Inrate Climate Impact Methodology

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1. Benefit of the Inrate Climate Impact Model for Investors

More and more investors analyze and report the climate implications of their portfolios to contribute to climate goals. An assessment of the climate impact is considered as an important feature and a necessary starting point to understand climate-related risks and opportunities linked to a portfolio. By accounting for climate-related risks, investors may reduce financial risks resulting from exposure, and reputational risks due to the climate impact of their assets under management. They can also profit from financial and reputational opportunities resulting from a transition to a low-carbon economy.[1]

A thorough climate impact analysis needs to take into account greenhouse gas (GHG) emissions along the entire value chain, as both impacts and risks are being transmitted physically, technically, economically and legally along these chains. Regulatory measures such as carbon prices and emission standards can, for instance, affect car producers via higher electricity prices relative to other energy costs, loss in competitiveness of cars running with combustion engines, and legal risks when not adhering to emission standards. Therefore, climate impact analysis must account for direct GHG emissions caused by a company's activities (Scope 1) as well as indirect GHG emissions occurring along supply, use and disposal chains of a company's products and services (Scope 2 and 3).

Despite important initiatives such as the CDP (Carbon Disclosure Project) and TCFD (Task Force on Climate-related Financial Disclosures of the Financial Stability Board), only few companies publish complete, consistent and comparable GHG emission data encompassing Scope 1, 2 and 3. Scope 3 data, in particular, are very rarely recorded. And if they are, they usually comprise only a small fraction of Scope 3 GHG emissions such as from business travels. Or they are necessarily based on inconsistent estimates by the reporting companies, as there is no global binding framework defining how greenhouse gas emissions are to be accounted for, and there is no mandatory external verification. Leaving aside Scope 3 GHG emission for climate impact reporting or portfolio analyses should not be an option, as, on average, they comprise around 73% of total GHG emissions (Figure 1).

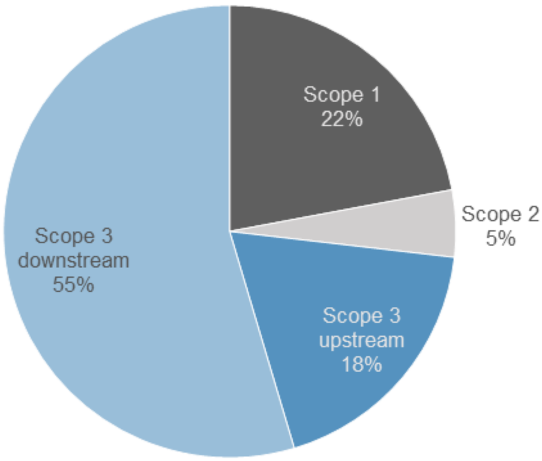

Figure 1: Contribution of all different Scopes to total GHG emissions. Source: Climate Impact Model, 2020.

[1] See Zimmermann, Hurst, Schwegler, Füssler, 2019: Measuring climate related risks in investment portfolios, edited by Swiss Sustainable Finance.

A sound assessment of the climate impact of a portfolio is therefore based on modelled data for calculating greenhouse gas emissions under Scope 3, which takes into account important economic linkages. In addition, modelled data ensure consistency and, if the model is scientifically sound and allows the necessary differentiation, provide a high-quality database for both climate impact and risk assessment.

The Inrate Climate Impact Model meets these requirements. It offers a complete and consistent assessment of GHG emissions and ensures comparability across companies. For energy companies and utilities which are very GHG intensive, physical data – such as energy and electricity produced and electricity purchased – is used to complement the modeled data. This ensures the reliability of the Climate Impact Model data of these companies. The Inrate Climate Impact Model enables investors to evaluate the GHG exposure of portfolios, derive climate-related GHG risks, identify low emission industries and construct GHG-optimized portfolios.

