
GHG	Greenhouse Gas
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CH_4	Methane
N_2O	Nitrous Oxide
HFCs	Hydrofluorocarbons
PFCs	Perfluorocarbons
SF_6	Sulphur Hexafluoride
NF_3	Nitrogen trifluoride
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
GWP100	Global Warming Potential over 100 years
GWP20	Global Warming Potential over 20 years
IIRC	International Integrated Reporting Council.
RTS	Regulatory Technical Standards
SFDR	Sustainable Finance Disclosure Regulation
VC	Venture Capital

EPIC: Overview Of The Methodology

This section aims to summarise the 'Extantia Carbon Math' proprietary approach and overall ESG methodology, when evaluating companies to establish their sustainability practices and Gigacorn potential.

In Figure 1 you can see a visual representation of the EPIC methodology timeline, categorised by investment processes. Figure 2 shows this impact process divided in terms of the three steps of the EPIC methodology, which follows the structure of this paper.

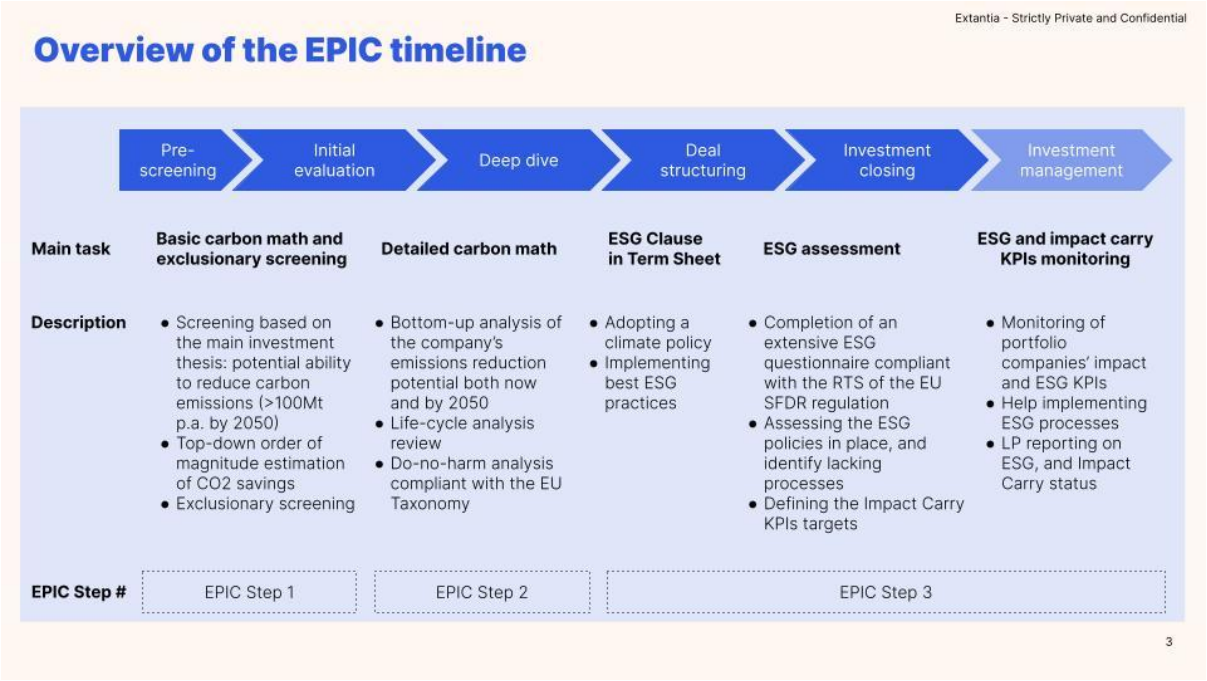


Figure 1: Schematic overview of the EPIC methodology's timeline

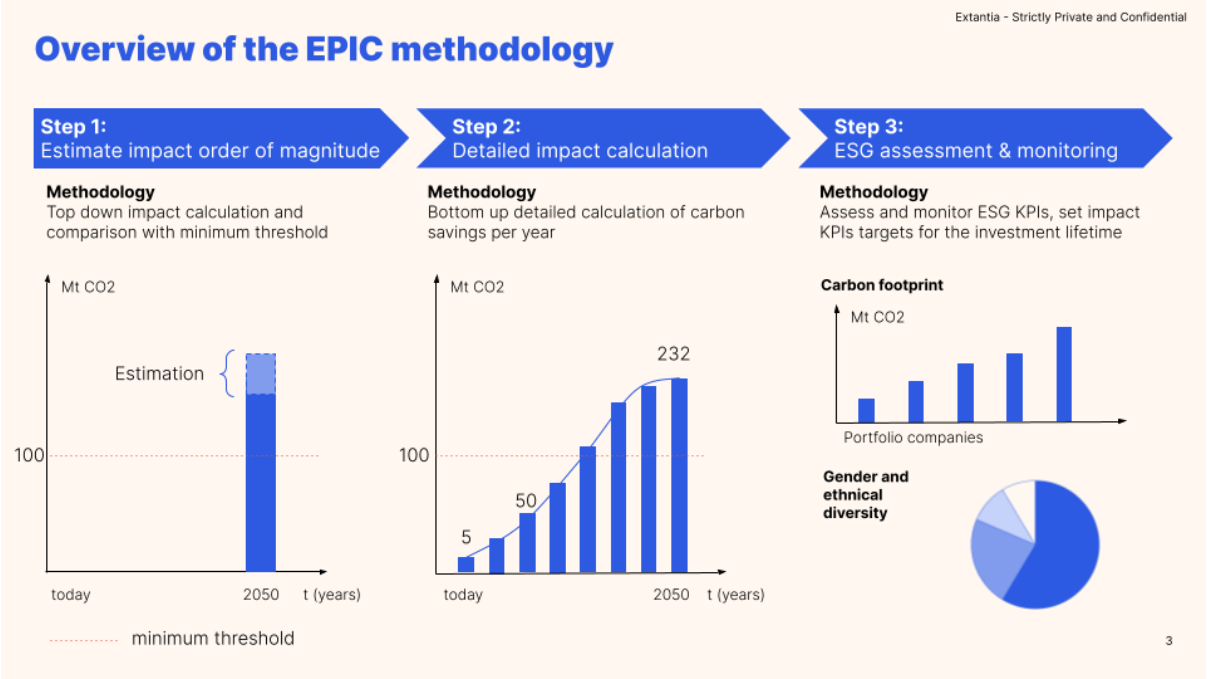


Figure 2: Schematic overview of the EPIC methodology in three steps

EPIC STEP 1

Integrating ESG criteria within a fund begins at the screening process. Based on an investment thesis and exclusionary process, one can select the companies having the most impact through a positive or negative screening. At Extantia, we divide the global economy into macro-economic sectors (e.g. transport, construction) and amongst these focus on six priority areas: Clean Energy, Mobility & Transport, Industrial Chemistry & Materials, Sustainable Buildings & Construction, regenerative Agriculture & Food, as well as emerging industries that support sinks such as direct air capture (DAC), carbon removal and carbon utilisation. We focus on these areas within the global economy as they hold the most significant potential to reduce CO2 emissions and are thus most likely to help solve the accelerating climate crisis (Figure 3).

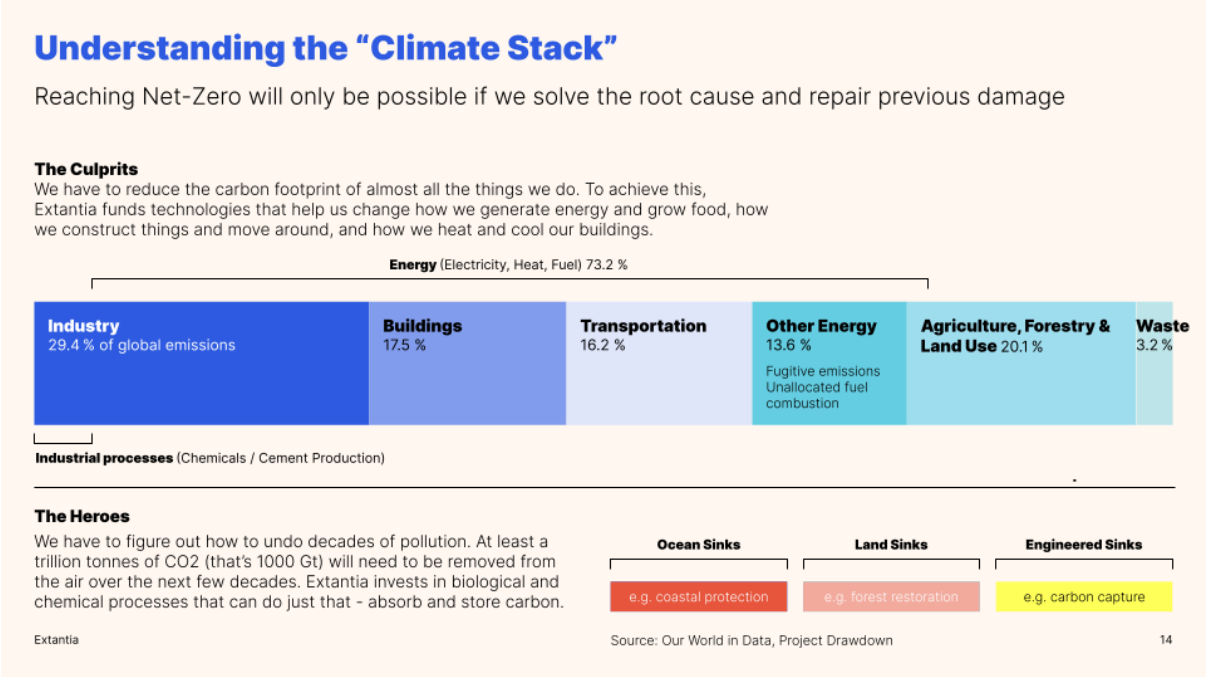


Figure 3: Global GHG emissions sources and sinks

Our initial exclusionary approach involves not investing in any venture that has the following attributes:

- Has an expected long-term net-negative impact on climate change (assessed with a lifecycle analysis and carbon calculations);
- Derives more than a third of its revenues from the extraction, manufacturing of, or trading in coal, oil, or natural gas, unless using technology intended to reduce net greenhouse gas emissions;
- Is involved in the production of and trade in tobacco and distilled alcoholic beverages;
- Is involved in gambling or pornography;s
- Is directly involved in the production of landmines, cluster munitions, chemical or biological weapons, or nuclear weapons in contravention of the Treaty on the Non-Proliferation of Nuclear Weapons.

Given the numerosity of deals entering the pipeline, the methodology has been conceived as a multi-step-based approach to ensure initial decisions can be made quickly, yet thoroughly, to ensure Extantia does not miss out on any Gigacorn in the pipeline nor do we spend unnecessary resources on evaluating those companies without the potential to become a Gigacorn.

In the first step we use a standardised questionnaire to gather information from the company on their unique sustainability proposition. This serves the purpose of ensuring that the company demonstrates to be sustainability- and impact-savvy. The standardised approach ensures we remain tech-agnostic

and focus only on solutions that make a significant positive contribution to the KPIs of the climate crisis.

We seek an ultimate saving potential of 1 Gt CO_2e per year by 2050 and an absolute minimum threshold of 100 Mt to continue the conversation with the company. Our questionnaire assesses companies with solutions in the six priority areas mentioned above and schematised in Figure 3. Through the standardised questionnaire, a company can indicate the priority area it addresses, the reduction it can enable at scale, and the share of the market it targets. In a short time, we are therefore able to assess the carbon reduction potential of companies.

In cases where we believe the company has misrepresented or not fully captured its potential we engage in conversations with the founders to discuss further and clarify to avoid missing out on potential Gigacorns. This might happen because the company's IP or technology is so new that it is not yet captured in existing 'maps' of tools or questionnaires. If and when this happens we either seek data from the company or use the latest scientific research to inform our analysis. If this route fails, we tap into the wealth of knowledge available within Extantia's Climate Science Advisory Board, formed by leading climate scientists and industry experts – each covering a key section of the challenging global pathway to Netero. This ensures that even when no data exist, the world's top experts support our assessment.

Step 1 concludes with a confident decision as to whether a company has the potential to reduce carbon emissions by 100Mt per annum by 2050. In case of significant climate impact – which is however below the GHG emissions reduction focus of Extantia – a suggestion to other VC funds we co-invest with will be made to ensure that a potentially high-impact company gets a chance to receive the funding it needs to scale.

An exemplary view of the standardised questionnaire is shown in Figure 4.

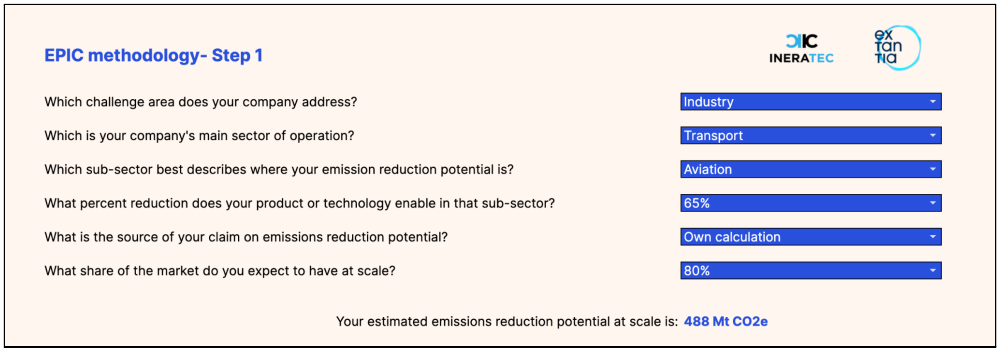


Figure 4: Example of the standardised questionnaire

In this example taken above (Figure 4), INERATEC is an Extantia investment. The company builds and sells modular chemical plants for the production of sustainable fuels such as e-kerosene, CO2-neutral gasoline, and clean diesel. In calculating INERATEC's impact potential, the first step was to identify the total emissions of the sector the technology is targeting (here, the sector is Transport and the sub-sector is the aviation industry). INERATEC's carbon reduction claims (65%) were then validated through high level literature review. The result is an order of magnitude estimation of the reduction potential. Since the order of magnitude is above Extantia's threshold (100Mt), INERATEC moves to the second step for a more detailed review.

EPIC STEP 2

In step 2, we are already confident a company has Gigacorn potential, but we still need to undertake further in-depth diligence checks to ensure we get the numbers right.

As a first confirmation to the numbers obtained in step 1, we follow a bottom-up approach that relies on life cycle assessment (LCA) of the products or technologies of the company. This allows us to benchmark the savings against traditional/alternative solutions. We then project market growth and technological development and uptake. For the uptake we consider Total Addressable Market (TAM), Serviceable Addressable Market (SAM), and Serviceable Obtainable Market (SOM).

More scientific explanations on this approach are laid out in the section "**MEASURING DEEP DECARBONISATION IMPACT WITH EPIC**".

Step 2 produces two key outputs for Extantia:

1. Our best estimate for the emissions reduction potential of the company which is used in scorecards and at-a-glance communication to LPs;
2. A detailed one pager with key, high-level methodological choices of our analysis for further communication to LPs correlated with an 'accusation audit' of about half a page that explains how the cautionary principle was applied in our analysis to adopt conservative hypotheses and avoid overestimates.

A visual overview of how the above materialises is shown in Figure 5: a typical, branded Extantia Carbon Math one pager (left) and projected annual GHG savings (in Gt CO2e) for some of the companies in Extantia's portfolio.

This Life Cycle analysis, along with the ESG questionnaire filled by the company in the next step, allows Extantia to ensure that the company follows a "Do No Significant Harm" principle, meaning that while the startup significantly contributes to emissions reduction, it causes no significant harm to biodiversity or society.

From an organisational perspective, it is important to note that running proper LCA assessments is time-consuming and bears the risk of diverting scarce time and resources of the investment team away from core tasks such as deal sourcing and commercial diligence. To mitigate this risk, we have established Extantia Climate Labs as a separate yet integrated function within the investment process.

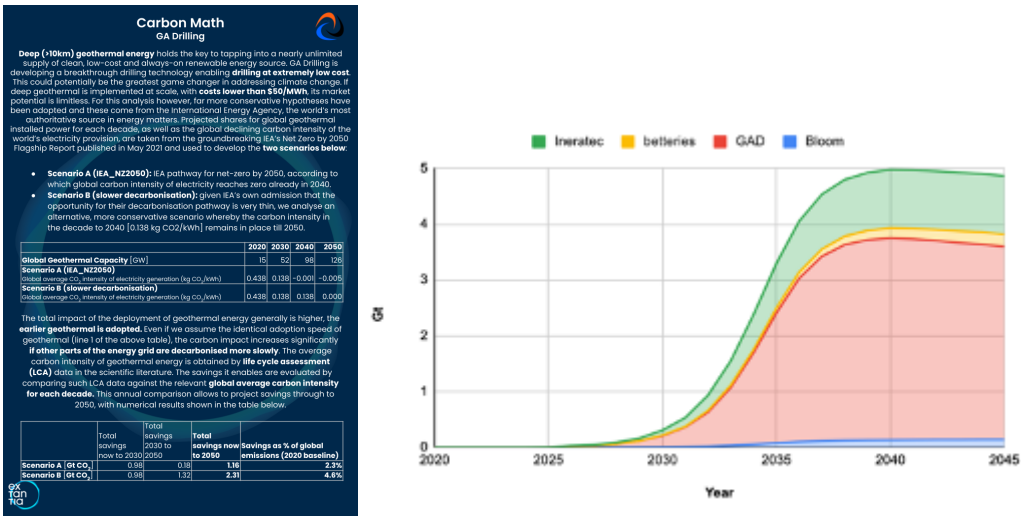
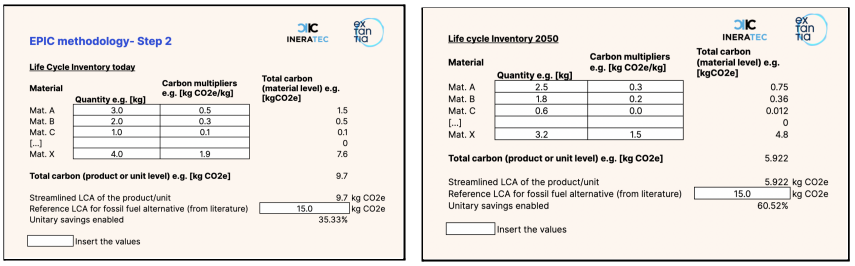


Figure 5: Example of a one-pager (left) and results on projected annual GHG savings for some of the companies in the portfolio (right)

Let's take again the example of INERATEC:
First, we begin with the Life Cycle Inventory, at the current level and projected level for 2050. In this step (Figure 6), INERATEC indicates which materials it is using as well as their quantities. The LCI is then completed for 2050 incorporating a set of assumptions about the future CO_2 multipliers.



EPIC methodology- Step 2

Life Cycle Inventory today

Material	Quantity e.g. [kg]	Carbon multipliers e.g. [kg CO2e/kg]	Total carbon (material level) e.g. [kgCO2e]
Mat. A	3.0	0.5	1.5
Mat. B	2.0	0.3	0.5
Mat. C	1.0	0.1	0.1
[...]			0
Mat. X	4.0	1.9	7.6

Total carbon (product or unit level) e.g. [kg CO2e] 9.7

Streamlined LCA of the product/unit 9.7 kg CO2e
Reference LCA for fossil fuel alternative (from literature) 15.0 kg CO2e
Unitary savings enabled 35.33%

Insert the values

Life cycle Inventory 2050

Material	Quantity e.g. [kg]	Carbon multipliers e.g. [kg CO2e/kg]	Total carbon (material level) e.g. [kgCO2e]
Mat. A	2.5	0.3	0.75
Mat. B	1.8	0.2	0.36
Mat. C	0.6	0.0	0.012
[...]			0
Mat. X	3.2	1.5	4.8

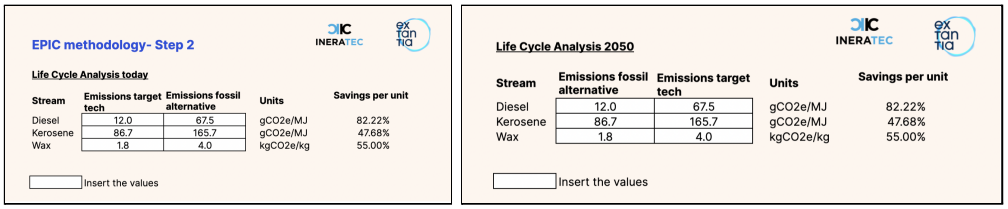
Total carbon (product or unit level) e.g. [kg CO2e] 5.922

Streamlined LCA of the product/unit 5.922 kg CO2e
Reference LCA for fossil fuel alternative (from literature) 15.0 kg CO2e
Unitary savings enabled 60.52%

Insert the values

Figure 6: Life cycle inventory of Ineratec

Then, based on the Life Cycle Inventory, we can conduct the Life Cycle Analysis (Figure 7) which entails a detailed comparison of INERATEC's emissions and the likely alternatives now and in 2050. All further information about a standard Life Cycle assessment can be found in the section **Existing Tools Used In Epic: Life Cycle Assessment.**



EPIC methodology- Step 2

Life Cycle Analysis today

Stream	Emissions target tech	Emissions fossil alternative	Units	Savings per unit
Diesel	12.0	67.5	gCO2e/MJ	82.22%
Kerosene	86.7	165.7	gCO2e/MJ	47.68%
Wax	1.8	4.0	kgCO2e/kg	55.00%

Insert the values

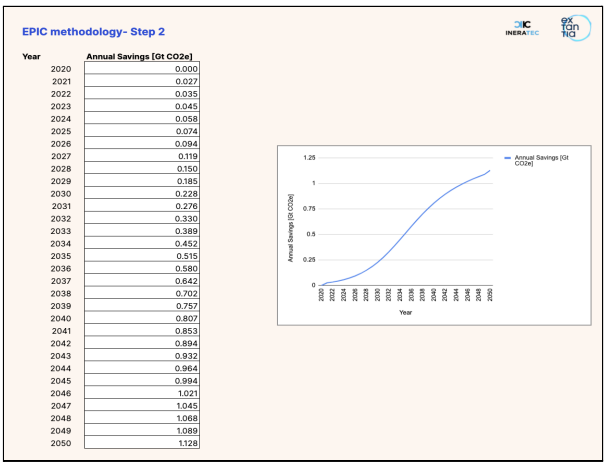
Life Cycle Analysis 2050

Stream	Emissions fossil alternative	Emissions target tech	Units	Savings per unit
Diesel	12.0	67.5	gCO2e/MJ	82.22%
Kerosene	86.7	165.7	gCO2e/MJ	47.68%
Wax	1.8	4.0	kgCO2e/kg	55.00%

Insert the values

Figure 7: Life cycle Assessment of Ineratec

Finally, based on the results of the Life Cycle assessment, we perform a dynamic CO_2 reduction projection (Figure 8), i.e. a detailed year-on-year CO_2 reduction projection. For this we utilise green premium projections, INERATEC's tech maturity and time to impact assessment as well as Extantia's carbon pricing model.



EPIC methodology- Step 2

Year	Annual Savings [Gt CO2e]
2020	0.000
2021	0.027
2022	0.035
2023	0.045
2024	0.058
2025	0.074
2026	0.094
2027	0.119
2028	0.150
2029	0.185
2030	0.228
2031	0.276
2032	0.330
2033	0.389
2034	0.452
2035	0.515
2036	0.580
2037	0.642
2038	0.702
2039	0.757
2040	0.807
2041	0.853
2042	0.894
2043	0.932
2044	0.964
2045	0.994
2046	1.021
2047	1.045
2048	1.068
2049	1.089
2050	1.128

Figure 8: Dynamic CO2 reduction projection of Ineratec

INERATEC's carbon savings potential (calculated in Step 1) is updated with this rigorously calculated estimation.

It should be emphasised that our LCI/LCA calculations are purely based on the company's reports and documents provided. We conduct a sanity check to the provided data, but we do not hold or commision our own new analysis. Naturally, we put more weight on reports that were prepared by objective third-party vendors.

Companies can sometimes be enablers: they do not generate a direct emission reduction through lower carbon products, nor they actively remove carbon from the atmosphere. Nevertheless, these companies might play an enormous role in the fight against climate change. Think, for instance, of a company offering data insights to organisations to understand where the most carbon emissions occur in their operations so that these can be addressed and mitigated. Such a company would be key to the organisation's emissions reduction journey, and as such, depending on the specific case in point we develop a tailored approach for emissions reduction estimates. Following the common approach used in LCA we develop a counterfactual baseline (i.e. what would have happened within the organisation, had the company not existed?) and against this we measure and assess benefits enabled by the company.

EPIC STEP 3

The Step 3 of the EPIC methodology starts when the decision to hand in a term sheet has been made. It consists of three main processes:

1) **The ESG Clause in the term sheet**

This clause is included in the term sheet to ensure that the management team of the company commits itself to integrate a climate policy and ESG best practices within their business. The standard ESG clause of Extantia includes these terms:

"After closing, the management commits on a best effort basis to:

1. Adopting a climate policy as soon as feasible but no later than within 12 months, as defined by measuring the company's direct operational carbon footprint, setting clear actions steps to reduce it and offsetting what is not reduced.

2. Evaluating and implementing best practices of its business activities with respect to Environment, Social and Governance (ESG) aspects. This includes the company's internal practices and external impact of the business model, services/products.

Such policy and practices will be discussed with and reported to the board. The investors will support the management with the above-mentioned commitments."

The ESG clause is in line with the recommendations of Leaders For Climate Action of which Extantia is a member.