2. Model Output and Usage for GHG Impact Analyses

The Inrate Climate Impact Model provides GHG emissions (in tCO_2eq) and GHG intensities (in $tCO_2eq/mUSD$) for about 3'200 companies, including the indices MSCI ACWI, SPI and SBI, as well as climate impact analyses for investment portfolios. Figure 2 shows example data for five companies. Besides the GHG data, Inrate provides additional company data such as sector and revenue.

			Total GHG emissions [tCO2eq]					GHG intensity [tCO2eq/mUSD]				
Company Name	ISIN	Inrate Sector	Encom-passing	Scope 1	Scope 2	Scope 3 upstream	Scope 3 downstream	Encom-passing	Scope 1	Scope 2	Scope 3 upstream	Scope 3 downstream
Accor	FR0000120404	Leisure	1'839'641	209'935	82'133	572'711	974'861	406	46	18	126	215
Continental	DE0005439004	Transportation	53'243'860	5'889'029	4'122'047	17'633'283	25'599'501	1'069	118	83	354	514
Nice	IL0002730112	Software	555'045	51'760	33'989	153'856	315'440	353	33	22	98	200
Tencent	KYG875721634	Communication	16'977'596	1'823'472	1'205'860	5'241'867	8'706'397	311	33	22	96	159
Zoetis	US98978V1035	Health	1'454'437	91'562	273'899	1'064'459	24'517	232	15	44	170	4

Figure 2: Example of total GHG emissions and GHG intensities for companies per Scope. Source: Climate Impact Model, 2020.

To analyse and compare portfolios, Inrate calculates the globally used key figure weighted average carbon intensity (WACI). Investors can use this data to report the climate impacts of their investments or make their own analyses. Furthermore, high-intensity sectors and companies can be identified, which allows to shift the portfolio towards sectors and companies with lower GHG intensities. Figure 3 shows an example of a portfolio with a total WACI below the benchmark. The separate assessment of the Scopes reveals that, in the example, the difference is mainly due to Scopes 1 and 3 downstream.

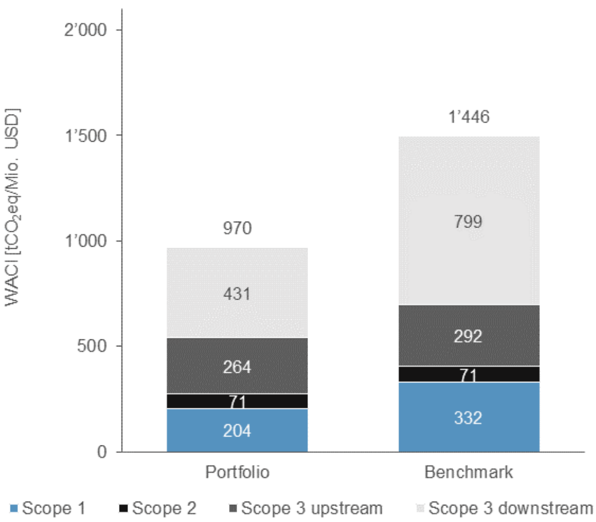

Figure 3: WACI per Scope. Source: Climate Impact Model, 2020.

Further insights are gained by illustrating the WACI per sector for a portfolio in comparison to the benchmark, and the sector weights in the portfolio (see Figure 4). The example reveals the low intensity sector selection of the portfolio: sectors with low WACI tend to have a higher share in the portfolio than sectors with high WACI. Furthermore, it shows that especially within the highly GHG intensive sectors, the portfolio contains less intensive companies than the benchmark.