2) ESG assessment

At Extantia we developed an ESG questionnaire to assess the ESG policies of the company in place, see where it stands in terms of practices, and see what could be improved or is urgently needed. It is compliant with the Regulatory Technical Standards (RTS) of the EU Sustainable Finance Disclosure Regulation (SFDR). Here is a snapshot of the information asked in the questionnaire:

- Environmental criteria
    - Greenhouse gas emissions (policy in place to achieve net zero carbon, carbon certification, use of carbon offsetting tools, carbon footprint and reduction in GHG emissions that the company contributes to)
    - Waste generation (recycling initiative, amount of hazardous waste generated)
    - Resource consumption (amount of resources used, emissions to water ratio, presence of sites/operations near biodiversity-sensitive areas)
    - Energy consumption and production (energy efficient measures, share of non-renewable energy consumption and production)
    - Suppliers (description and location of suppliers, potential sustainability risks)
- Social criteria
    - Social policies (health and safety policy, diversity, anti-harassment, anti-discrimination policy)
    - Diversity and Inclusion (share of female employees and number of nationalities in the firm, gender pay gap)
    - Employee satisfaction (measurement and score, turnover rate)
    - Employee fulfilment (employee metrics tracked, employee benefits, training opportunities)
    - Workplace accidents (policy and number of accidents)
- Governance criteria
    - Civic engagement
    - Sustainability risk (top risks and how they are mitigated)
    - Governance policies (sustainability in remuneration, code of conduct, ABC policy, ESG KPIs at board level)
    - Management diversity (proportion of female employees in the management and supervisory board, ESOP structure)

- Data management (IT security management system and GDPR compliance)
- UNGC principles
- Corruption (key risks and mitigation)

3) ESG KPIs monitoring

A shorter version of the above-mentioned ESG questionnaire, focusing solely on the KPIs we want to monitor on an annual basis, is regularly distributed to portfolio companies. It is also compliant with the RTS of the EU SFDR regulation, covering all mandatory Regulatory Technical Standards and some optional ones.

Here are the KPIs we monitor on a regular basis:

- Environmental criteria
  - Greenhouse gas emissions (carbon footprint and reduction in GHG emissions that the company contributes to)
  - Waste generation (amount of hazardous waste generated)
  - Resource consumption (amount of resources used, emissions to water ratio, presence of sites/operations near biodiversity-sensitive areas)
  - Energy consumption and production (share of non-renewable energy consumption and production)
- Social criteria
  - Diversity and Inclusion (share of female employees and number of nationalities in the firm, gender pay gap)
  - Employee satisfaction (measurement and score, turnover rate)
  - Workplace accidents
- Governance criteria
  - Governance policies (ESG KPIs at board level)
  - Management diversity (proportion of female employees in the management and supervisory board, ESOP structure)

This is then implemented in LP reporting, and used as an internal resource for portfolio companies' monitoring, and as a support for board meetings discussions. This is not solely a passive monitoring exercise. We use this data to proactively encourage portfolio companies to identify one ESG objective to address at every board meeting, with particular attention to diversity and inclusion.

Impact Carry Calculation Method

The Impact Carry KPIs

We aim to create value for investors and portfolio companies, as well as for our society and planet ("doing well by doing good"). We achieve short-term alignment of interests by tying 30% of the Partnership's Profits that are to be allocated to the Carry Limited Partner to the achievement of sustainability goals ("Impact Hurdle"). This means that the Carry Limited Partner will receive 70% of its proceeds after the Preferred Return is met and the other 30% if and to the extent the Impact Hurdle is met.

To include the portfolio's impact in Extantia's carry allocation, we have defined Impact Carry KPIs from within the ESG sphere. Each Impact Carry KPI has a weight which reflects its relative importance in the overall performance of the Portfolio Company.
The Impact Carry KPIs and their weights are:

Number	Impact Carry KPI	ESG category	Units	Weight
1	GHG emissions reduction	Environmental	t CO_2e	70%
2	Staff turnover	Social	%	10%
3	Nationalities diversity	Social	%	5%
4	Gender diversity in the company	Social	%	5%
5	Gender diversity in the management board	Governance	%	5%
6	Gender diversity in the supervisory board	Governance	%	5%

At the time of an investment in a Portfolio Company, we define for each Impact Carry KPI a target value that will be the reference value to achieve over the lifetime of the investment. As the exact lifetime of any investment cannot be determined ex-ante, a Target Value shall be set to each of the three first years following the investment.

As the carbon reduction carries most of the weight in the set of KPIs (70%), we follow a careful approach to make sure that it (and other targets) is accurately set.

For each portfolio company, we use bottom-up data from the business plan of the company. This gives us initial estimates of sales and volumes, which we adjust downwards through in-house expert entrepreneurial judgement for a conservative approach (as a rule of thumb business plans require 2x more time and money, and thus targets for each year should be discounted by 50%). By combining conservative sales data from the company with our detailed LCA results we are able to estimate annual and total savings expected from each company in the portfolio within the lifetime of the fund. One example is shown in the following Table:

Company A: e-fuels | Savings per unit: 2 kg CO_2e/ litre of fuel				
	Year 1	**Year 2**	**Year 3**	**Total**
Sales (litres)	200,000	1M	50M	51,2M
Savings (kt CO_2e)	0.4	2	100	102.4

Following an investment in a Portfolio Company, the Target Values as defined by us are presented to the fund's supervisory board, the Limited Partner Advisory Committee (LPAC). If the LPAC feels we set the target too low or too high, they can propose we make amendments to the Target Values.

During the holding period, we may also amend the Target Values (with the approval of the LPAC), in particular, but not limited to, in case of the following two scenarios: (a) Exogenous factors: In case of significant changes in the business environment of the Portfolio Company that are beyond its control; and (b) Endogenous factors: If a Portfolio Company decides to pursue a change of strategy or business model that is required for the sustainability of the company and that requires an amendment to the Target Values (each such adjusted target value an "Adjusted Target Value").

In case of Follow-On Investments, we may propose to the LPAC adjustments to the Target Values.

In case of write-offs within the holding period, the amount invested in the relevant Portfolio Company and its emissions-reduction-potential will be removed from the total investment amount and total ERP of the portfolio.

For each Portfolio Company we will annually review the performance against the Target Value. The Company Impact Score (or "CIS") for a Portfolio Company "A" is calculated through the following formula:

$$CIS_{A_i} = \frac{KPI_{1_iR}}{KPI_{1_iP}} * w_{1_i} + \frac{KPI_{2_iR}}{KPI_{2_iP}} * w_{2_i} + \frac{KPI_{3_iR}}{KPI_{3_iP}} * w_{3_i} + \frac{KPI_{1_iR}}{KPI_{1_iP}} * w_{4_i} + \frac{KPI_{2_iR}}{KPI_{2_iP}} * w_{5_i} + \frac{KPI_{1_iR}}{KPI_{1_iP}} * w_{6_i}$$

where *i* stands for the i^{th} year from investment, *w* stands for the weight of the KPI, R stands for Realised and P for planned. Once this is done for all companies, the impact score for the portfolio can be calculated. This requires us to identify the weight of each company within the portfolio, and we will review the most common approaches used in the next section.

Portfolio Weight Methods Used In Venture Capital

Here are the most commonly used approaches to weight portfolio companies in venture capital and academic research.

Ticket-based weighting

This is a standard approach of normalising by % of investment within a portfolio. In practice it works out as follows:

Company	Ticket	"Weight" of the company
A	€2.5M	25%
B	€5M	50%
C	€2.5M	25%
Total	**€10M**	**100%**

The key element is that impact 'only' matters in defining KPIs and evaluating multiples but not in the importance the company has within the portfolio.

Emission-reduction-potential-based weighting

In this case the size of the ticket does not matter and it is only the emission reduction potential assessed in Step 2 that defines the size of the compact.

Company	From Step 2	"Weight" of the company
A	3 Gt	30%
B	2 Gt	20%
C	5 Gt	50%
Total	**10 Gt**	**100%**

In this case impact matters in defining KPIs as well as in evaluating multiples and also to determine the importance the company has within the portfolio. Bigger or smaller tickets would not be captured by this approach therefore missing out on the 'size' that a company has within the portfolio.

Ticket and emission based weighting

This approach is an average of the previous two. Basically, impact matters in defining KPIs and evaluating multiples and also partly to determine the importance the company has within the portfolio.

Weighting based on Carbon Reduction on Carbon Invested (CROI)

CROI is a new metric that is being discussed in academic circles, simply captured through the following formula:

$$CROI = \frac{GHG_{NS}\,[kgCO_{2e}]}{GHG_{EC}\,[kgCO_{2e}]}$$

where EC is the embodied carbon to enable a technology/product to exist and NS refers to the savings the product/technologies enables. A CROI higher than 1 means a positive impact on global emissions, a CROI lower than one instead indicates that a company has cost more to the environment than the benefit it has produced.

CROI could be calculated for each company annually and at the end of the fund, and then averaged across the portfolio. The problem with CROI is that, while it accurately captures emissions for a company, it creates problems at portfolio level since it is a dimensionless number. A paradoxical example where a single company that performs decently can mask the poor performance across the whole portfolio is shown below.

Company	Savings	Embodied carbon	Net carbon performance	CROI
A	10 Mt	1 Mt	- 9 Mt ✅	10
B	0.2 Mt	1 Mt	0.8 Mt ❌	0.2
C	0.1 Mt	50 Mt	9.9 Mt ❌	0.001

Portfolio	**10.3 Mt**	**52 Mt**	**41.7 Mt ❌**	**3.4 >> 1 ✅**

In the case above only Company A has actually produced a climate benefit. Company B and C didn't "repay" their embodied carbon in time and at the end of the fund they have caused more harm than good (they might still do good in the future but this would not be captured within the lifetime of the fund). However, since we average the CROI across the portfolio the resulting CROI is higher than 1. Therefore while CROI at company level is an accurate measure of performance it can mask things at portfolio level.

Portfolio Weights And Impact Carry At Extantia

While the norm used by other funds is to weigh a company based on the size of the ticket compared to the overall portfolio value, we felt this entirely money-focused approach would not serve well the climate-first focus of Extantia. Out of the approaches shown above we chose to assign equal weighting to the size of the tickets as well as the Gigacorn potential calculated in Step 2. Therefore, the weight of each company in the portfolio shall be the average of i) the amount invested in the company divided by the total amount invested in the portfolio, and ii) the emissions-reduction-potential ("ERP") of the company divided by the total ERP of the portfolio:

$$w_A = \frac{1}{2} \bullet \left(\frac{€_A}{€_n} + \frac{ERP_A}{ERP_n} \right)$$

An example of how this pans out in a portfolio is shown in the table below:

Company	**Ticket**	**Gigacorn potential**	**"Weight" of the company**
A	€2.5M (25%)	3 Gt (30%)	28% (0.28)
B	€5M (50%)	2 Gt (20%)	35% (0.35)
C	€2.5M (25%)	5 Gt (50%)	37% (0.37)
Total	**€10M**	**10 Gt**	**100%**

With weights known, it is possible to calculate the impact score for the whole portfolio. The Portfolio Impact Score (or "PIS") shall be the sum of all of the CISs each multiplied by the weight of the company in the portfolio.

$$PIS_i = \sum_{j=1}^{n} CIS_{A_i} \bullet w_A$$

where *i* refers always to the i^{th} year from investment, *j* is an index to iterate through all companies in the portfolio, CIS_{Ai} is the Impact Score for the Company A in the i^{th} year, and w_A is the weight the company has within the portfolio.

Finally, the Impact Carry to be distributed to the Carry Limited Partner shall be:

$$Impact\ Carry\ = 30\% \bullet Impact\ Carry\ Multiple$$

Where the Impact Carry Multiple shall be (i) 1 if the PIS_F is larger than 0.8; (ii) 0 if the PIS_F is smaller than 0.6; and $\frac{PISF-0.6}{0.2}$ if the PIS_F is larger than 0.6 but smaller than 0.8.

$$Impact\ Carry\ Multiple = \begin{cases} 1, & PIS_F > 0.8 \\ \dfrac{PIS_F - 0.6}{0.2}, & 0.6 < PIS_F < 0.8 \\ 0, & PIS_F < 0.6 \end{cases}$$

A simplified overview of the calculations can be found in Figure 9:

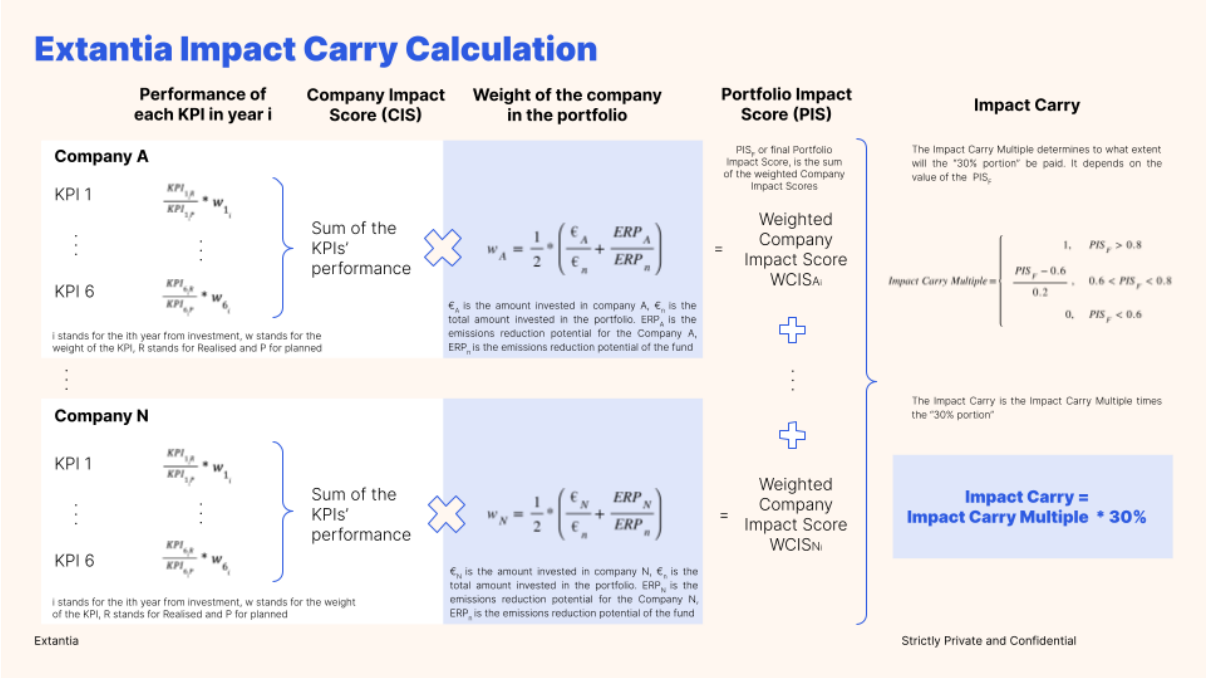


Figure 9: Extantia Impact Carry calculation

An example calculation can also be found in Appendix C.

Deep Dive In Our Carbon Math

In the following section, you can find more information on the calculations we use to estimate the carbon savings of the companies we invest in, and what tools it is based on.

Existing Tools Used In EPIC

Life Cycle Assessment

The undisputed global landmark for environmental impact analysis is Life Cycle Assessment (LCA). LCA is the "compilation and evaluation of the inputs and outputs and the potential environmental impacts of a product system throughout its life cycle" (ISO, 2006a; b). In other words, an LCA quantifies the environmental impacts and resource use throughout a product's lifecycle, from raw material acquisition, to production, use and waste.

Nowadays, in conducting an LCA, ISO standards 14040/44 are key starting points. The methodological frameworks of ISO standards consist of four phases:

1) Goal and scope definition
2) Life cycle inventory (LCI) analysis
3) Life cycle impact assessment (LCIA)
4) Interpretation

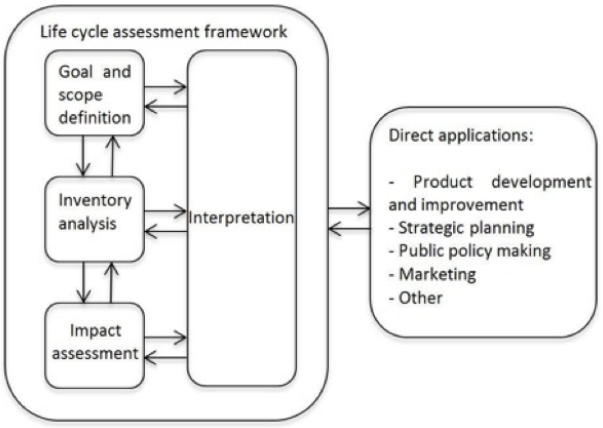


Figure 10: Life cycle methodological framework (source: ISO 2006a)

These are described in more details below:

1) Goal and scope definition

The first phase deals with defining the goal and scope of the study. An important step is to define the functional unit (FU), e.g. CO_2 emissions, to

ensure comparability. Another step is to define the intended depth of the assessment and the limits of the analysis. In this first stage, questions and/or hypotheses are formulated. Extantia uses the attributional LCA (ALCA) approach, that aims to estimate what share of the global environmental burdens belongs to a product (Finnveden et al., 2009). This approach is recommended by current standards when assessing the GHG emissions of goods and services (BSI, 2011).

2) Life cycle inventory (LCI) analysis

The LCI phase represents the inventory of the input/output data of the system being studied and it involves the collection of the necessary data to perform the LCA. Extantia uses process-based analysis for collecting data, as it is more tailored to industrial processes and the buildings sector. It is indeed the one suggested by European and International Standards specifically developed for the construction sector (Moncaster and Song, 2012).
Examples of inputs and outputs in the Life cycle inventory are, for example, raw materials or resources, different types of energy, water, land, or air emissions. This data is collected through data collection sheets that gather quantitative data on a company level, process, and product level.

3) Life Cycle Impact Assessment (LCIA)

The LCIA phase serves the purpose of evaluating the significance of potential environmental impacts using the results from the LCI stage. Here is a graph summarizing the process:

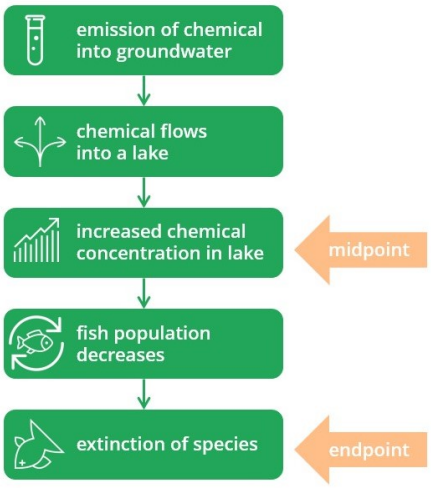


Figure 11: Impact assessment indicators (source: PRÉ Sustainability)

Endpoints are used to assess damage-oriented categories such as human health, and ecotoxicity (or forest and vegetation in Figure 2). Endpoints are

results from different impact categories that are then brought together to contribute to a final, single, cumulative score (known as the 'endpoint') for the product under examination. A widely used example of such an approach is the Eco-Indicator 99 (EI99) which groups damage categories into three areas of protection: human health, ecosystem quality, and natural resources (PRé-Consultants, 2000). They are useful to describe different damages, but if on the one hand results are easier to communicate the conclusions of a study, on the other they are less transparent and hard to compare (Eldh and Johansson, 2006; Blengini and Di Carlo, 2010; Buyle et al., 2013).

Midpoint methods look instead at themes such as climate change in terms of global warming potential, for instance, and are generally believed to yield a more exhaustive picture of ecological impacts (Buyle et al., 2013). Results from midpoint indicators are expressed by numbers along with their units (e.g. kgCO2e, kgPM10eq).

That is why Extantia uses the midpoint method for its own Life Cycle Assessments.

4) Interpretation

Finally, in the fourth phase, findings from LCI and LCIA are considered together in order to deliver results coherent with the goal and scope stated. Eventually, this phase should lead to defining the conclusions of the study, explaining its limitations, and providing recommendations (ISO, 2006a; b).
At Extantia, this interpretation is done in terms of annual current and expected future carbon savings of the solution, or "decarbonisation impact".

It should also be noted that prospective LCA (Villares et al., 2017; Cucarachi et al., 2018), while assessing potential environmental impacts from new technologies even still at the R&D stage, is particularly relevant for venture capital.
There has been a vibrant academic debate on how a prospective LCA could and should be performed with premier examples being LiSET (2018), ETEA (2019), the market and technological maturity approach (Bergerson 2019). Furthermore, due to the early nature of this new LCA branch, there is a lack of an agreed methodological approach for prospective LCA applications in practice (e.g. we have the methods of Giesen et al., 2020; Van der Hulst et al., 2020; Thonemann et al, 2020; Cooper and Gutwoski, 2020, etc). In addition to the lack of a widely agreed upon method, another key issue is that the background future scenarios, central to prospective LCA, only exist partially for the energy and some metal sectors. Therefore even if a method existed, there

would currently be no sufficient data for real-life applications of prospective LCA.
Therefore, Extantia has decided to base the EPIC methodology on the Life Cycle Assessment approach.

GHG Protocol

Within the business world, the GHG protocol is the most prominent global standard on GHG accounting and reporting. In terms of coverage, the GHG protocol addresses the same six GHGs included in the Kyoto Protocol, namely CO2, CH4, N2O, HFC, PFCs, SF6. The Protocol is founded on five key principles (relevance, completeness, consistency, transparency, and accuracy) and five objectives:

1. Help companies prepare GHG inventories that represent true and fair account of their emissions through standardised approaches and principles
2. Simplify and reduce the cost of compiling a GHG inventory
3. Provide businesses with info useful to manage and reduce GHG emissions
4. Provide info that facilitates participation in mandatory/voluntary GHG programmes
5. Increase consistency and transparency in GHG accounting and reporting

The standard does acknowledge the complexity of the global economy and the diversity of industries and sectors. For this reason a number of cross-sector and sector-specific calculation tools are provided to complement the standard. These tools are consistent with IPCC science and are still considered 'best practice' in the space of accounting and reporting. They offer step-by-step guidance and electronic worksheets to facilitate the calculations.

The standard follows an approach that has existed since life cycle assessment (LCA) was first conceived, i.e. that of system boundary that defines what is included in an assessment and what remains out of it. The GHG Protocol too requires a "chosen inventory boundary" but mandates to "disclose and justify any specific exclusion".

These key points, overall, aim for the removal of systematic under and/or overestimation of the emissions linked to activities, and to reduce uncertainties as far as practically possible. Therefore companies should still make their best effort for completeness and accuracy. When this is not possible, every exclusion and limitation should be transparently documented.

A company needs to identify emissions associated with its operations, categorising them as direct/indirect, and choosing the scope of accounting and reporting for indirect emissions.

- Direct (or Scope 1) emissions are those that occur from sources that are owned or controlled by the company. Examples of Scope 1 emissions are:
    - Generation of electricity or steam such as boilers
    - Physical or chemical processing as in waste processing
    - Fugitive emissions from intentional or unintentional releases and leaks
- Indirect (or Scope 2 and Scope 3) emissions are those that are a consequence of the activity of the company but that occur at sources owned or controlled by other companies. An example of Scope 2 emissions are GHG emissions from the generation of purchased electricity used by the company
- Scope 3 is an optional/voluntary reporting category, also in terms of what gets included in Scope 3. Examples of Scope 3 emissions are:
    - Extraction and production of materials and fuels
    - Transport-related activities
    - Disposal of waste

Extantia calculates carbon emissions of portfolio companies in a GHG compliant way. GHG emissions allow for a better comparability, are compliant with the Regulatory Technical Standards of the European Union Regulation "Sustainable Finance Disclosure Regulation (SFDR)".

The Carbon Reduction Assessment: New Enterprises (CRANE)

The CRANE (Carbon Reduction Assessment: New Enterprises) tool helps assess the emissions reduction potential of climate technologies. In 2019 a number of stakeholders, led by Prime, NYSERDA, the MIT Energy Initiative, and Rho AI, realised existing climate impact assessment tools in the market were designed solely to retrospectively assess the climate impact of a business as it exists today. There was therefore a gap in the marketplace for tools to inform investors about the potential for their investments to mitigate future emissions, which is the aim of CRANE. In December 2017 Prime and NYSERDA developed a methodology for climate impact assessment for early-stage ventures upon which calculations are based.

CRANE conceives three methods for impact assessment:

1. Affiliation-based: in this case investors look at organisations that explicitly define impact hurdles in their investment criteria (e.g. BEV's 500 Mt GHG emissions mitigation potential). Investors who decide with the affiliation-based method essentially outsource the impact assessment potentials to those other organisations.
2. Technology-based: this method relies on scholarly evidence that PRIME has used to develop a list of promising technologies (Figure 12a). This method is rooted in the understanding that solving the climate crisis will require a broad portfolio of solutions across a wide variety of sub-sectors and those lists aim to help investors diversify in different climate solutions.
3. Company submission-based: this method relies on companies interested in inbound investment that need to therefore submit their own impact assessment. Companies exceeding a desired impact threshold can then be considered for further due diligence.

Electricity and Heat Production	Agriculture and Other Land Use	Buildings	Transportation	Industry
Greater than 30% efficient, less than $0.10 per Watt solar PV	Zero-GHG fertilizer production	Improved dehumidification, latent, & sensible cooling HVAC technologies	Lightweight structural components with high throughput manufacturing capabilities	Industrial process integrated CCS
High capacity factor, low-cost wind	Non-meat-based meat-protein substitutes	Low cost cold weather heat pumps	Non-food-based biofuels	Low-GHG steel and aluminum production
Low- or zero-GHG flexible "baseload" power plants	Advanced grassland, cropland, and forest management solutions	Autonomous, efficient building management	High efficiency, low cost electricity-to-fuel pathways	Low-GHG cement production
Flexible, fail-safe nuclear energy technologies	High efficiency vertical farming solutions	Ultra-low cost, efficient building envelope materials	Electric- or hydrogen-fueled aircraft	Non-fossil-based pathways to today's petrochemicals
Low cost seasonal energy storage	Fail-safe geoengineering solutions	Non-vapor compression (VC) cycle refrigeration	Next-generation battery solutions	Low grade waste heat capture solutions
Cost effective, low-parasitic load carbon capture and storage (CCS)		Low cost, long duration thermal energy storage	Multi-purpose, high-performance biomass feedstocks	High efficiency industrial separations
Non-wires-based electricity transmission			High efficiency hydrogen production pathways	High fidelity, broad input recycling solutions
Scalable bioenergy-based CCS			High efficiency, low cost gas storage and transport	
Low cost hydrogen storage and delivery			Next generation non-vehicle-based transportation solutions	
Nuclear fusion				
Next-generation transformers & network infrastructure				

Figure 12a: Down selection method 2 – Technology-based down selection; Example 1 - PRIME Coalition's Breakthrough Technology (source: PRIME – NYSERDA Methodology for Climate Impact Assessment)

Figure 12b: Down selection method 2 – Technology-based down selection; Example 2 – "Technical Quests" Identified by Breakthrough

CRANE's methodology aims to establish an Emission Reduction Potential (ERP), which as clearly stated is not a forecast but an estimate of the GHG mitigation of an early-stage venture. It is a rigorous and robust approach, mostly science-based, but quite laborious and time consuming which relies on 5 steps:

1. Estimate the emissions of the product being displaced (e.g. EVs displace ICEs). It is suggested this is done through LCA and emission factors databases.
2. Estimate the parameters associated with additionality. Additionality is a crucial element in the current climate crisis and requires proof that a new climate product entering the market will generate an emission reduction that would not have occurred unless that new product existed. An example that violates the additionality principle is the case of a country already having set in law a phase-out of ICEs by e.g. 2035. A new EV player entering the market of that country could not claim the benefit of avoiding emissions from ICEs since these would occur anyway because enshrined in law regardless of whether the new player enters the market and is successful in its venture. The additionality principle aims to mitigate and hopefully avoid double and triple counting of GHG emissions reduction.
3. Estimate the significance of embodied emissions of the venture's product. This is the first moment in which the CRANE methodology diverges from science. As seen in previous sections, a proper LCA covers the impacts from cradle to grave of a product. CRANE instead suggests looking at the significance of embodied emissions of the venture's product and comparing them against the emissions of the product displaced. Ironically this 'principle of magnitude' allows one to wholly

neglect embodied emissions (which already suffer from severe and recurrent underestimation) without even having accounted them in full in the first place (i.e. chronologically in CRANE the decision to account for embodied emissions of a venture's product happens before calculating them, cf. p. 22).