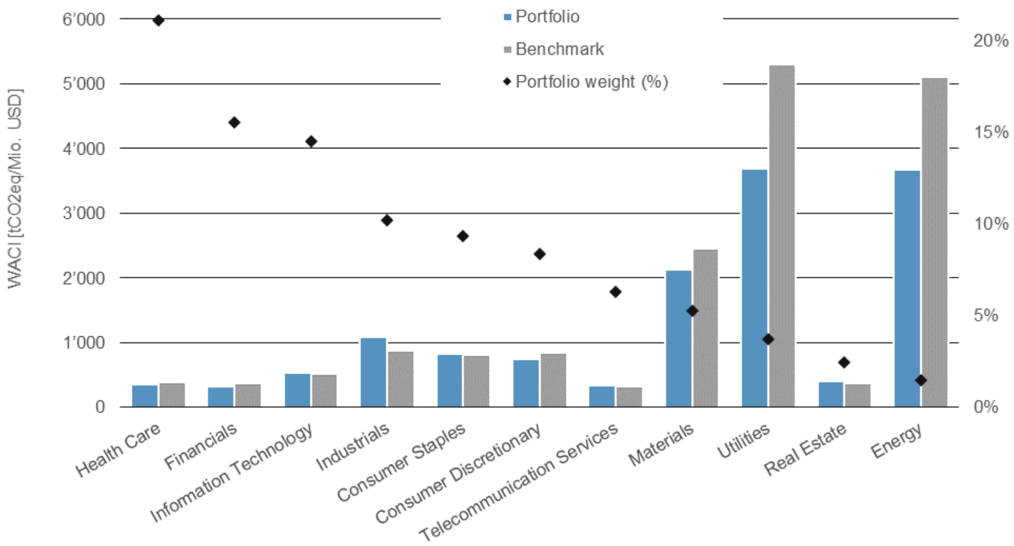

Figure 4: WACI and portfolio weight per sector. Source: Climate Impact Model, 2020.

3. The Inrate Climate Impact Model

3.1 Model Overview and Data Source

The Inrate Climate Impact Model is a quantitative model that estimates the GHG intensity of business activities. The model accounts for direct GHG emissions resulting from in-house production processes (Scope 1), indirect emissions associated with the purchase of energy (Scope 2) as well as indirect emissions associated with the purchase of goods and services from suppliers (including disposal, Scope 3 upstream) and emissions associated with the intermediate or final use of the output of the production processes (Scope 3 downstream). The model parameters consist of GHG emission intensities, measured in tons of CO_2 equivalent (tCO_2eq) per million USD revenue.

The GHG intensities derived in the Inrate Climate Impact Model are based on an economic input-output life-cycle assessment (EIO LCA). Input-output analysis is based on the monetary flows induced by an economic activity across the entire supply, use and disposal chain. In combination with environmental data it allows to quantify GHG emissions that are linked to these monetary transactions. It allows to trace total GHG emissions embodied in goods and services used as direct or indirect input for an economic activity ("upstream emissions") as well as GHG emissions linked to the use of its direct and indirect outputs from that activity ("downstream emissions").

Environmentally extended multiregional input-output (EE MRIO) databases provide the necessary economic and environmental information for the EIO LCA. The Inrate Climate Impact Model uses the globally aggregated EE MRIO of 2011 from the Exiobase 3 dataset[2] to derive the GHG intensities for Scope 1, 2 and 3. It covers 44 countries, 5 regions and 200 products as well as 22 greenhouse gases from different emission sources.[3] The Exiobase was developed within the project DESIRE (Development of a System of Indicators for a Re-source Efficient Europe) by a consortium of several research institutes. It provides information on the quantity of inputs (in million USD) needed to produce different products and services and the corresponding Scope 1 GHG emissions (in tons of CO_2 equivalents).

Technical progress over time can be accounted for in several ways. The GHG intensities can be updated either by using a new version of the Exiobase EE MRIO or based on any other type of EE MRIO that provides a similar level of sectoral disaggregation and that contains information on the same environmental impacts (e.g. GHG emissions).