4. Estimate potential product deployment. This is a future estimate and as such intrinsically fraught with uncertainty. CRANE suggests to use standardised and empirically demonstrated models of technology diffusion to create estimates of potential product deployment. To this end, it offers an interesting and very valuable historic overview of how many products and technologies have nearly always followed an S-curve (Figure 13). While an S-curve path is almost certain, an S can manifest in many different ways and the underlying curve is mathematically controlled by three key parameters that therefore require further estimates and incur even more uncertainty. In addition to the uncertainty around market penetration there is also the uncertainty on market growth which introduces yet another necessary estimate and source of uncertainty. For this CRANE suggests using globally-leading and established sources (e.g. the IEA Energy Technology Perspectives). To mitigate this additional uncertainty CRANE suggests using a three-point estimate for market growth (i.e. conservative, baseline, and aggressive forecast).

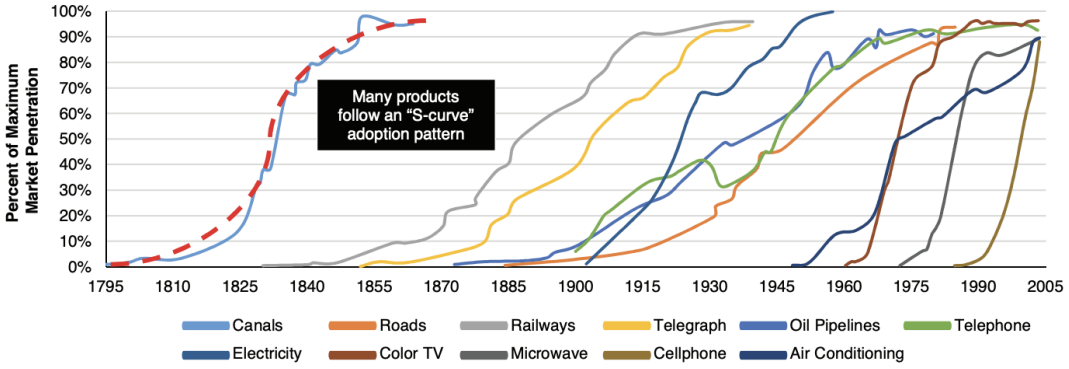


Figure 13: Evidence of how many products and technologies have historically followed an S-curve in terms of market penetration

5. The fifth and last step consists in putting it all together to estimate the Emission Reduction Potential (ERP). An overview of how this gets calculated and what it yields is shown in Figure 13.

$$\begin{aligned}&\textit{Emissions Reduction Potential}\\&= (\textit{Total system emissions in scenario without the new venture's product}\\&- \textit{total system emissions in scenario with the new venture's product})\\&= \sum_{y=1}^{30}\Big[\Big(\frac{\textit{Emissions of Displaced Product in year } y}{\textit{Unit of Product Sold}} - \frac{\textit{Emissions of Product in year } y}{\textit{Unit of Product Sold}}\Big)\\&* (\textit{Penetration of Product in year } y) * (\textit{Market Size of Product in year } y)\Big]\end{aligned}$$

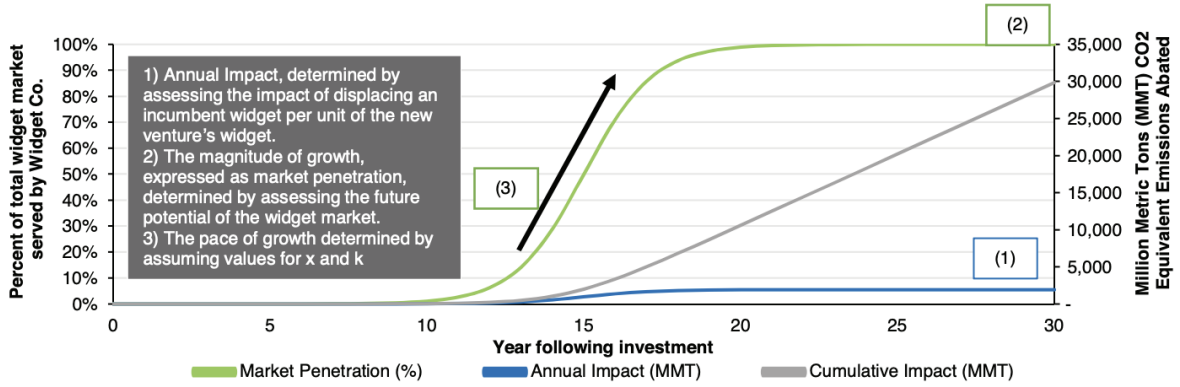


Figure 14: CRANE's overall methodology for estimating the Emission Reduction Potential (ERP) of early-ventures

Each of the steps above involves sub-steps that require assumptions, data gathering and further estimates. The ERP thus calculated would then offer the number that an investor should use to decide whether or not the company falls within the desired climate impact.

Data Sources

The data sources used are an absolutely crucial part of the accuracy and reliability of any quantitative assessment. We live in a moment in history where data is abundant but is not yet always captured in useful and transparent ways. Therefore, out of the multitude of numbers and datasets 'out there' it would be best to use those that have been developed with scientific credibility and subjected to peer-review or at least produced through internationally agreed methodologies. The main examples of those fitting these requirements are presented in this section.

EXIOBASE is a globally leading and detailed Multi-Regional Environmentally Extended (MR-EE) database. It distinguishes between Supply-Use Tables (SUT) and Input-Output Tables (IOT). It was developed by harmonising and detailing supply-use tables for a large number of countries and estimating emissions and resource extractions by industry. The MR-IOT then can be used for the analysis of the environmental impacts associated with the final consumption of product groups.

Similar to EXIOBASE, **Eora** is a global supply chain database that consists of a multi-region input-output table (MRIO) model that provides a time series of high-resolution IO tables with matching environmental and social satellite accounts for 190 countries. Eora is being continuously updated and it has been used at Deloitte, KPMG, Ernst & Young, McKinsey Global Institute, Amazon.com, the European Commission, the IMF, the World Bank, and the UN, and downloaded at over 800 universities.

Differently from the previous two, **ecoinvent** is a not-for-profit association based in Zurich, Switzerland, dedicated to the availability of high-quality data for sustainability assessments worldwide. The ecoinvent database currently contains more than 18'000 reliable life cycle inventory datasets and is updated annually to include new and updated data, as well as technical improvements.

In addition to these three main sources there are also **Environmental Product Declarations (EPDs)** that are produced according to international standards, For instance the international EPD system operates in accordance with the ISO 14025, TS/14027, 14040.

In addition to EPDs there are **Product Environmental Footprints (PEFs)** which might be playing a leading role soon as they are strongly supported and fuelled by the EU. PEF is a methodology that quantifies all environmental impacts over the life cycle of a product and would be supplemented with product category-specific rules.

Last but not least, perhaps the most important source for the evaluation of emerging technologies and innovative ideas might come from the scientific literature. All data sources mentioned above report historic data, some even data from a few years ago. Startups operating in the climate tech space are likely to be using innovative products, materials and/or technologies for which no historic data exists. However, they might have been explored at lab or pilot scale in Universities and as such led to academic publications, which therefore often represent a great resource for understanding in detail such new technologies, materials and products.

Measuring Deep Decarbonisation Impact With EPIC

This section introduces the methodological approach developed by Extantia to assess deep decarbonisation impact reliably, transparently, and in a replicable manner.

We focus on identifying two types of potential Gigacorns, whereby annual carbon savings are either (1): generated through direct technology impact (e.g. direct air capture technology, clean hydrogen & fuels) or (2) made possible indirectly through enabling infrastructure (e.g EV battery upcycling, geospatial & climate analytics, carbon accounting & action software) by the company. To do so, we rely on a standard S-curve (sigmoid function) as per Eq. (1):

$$S(t) = m + (M - m) \cdot \left\{ \frac{1}{\left[1 + e^{(-k \cdot (t - \bar{t}))}\right]^a} \right\} \qquad (1)$$

,where:

- m is the minimum market share at the time of investment t_0, which we assume to be zero;
- M is the maximum market share at scale which we assume to be 20% of TAM;
- t are the time buckets, in our case from year of investment (t_0) to 2050;
- $(\bar{t})$ is the average of time buckets (10 in our case);
- k>0, is a parameter that controls the curve: the higher the value the later the fast growth begins and the steeper it is (k=0.85 in our standard case);
- a>0, is a parameter that controls the curve: the lower the value the sooner the growth begins and the slower it is (a=0.7 in our standard case).

We assume for each company to be able to obtain a 20% of the market share at scale but we define an individual growth curve (S-curve) for each of the companies. The S-curve is tailored to the company's development stage, their technology readiness level (TRL), whether or not it already has paying customers, etc. This morphs the S-curve to reflect rapid vs. slower growth as well as short-term vs. long-term market uptake. Three exemplary S-curves are shown in the image below.

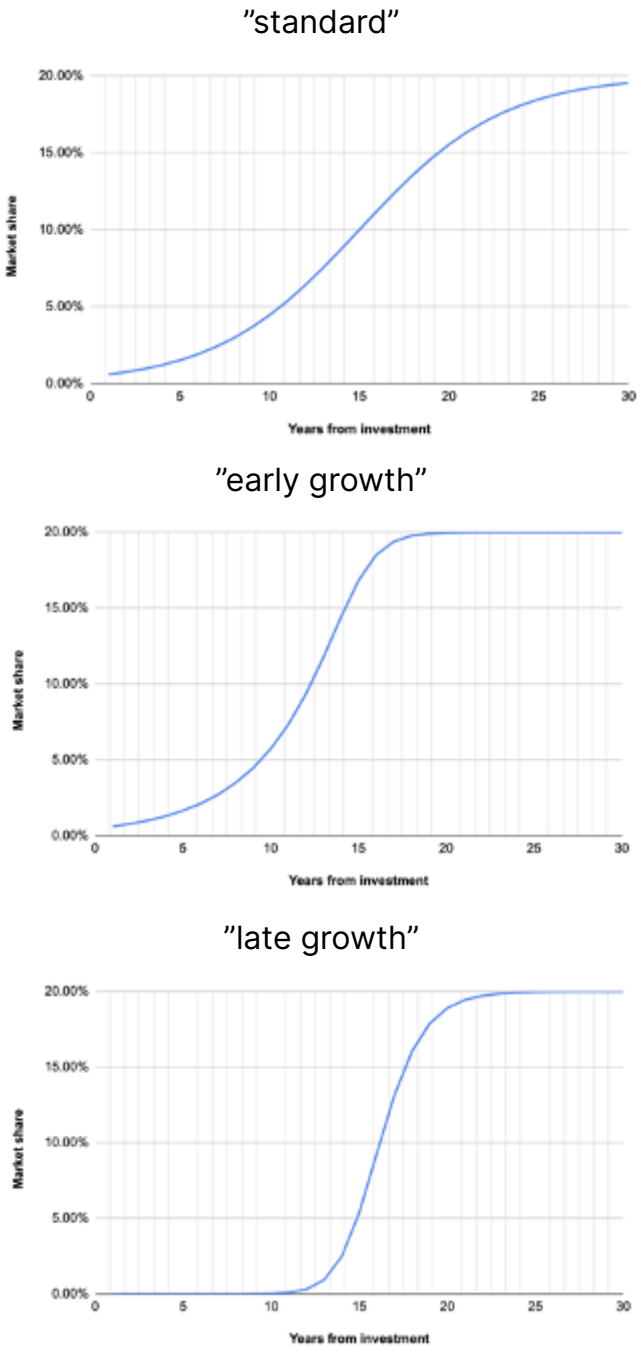


Figure 15: Example of sigmoid functions used in Step 2

The S-curve is then combined with LCA data to project the savings. Given the highly innovative nature of companies we deal with, oftentimes the scientific LCA literature is scant.

When this happens, we carry out in-house a simplified LCA to avoid over reliance on data that are poorly representative. Depending on the product/technology being assessed we either adopt the

internationally-regulated LCA methodology (ISO 14000 series Standards) or the environmentally-extended multi-regional input-output (EEMRIO) analysis, a Nobel-prize winning approach to link economic activity and environmental repercussions. In either case, we enrich our approach with both scenario and uncertainty analysis. The former ensures we are prepared for how different futures might manifest (e.g. shares of geothermal energy capacity installed globally by 2050), while the latter allows us to factor in the inherent uncertainty in input data that determines our carbon savings results (e.g. carbon intensity of geothermal energy).

Appendix A: Other Valuable Sources To The Climate Tech Space

Here is an overview of some emissions reduction potential estimates or impact assessments from the Climate Tech space.

The **Theory of Change (ToC)** is a structured approach to promote social change based on planning, participation and evaluation. It originated in the management field at the end of the previous century. A key feature is that it looks beyond mere goals and objectives to further include impact (i.e. the forecast effect of achieving the stated goals). For this reason it is particularly suited to impact assessment from a social transition and management, monitoring and implementation perspectives – particularly to ease companies into this space if they had not been in it before. In its conception it is centred on three quality control criteria:

a) Plausibility: does the pathway to impact follow logic and make sense? Are outcomes in the right order?
b) Feasibility: can an initiative realistically achieve its long-term impact? Are resources and timeline adequate?
c) Testability: are the impact indicators solid and measurable? Will they hold sufficient information to judge success and failure? Are they accepted by the relevant audiences?

Within impact investment, IRIS+ and the GIIN have capitalised on ToC and produced a dedicated guidance[1]. It offers an easy to implement ToC checklist to get companies started and spur conversation around the if-then scenarios linked to potential future impacts.

When it comes to impact reporting, **Future Positive Capital (FPC)** seems to have stricken a nice balance between depth and breadth. It provides generalist information but sufficiently corroborated by numbers to offer a 'scientific' perspective. Each company in the portfolio has a dedicated zoom-in section in the report, and key impact metrics are shared. Interestingly, not all companies are measured against masses of CO_2 mitigated or removed but all are evaluated in terms of both Paris alignment and SDGs alignment.

Still within the climate tech start-up space, the **Simple Emission Reduction Calculator (SERC) by Clean Energy Ventures**, which acts very much as SERC's own entry barrier for investment-seeking start-ups. The calculator is simple to complete with information most founders already have according to CEV. SERC offers a simple test that, if passed, triggers aggressive modelling and testing of

[1] IRIS, 2019. Theory of Change (OD6350). v5.0.

assumptions during a detailed due diligence process. CEV mandates that its investments "must demonstrate the potential to mitigate multiple gigatons of CO2e between initial investment and 2050". While SERC's calculation methodology is not fully disclosed it does seem to rely on principles similar to CRANE (e.g. market at scale and penetration timespan). Mock calculations attempted on the calculator seem to suggest a linear scaling but also a rather generous estimate of emission savings. For example, a simple energy efficiency conversion (e. 12,000 kWh saved per year) with 1,000,000 homes covered at scale per annum resulted in an emission reduction potential of 2.2 Gt CO2e between 2021 – 2050. Even as a cumulated value over nearly three decades the estimate does seem excessive.

The annual impact report from **SET Ventures** helps understand the range of impacts that funds are currently achieving. E.g. in 2020 impact reported is:

- 8.8 kt (direct savings)
- 211 kt (indirect savings)
- 310 green jobs in the active portfolio
- 11.7 GWh of direct energy savings (linked to pt. 1)

In addition to the above, a recent valuable resource for the climate tech space is the **Levelized Cost of Carbon Abatement (LCCA)** developed by Columbia University. LCCA offers an improved methodology for comparing technologies and policies based on the cost of carbon abatement. In essence, it measures how much CO_2 can be reduced by a specific investment or policy, taking into account relevant factors related to geography and specific asset. It calculates how much an investment or policy costs on the basis of dollars per ton of emissions reduced. Previous marginal or levelized cost methodologies that assess carbon reduction options often failed to consider the specific contexts that determine the real, all-in costs of a policy and the real, all-in impacts on emissions. These costs and impacts can vary depending on the contexts and details of geography, existing infrastructure, timing, and other factors. LCCA attempts to improve understanding of the real climate costs and benefits by including specific and local CO_2 reductions in all estimations and consistently applying standard financial metrics that more accurately represent and compare costs.

The **Oxford Offsetting Principles** published by the Smith School at the University of Oxford is a useful resource for those companies in the climate tech space that might be entering the carbon offsets markets (e.g. DAC, biochar, etc.) to ensure that a company's potential for revenue from offsets is

evaluated against best practises and guidelines to achieve a zero carbon society.

Lastly, there is a quickly growing set of tools for streamlined and seamless carbon accounting in the form of SaaS. Key examples are Greenly[2], xtonnes™[3] and the Plan A TÜV-verified Corporate Carbon Footprint (CCF) calculation methodology[4]. These are all methodological declinations of the GHG protocol (i.e. covering Scope 1, 2 and 3 emissions) and differ in the underlying assumptions, data or databases used, user interface, features and functionalities, streamlined (ESG) reporting, alignment to net-zero, identification of hotspots and provision of mitigation pathways and opportunities.

[2] https://en.greenly.earth/
[3] https://xtonnes.com/
[4] https://plana.earth/academy/plan-a-tuv-rheinland-certified/

Appendix B: Other Methodologies For GHG Reduction Measurements, Accounting, And Reporting

The Global Reporting Initiative (GRI)

The Global Reporting Initiative (GRI) is an independent, international organisation headquartered in Amsterdam that helps businesses and other organisations take responsibility for their impacts through the provision of a common language to communicate them. The GRI Standards are claimed to be the world's most widely used standards for sustainability reporting.

There are three universal standards (Foundation, General Disclosures, and Management Approach) and three topic-specific standards each covering Economic, Environmental, and Social impacts. Each GRI standard has a similar structure with clear sections distinguishing between (i) reporting requirements, (ii) recommendations, and (iii) guidance. Requirements are mandatory; recommendations cover a particular course of action that is encouraged; and guidance include background information.

Within the scope of this report, and given Extantia Capital's focus on Gigacorns, the appropriate topic-specific standard is the GRI300 (Environmental) and within this the GRI305 (Emissions). GRI305 addresses emissions to air, intended as the discharges of substances from a source into the atmosphere. Types of emissions covered are GHG emissions (the same GHGs included in the Kyoto Protocol), ozone-depleting substances (i.e. those responsible for depleting the ozone layer that filters out the sun's biologically harmful ultraviolet radiation UV-B), and nitrogen and sulphur oxides (pollutants that have adverse effects on climate, ecosystems, air quality, habitats, agriculture, and human and animal health). The reporting requirement for GHG emissions in the GRI305 follows the requirements of the GHG Protocol Corporate Standard and the GHG Protocol Corporate Value Chain (Scope 3) standard – presented and discussed in the previous section. The GRI305 also follows a nearly identical terminology to distinguish between the three scopes, specifically:

1. Direct (Scope 1) GHG emissions
2. Energy indirect (Scope 2) GHG emissions
3. Other indirect (Scope 3) GHG emissions

Alongside the GRI305, two of the other universal standards on General Disclosure (GRI102) and Management Approach (GRI103) shall also be used. GRI102 is used to report contextual information about an organisation and its reporting practises. GRI103 is instead used to report how an organisation manages its material topics with a focus on two key points:

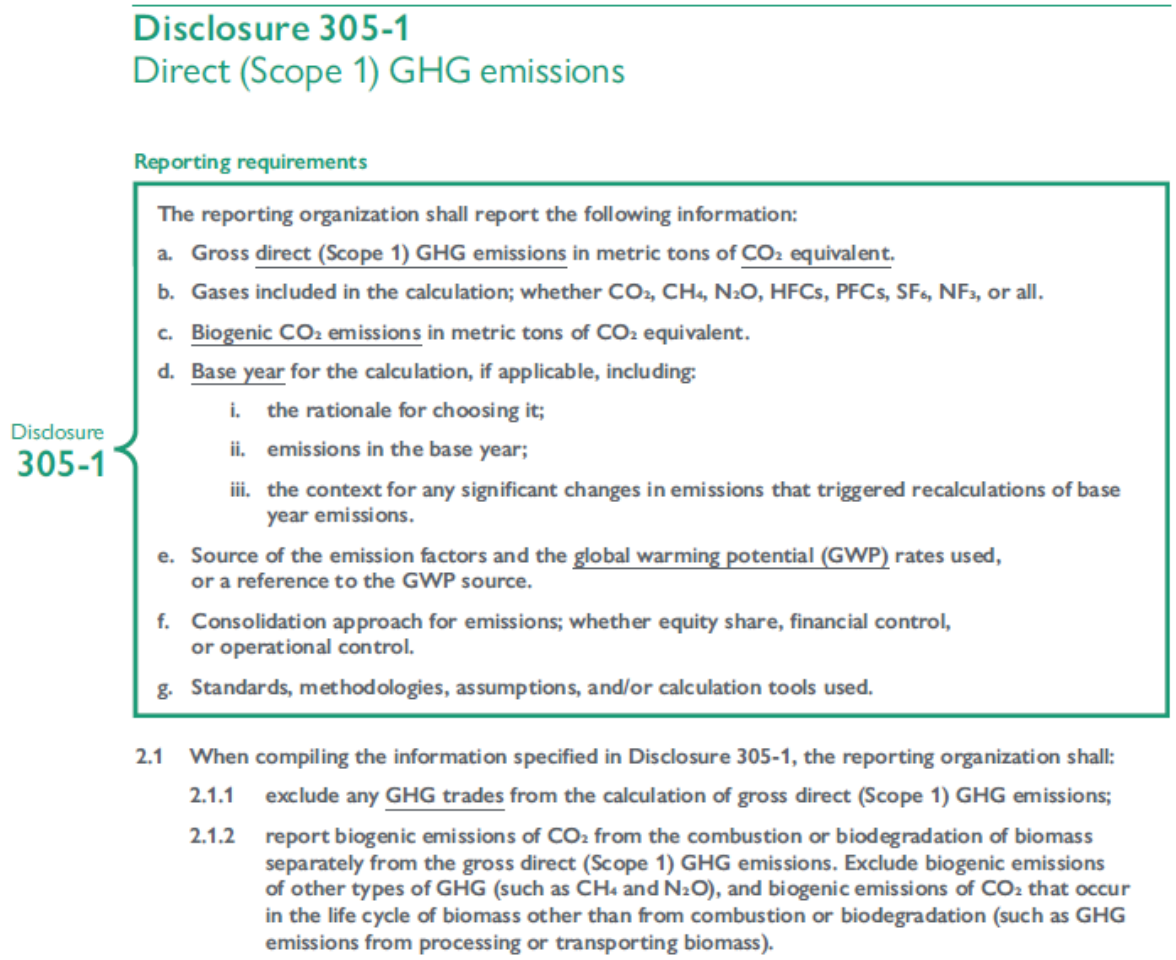
- Why the topic (e.g. emissions) is material, and
- Where the impacts occur

GRI states that the GRI305 (Emissions) can be used by an organisation of any size, type, sector or geographic location and therefore it makes it interesting for the venture capital domain. Further, there are two options for preparing a report (Core or Comprehensive) depending on the extent of disclosure included in the report. This dual-level also seems to support the initial stages of a start-up funded by venture capital.

Compliance with GRI305, requires reporting in 7 sub-sections. Specifically:

- Disclosure 305-1: Direct (Scope 1) GHG Emissions
- Disclosure 305-2: Energy indirect (Scope 2) GHG Emissions
- Disclosure 305-3: Other indirect (Scope 3) GHG Emissions
- Disclosure 305-4: GHG Emissions intensity
- Disclosure 305-5: Reduction of GHG emissions
- Disclosure 305-6: Emissions of ozone-depleting substances (ODS)
- Disclosure 305-7: Nitrogen oxides (NOx), sulphur oxides (SOx), and other significant air emissions

The GRI305 standard, while nearly wholly reliant on the GHG Protocol, is much leaner in its structure, documentation and implementation and also offers clear and concise instructions for compliant mandatory reporting. An example of the reporting requirements needed for Disclosure 305-1 are shown in Figure 15.



Disclosure 305-1
Direct (Scope 1) GHG emissions

Reporting requirements

Disclosure 305-1

The reporting organization shall report the following information:

a. Gross direct (Scope 1) GHG emissions in metric tons of CO_2 equivalent.

b. Gases included in the calculation; whether CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3, or all.

c. Biogenic CO_2 emissions in metric tons of CO_2 equivalent.

d. Base year for the calculation, if applicable, including:

   i. the rationale for choosing it;

   ii. emissions in the base year;

   iii. the context for any significant changes in emissions that triggered recalculations of base year emissions.

e. Source of the emission factors and the global warming potential (GWP) rates used, or a reference to the GWP source.

f. Consolidation approach for emissions; whether equity share, financial control, or operational control.

g. Standards, methodologies, assumptions, and/or calculation tools used.

2.1 When compiling the information specified in Disclosure 305-1, the reporting organization shall:

2.1.1 exclude any GHG trades from the calculation of gross direct (Scope 1) GHG emissions;

2.1.2 report biogenic emissions of CO_2 from the combustion or biodegradation of biomass separately from the gross direct (Scope 1) GHG emissions. Exclude biogenic emissions of other types of GHG (such as CH_4 and N_2O), and biogenic emissions of CO_2 that occur in the life cycle of biomass other than from combustion or biodegradation (such as GHG emissions from processing or transporting biomass).

Figure 16: example of instruction to comply with mandatory reporting requirements in one of the subsections of GRI305

While some of the elements of the GRI Standards make it interesting for VC-funded start-ups there still are conflicting requirements between compliance to the standards and the reality of an early stage start-ups. The main ones are:

- Lack of historic data on emissions to demonstrate reduction
- Not having scaled up yet which makes it impossible to know GHG emissions at scale
- Impossibility of setting a baseline year for calculation
- Impossibility of normalising impacts to units (e.g. products sold) if commercial activity of the start-up has not begun

While some of these issues could be resolved with modelling, scenarios and projections doing so would be highly laborious and also invalidate compliance with the standards.