3.2 Calculation of Scope 1-3 Emission Intensities

Scope 1 GHG emission intensities are derived by dividing the direct GHG emissions of a given economic sector in the input-output table by the respective revenue. Scope 2 and Scope 3 upstream GHG emissions are calculated in a second step by multiplying each direct and indirect input into a production process with the direct GHG emissions (Scope 1) related to the production of the corresponding input (e.g. electricity generation, raw materials, etc.). Scope 2 GHG emissions are derived by adding up emissions related to electricity and heat generation inputs. All remaining inputs combined correspond to Scope 3 upstream emissions. Scope 3 downstream GHG emissions are finally calculated by assigning emissions from each activity that uses the output of an activity proportional to its contribution to the revenue of the buying sector. Corresponding GHG intensities are again derived by dividing Scope 2 and 3 GHG emissions by the respective revenue.

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[2] www.exiobase.eu

[3] The EE MRIO tables include emissions from fuel combustion as well as GHG emissions from non-combustion sources, such as agricultural activities, process emissions from cement and lime production and fugitive emissions. It accounts for emissions of CO2, methane (CH4), nitrous oxide (N2O) as wells as fluorinated gases such as HFC, PFC and SF6 (each in tCO2eq).

Since the sector classification of the Exiobase database differs from the Inrate Business Activity Classification (IBAC) of the Climate Impact Model, GHG intensities derived from the Exiobase database need to be matched to corresponding Inrate activities. Between the two sectoral structures three types of relationships occur:

- **1 : 1 relationship:** One sector of the Exiobase dataset can be matched to exactly one Inrate activity. In this case, both GHG intensities are equal.
- **1 : n relationship:** If a single sector of the Exiobase database is further disaggregated within the Inrate activities, all activities are assigned the same GHG intensity from the corresponding Exiobase sector. In this case, intensities are equal in both data sets.
- **n : 1 relationship:** N sectors of the Exiobase dataset are matched to one Inrate activity. In this case, a weighted average intensity is calculated by dividing the total emissions by the total gross production of the respective Exiobase sectors.

Figure 5 shows the Inrate sectors covered by the Inrate Climate Impact Model and their GHG intensities per Scope. It shows that for most sectors Scope 3 downstream intensities make up a significant part of total GHG intensities. An exception is the utilities sector where Scope 1 accounts for the largest part. It also reveals that the sectors energy and utilities are by far the most GHG intensive sectors. Therefore, for these sectors, the model-based GHG intensities are complemented or replaced by company-specific physical data, as described below.