The Science Based Targets initiative (SBTi)

The Science Based Targets initiative (SBTi) is a partnership between the Carbon Disclosure Project (CDP), the United Nations Global Compact, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). SBTi aims to drive ambitious climate action in the private sector by enabling companies to set science-based emissions reduction targets.

Similarly to the GRI it also fully adopts the scopes of the GHG protocol, and, depending on the industry sector of the company, targets are different for Scopes 1 and 2 (direct GHG emissions) and Scope 3 (indirect GHG emissions). In addition, a company can choose what temperature alignment it aims for. The 2°C is no longer accepted as of October 2019 and the two remaining alignments are:

- Well below 2°C: approx. 66% chance of limiting peak warming between present and 2100 to below 2°C
- 1.5°C: approx. 50% chance of limiting peak warming between present and 2100 to below 1.5°C

In addition to the choice of temperature alignment, a company must also choose what type of Scope 1 and 2 targets it wishes to set, and whether Scope 3 targets are required. An overview of the whole process is shown in Figure 16.

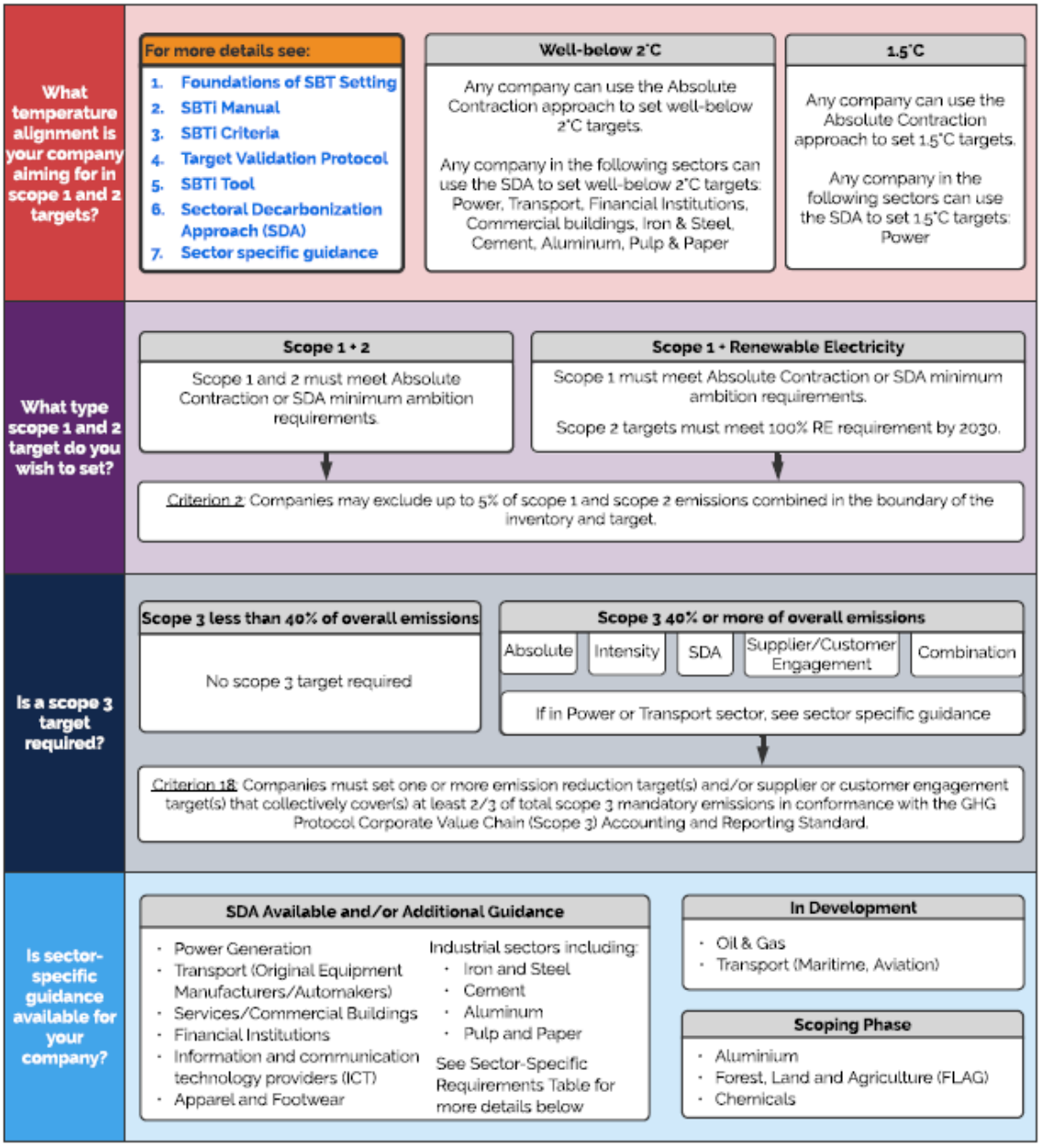


Figure 17: The How To Guide Setting Science Based Targets (April 2021)

The requirements vary with company nature and size and within the boundaries of a typical VC-funded start-up, the closest route to apply is through the SME dedicated route. In this case, the SBTi invites SMEs to submit targets through a new (2020), streamlined target validation route exclusive to SMEs. This route conveniently enables SMEs to bypass the initial step of committing to set a science-based target and the regular target validation process, and to immediately set a science based target for the company's scopes 1 and 2 emissions by choosing from one of several predefined target options.

Essentially, the SME route consists of completing a checklist with commitments, sending the commitment letter, and paying a reduced fee of USD1,000 (+VAT) to be automatically approved and posted to the SBTi website. This is a convenient and not too expensive way for start-ups to demonstrate their (future) commitment to science-based compliance when it comes to GHG emissions reductions.

The only potential issue is that one of the questions in the SME checklist refers to the company's Scope 1 and Scope 2 emissions in 2018. Many start-ups being funded today would not have yet been founded in 2018. Upon looking in the FAQs, this seems more subtle as the guidance on the base year reads as "Companies using the SME route cannot choose a different base year than 2018, 2019 or 2020 nor target year." Since the above was written in 2021, it would seem that an SME could choose as its base year the first full calendar year of its operation even if the SME form seems to strictly mandate to report 2018 emissions.

The Global Impact Investing Network (GIIN) and IRIS+

The Global Impact Investing Network (GIIN) is a not-for-profit organisation and defines itself as the global champion of impact investing, dedicated to increasing its scale and effectiveness around the world. By convening impact investors to facilitate knowledge exchange, highlighting innovative investment approaches, building the evidence base for the industry, and producing valuable tools and resources, the GIIN seeks to accelerate the industry's development through focused leadership and collective action. The GIIN is led by a Board of Directors made up by key representatives of globally leading investment institutions (e.g. Prudential Financial, A16Z, The Brookings Institution, Swedfund), and an internal Senior Management Team.

In 2018 the GIIN produced the Roadmap for the Future of Impact Investing, in which it envisions a fast-approaching future when social and environmental factors are integrated into investment decisions simply by default, as the 'normal' way of doing things. To support impact measurement and management (IMM) the GIIN developed, launched and made freely available IRIS+, the generally accepted system for measuring, managing, and optimising impact.

IRIS+ aims to allow investors to make a financial return while allowing, enabling and supporting social and environmental solutions to the challenges the world is facing. IRIS+ therefore aims to be the common language that allows investors

to understand and compare the financial, social, and environmental performance of their investments.

Within IRIS+, investors (or fund managers) can select the goal of an investment and once this is done IRIS+ helps identify the metrics that matter to track the impact of that investment. Two key principles are clarity and comparability to ensure the way impact is measured and managed can be easily and unequivocally understood. IRIS+ thus connects common investment goals to specific outcomes, and practical implementation guidance in one system. IRIS+ covers a wide range of impact themes that align with the United Nations Sustainable Development Goals (SDGs), and this allows one to get a broader picture of an investment or a portfolio's impact.

The system allows to start either from impact categories (Figure 17a) or the SDGs (Figure 17b).

Figure 18: starting points to begin an IMM framework within IRIS+

Even when impact categories are selected, the system still links the framework to the SDGs thus allowing a richer and dual level of analysis. For each strategic goal set, IRIS+ guides the user through key elements to consider, such as:

- WHAT: scale of addressable problem, what positive outcomes look like, and how important the change would be to people/planet
- WHO: the stakeholder(s) who investors want to target, given that each strategic goal as a large pool of potential shareholders
- HOW MUCH: this is the measurement of the impact, as investors should assess how significant the investment's effect might be
- CONTRIBUTION: this is a key element/question to avoid greenwashing as it invites the investors to reflect how the effect they want to have compares to what is likely to happen anyway. A well-known example of where this has been poorly considered is investment in renewable energy technologies that should have reduced reliance in fossil fuels when instead no measurable reduction in fossil fuels actually materialises.
- RISK: the risk element invites to consider the likelihood that impact will be different than expected.

Depending on the impact categories selected different outcomes are possible, and once an outcome is selected (e.g. GHG reductions) within an Impact Theme (e.g. Climate Change Mitigation) through a specific Strategic Goal (e.g. provision of clean heat and electricity), available studies that support the evidence are shown to the user with a qualitative indicator of the study rigour.

IRIS+ further offers a set of core metrics, further sources to support the evidence presented and a downloadable worksheet summarising the set of

core metrics with details for each. To compile duly the required data additional resources and guidance are available to the users, organised in modular system (IRIS Taxonomy, IRIS and the SDGs, the Five Dimensions of Impact Investment, Data Collection, Decision Making, Impact Due Diligence and Impact Portfolio). These resources offer a rich knowledge base to begin to use and then familiarise with IRIS+ but it is unlikely that they can fit the reality of an early-stage start-up whose main resources are devoted to developing, optimising and financing the core business.

A good element to take away, however, is the Due Diligence Impact Questionnaire. This could be co-filled by the founders and Extantia Capital as a procedural, documental and reproducible step that could be applied to all investments. The rather severe downside of IRIS+ is that at the moment both Impact Themes and Strategic Goals are rather limited. They do not even cover the range of possibilities offered by today's technologies and are therefore unlikely to capture well the breadth we are seeing in early stage climate tech ventures.

WEF & IBC – Measuring Stakeholder Capitalism

Within the International Business Council (IBC), the World Economic Forum (WEF) in collaboration with Deloitte, EY, KPMG and PwC prepared a White Paper published in September 2020 for measuring stakeholder capitalism, which aims to work towards common metrics and consistent reporting of sustainable value creation.

The result of work done between 2017 and 2020, the White Paper seeks to improve the ways in which companies measure and demonstrate their contributions towards creating more prosperous societies and a more sustainable relationship with the planet. In addition to these admirable aims, it also recognises that companies that hold themselves accountable to their stakeholders and increase transparency in their reporting will be both more viable and valuable in the mid- to long-term.

The results of this process presented in the White Paper consist in 21 core and 34 expanded metrics and disclosures, specifically:

- Core Metrics: 21 more-established or critically important metrics and disclosures. These are primarily quantitative metrics for which information is already being reported by many firms or can be obtained with very reasonable efforts. They focus primarily on activities within an organisation's own boundaries.

- Expanded Metrics: 34 metrics and disclosures that tend to be less well established within existing practice and standards, and also have a wider value chain scope or convey impact in a more sophisticated way.

The core areas around which the White Paper revolves are four (also referred to as the 'four pillars' in the paper):

1. Principles of Governance
2. Planet
3. People
4. Prosperity

The sources for the vast majority of the core metrics are GRI documents, but also – albeit significantly less frequently – the GHG Protocol, the Science Based Target initiative, the Taskforce on Climate-related Financial Disclosures among others. As for the expanded metrics, occasionally there are other sources considered too (e.g. the US EPA or ISO standards), with the occasional new metric developed in the paper – for example 'Land use' within the Nature Loss theme or 'Single-use plastics' within the Solid Waste theme). To prioritise and filter all themes and metrics five key criteria were used:

1. Consistency with existing standard and frameworks
2. Materiality to long-term value creation
3. Extent of actionability
4. Universality across industries and business models
5. Monitoring feasibility of reporting

The White Paper surely represents an interesting, innovative and ambitious approach to measuring value creation but is way beyond the stage that most of the companies considered by Extantia are at.

Some elements (e.g. principles of governance) might instead be useful for Extantia itself, to be incorporated in its own ESG Policy.

The Sustainability Accounting Standards Board (SASB)

The Sustainability Accounting Standards Board (SASB) offers a set of standards that guide the disclosure of financially material sustainability information by companies to their investors.

Compared to other standards (e.g. GHG Protocol), SASB Standards seem to have more sectoral-specific guidance. Indeed, they are available for 77 industries and help identify the subset of ESG issues most relevant to the financial performance in each industry.

SASB Standards are maintained under the auspices of the Value Reporting Foundation, a new venture (announced in November 2020 and formalised in June 2021) combining the resources of SASB and IIRC to provide a robust toolset for planning and reporting. That toolset includes principles to support strategic planning by businesses (Integrated Thinking Principles), a framework for external communication (Integrated Reporting Framework), and the SASB Standards to ensure that investors have consistent and reliable information. These resources aim to support better decision making by both businesses and investors, creating a feedback loop of information and a common language.

Specifically SASB Standards are designed to communicate to investors about how sustainability issues impact the long-term enterprise value. They can be used by companies as a practical tool for implementing the principles-based framework recommended by the Task Force for Climate-Related Financial Disclosures (TCFD). Additionally, in July 2020 SASB and GRI announced a collaborative workplan to show how companies can use both sets of standards together. SASB prides itself that its metrics for disclosure topics are aligned with existing metrics wherever possible and the SASB standard reference metrics are already in use by industry, from more than 200 entities including WHO, CDP and several others.

SASB Standards follow a layered approach that narrows down from Sectors to Metrics. Figure 18 shows an example relevant to Extantia's focus on GHGs emissions.

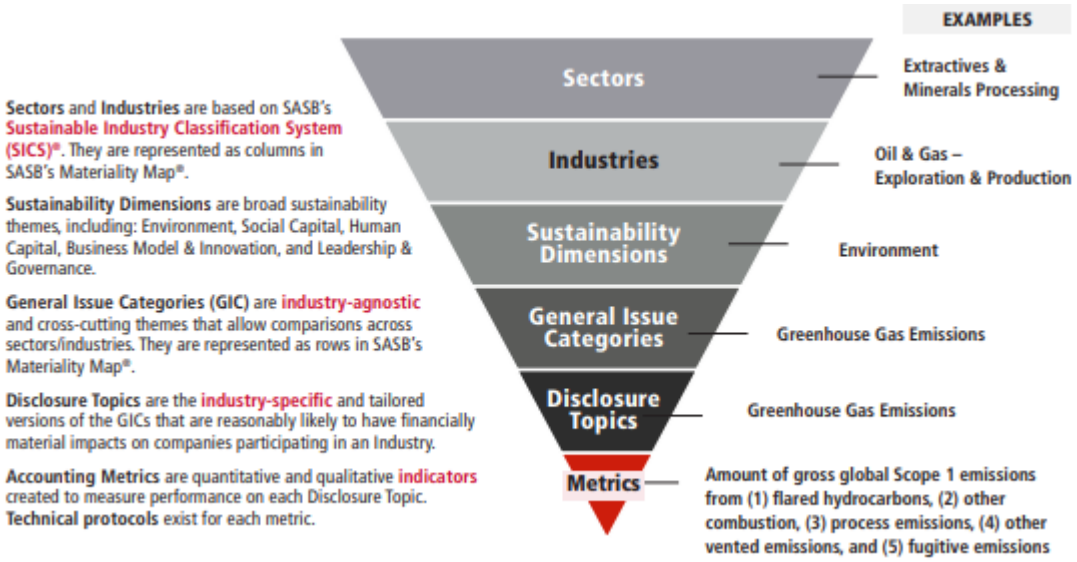


Figure 19: Structure of SASB Standards (source: SASB Implementation Supplement GHG emissions)

It can be seen that while the structure might vary from other standards and frameworks presented in this document, when it comes to hard measurement and quantification even SASB Standards refer to amounts of GHGs. In particular, the Supplement of GHG emissions shown above specifically mandates to calculate the metric according to the globally accepted methodology of the GHG Protocol, which – once again – retains its centrality.

Other elements that SASB Standards offer are guidance for standard-setting process, a conceptual framework (covering SASB's approach to accounting and disclosure including disclosure topics and accounting metrics), and rules of procedures (covering the operating procedures of monitoring, standard-setting, implementation, and monitoring).

Appendix C: A detailed Impact Carry calculation

At Extantia, we have a set of six Impact Carry KPIs that are reviewed regularly with the company:

Number	Impact Carry KPI	ESG category	Units	Weight
1	GHG emissions reduction	Environmental	t CO_2e	70%
2	Staff turnover	Social	%	10%
3	Nationalities diversity	Social	%	5%
4	Gender diversity in the company	Social	%	5%
5	Gender diversity in the management board	Governance	%	5%
6	Gender diversity in the supervisory board	Governance	%	5%

For each company we review annually their performance against the annual target, and calculate the Impact Score of the company. The company is then weighted in the portfolio according to the size of the tickets as well as its Gigacorn potential and the resulting weight of each company in the portfolio is an average of both. The Impact Score of the fund is then the sum of these weighted company's Impact Scores, and the carry is based on the achieved of these Scores.

Figure 19 is a simplified approach of the Impact Carry calculation:

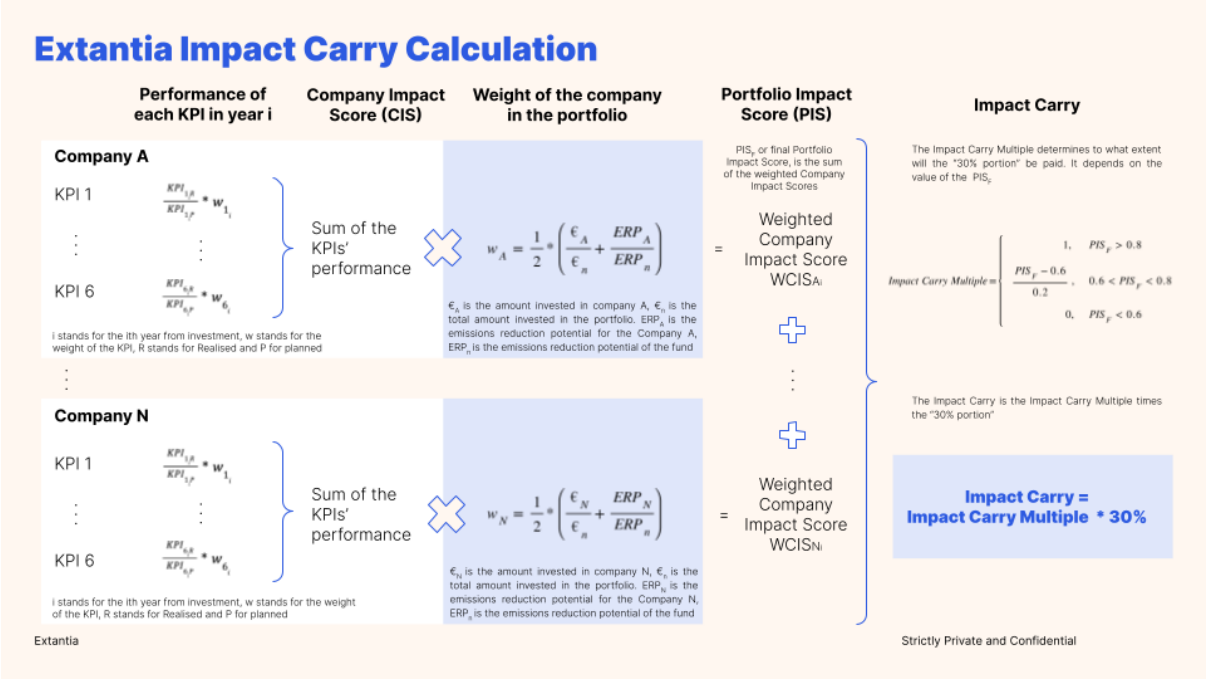


Figure 19: Extantia Impact Carry calculation

Here would be an example of an actual calculation for the portfolio companies of the fund:

Company	KPI	KPI Planned	KPI Realised	Performance of each KPI	KPI weight	Company Impact Score (CIS)	Amount invested	Emissions Reduction Potential	Weight of the company in the portfolio	Weighted Company Impact Score
Company 1	Emissions Savings (t CO2)	5	3	0.60	70%	**0.65**	€ 2,000,000	5	**0.23**	**0.15**
	Staff turnover (%)	20	30	0.67	10%					
	Nationalities diversity	30	20	0.67	5%					
	Gender diversity in the company	40	20	0.50	5%					
	Gender diversity in the management board	30	30	1.00	5%					
	Gender diversity in the supervisory board	40	50	1.00	5%					
Company 2	Emissions Savings (t CO2)	10	10	1.00	70%	**0.90**	€ 1,000,000	8	**0.22**	**0.20**
	Staff turnover (%)	20	20	1.00	10%					
	Nationalities diversity	30	15	0.50	5%					
	Gender diversity in the company	40	10	0.25	5%					
	Gender diversity in the management board	30	10	0.33	5%					
	Gender diversity in the supervisory board	40	35	0.88	5%					
Company 3	Emissions Savings (t CO2)	6	5	0.83	70%	**0.77**	€ 500,000	10	**0.23**	**0.17**
	Staff turnover (%)	20	40	0.50	10%					
	Nationalities diversity	30	12	0.40	5%					
	Gender diversity in the company	40	25	0.63	5%					
	Gender diversity in the management board	30	30	1.00	5%					
	Gender diversity in the supervisory board	40	25	0.63	5%					
Company 4	Emissions Savings (t CO2)	7	6	0.86	70%	**0.85**	€ 4,000,000	3	**0.32**	**0.28**
	Staff turnover (%)	20	10	1.00	10%					
	Nationalities diversity	30	15	0.50	5%					
	Gender diversity in the company	40	45	1.00	5%					
	Gender diversity in the management board	30	35	1.00	5%					
	Gender diversity in the supervisory board	40	20	0.50	5%					
Total							€ 7,500,000	26.00		**0.79**

Figure 20: Detailed Impact Carry calculations for four portfolio companies

On Figure 20, it can be seen that in this example the final Portfolio Impact Score (PIS_F) would be 0.79. The Impact Carry Multiple would then be (0.79-0.6)/0.2 = 95%. With the Impact Carry Multiple in place the actual Impact Carry to be distributed to the Carry Limited partner can be calculated, which would equal 95%*30% = 28.5%.

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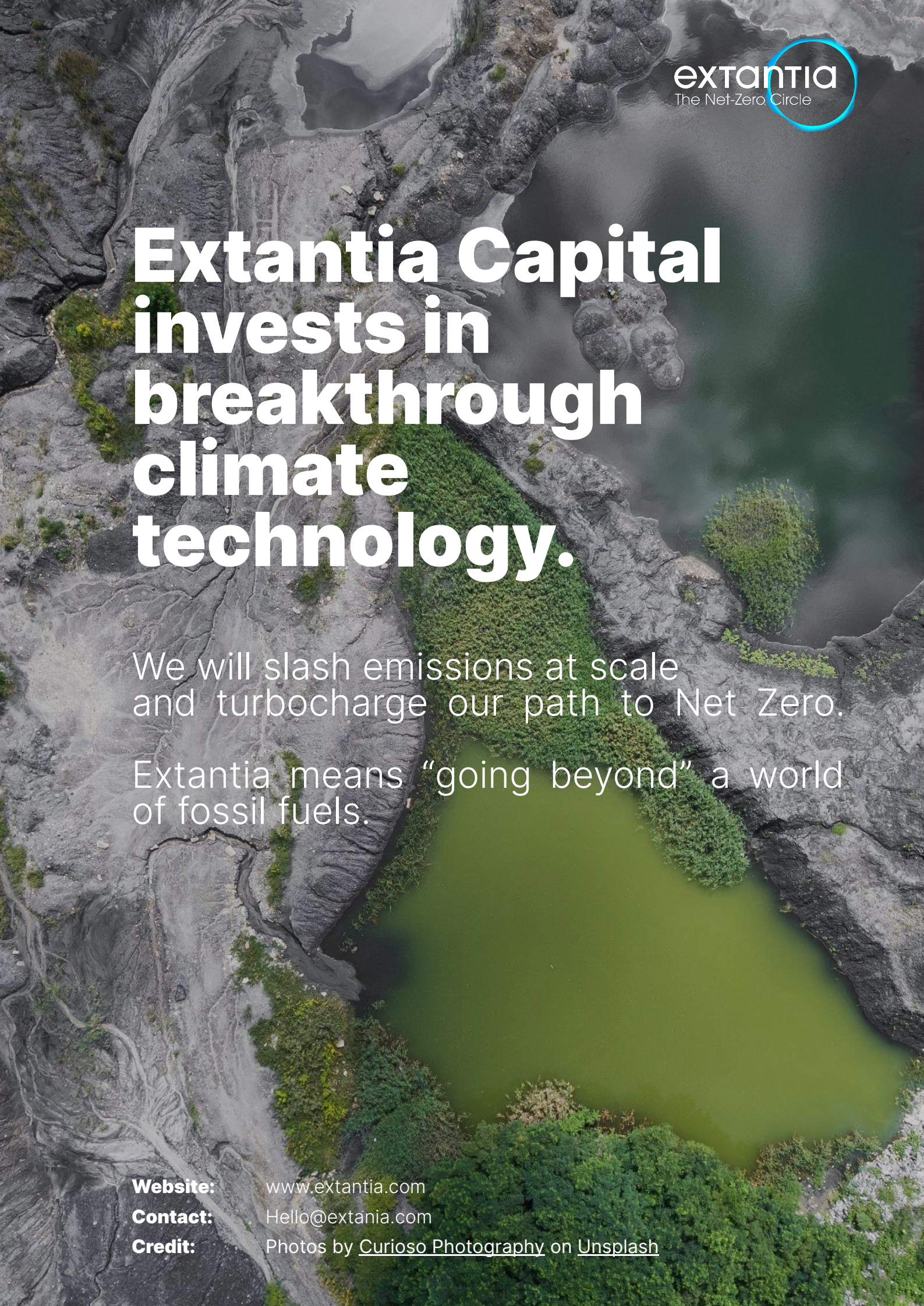

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