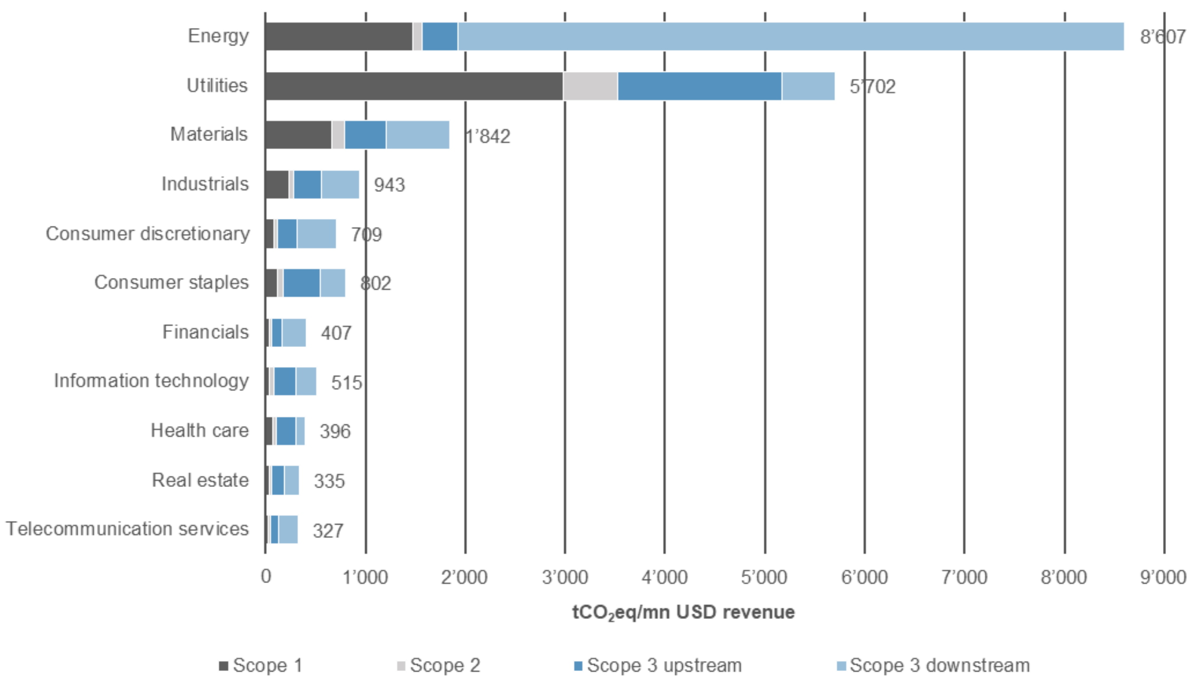

Figure 5: Scope 1, 2 and 3 emissions of the Inrate Sectors. Source: Climate Impact Model, 2020.

4. Research Process to Derive Company GHG Intensities and Total Emissions

The company-specific GHG intensities are updated annually. They are derived based on three major steps, which are described in the following figure and subchapters.

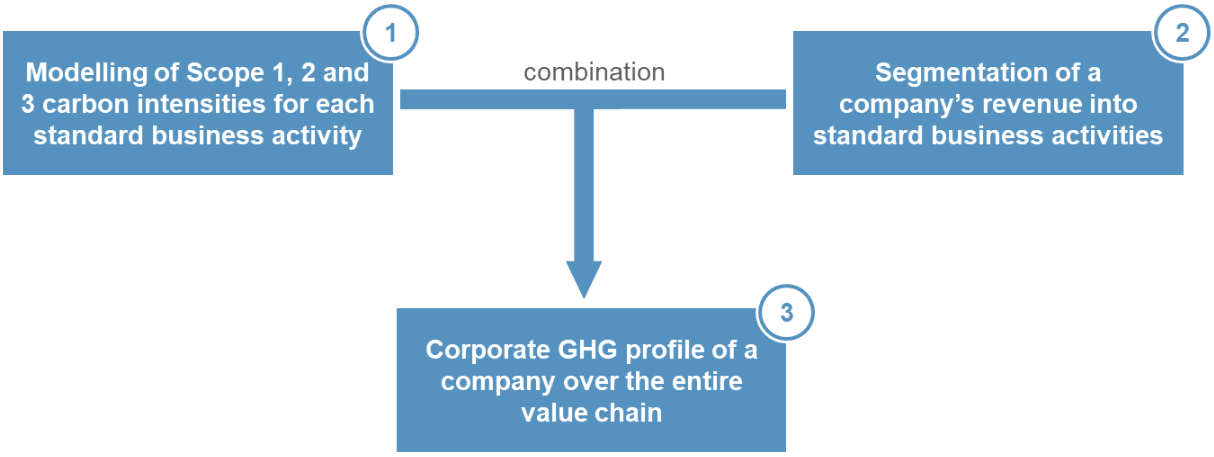

Figure 6: Three steps of the research process.

Step 1: Assessing GHG intensity of activities

Scope 1, 2 and 3 GHG intensities of economic activities are assessed based on the Climate Impact Model as described above. For companies in the two most GHG intensive sectors (energy and utilities), the modelled emission data are replaced or complemented with values derived from bottom-up research on physical data: energy and fossil fuel production volumes, electricity production volumes, purchased electricity volumes and corresponding emission factors[4]. In the following three cases, model values are replaced or complemented with values based on bottom-up research:

- Scope 1 emissions of utilities: These emissions are calculated based on the annual energy production of these companies in Terawatt hours (TWh), split into the energy carriers coal, oil, natural gas, hydropower, solar, wind, and other renewable energies. Emissions of each energy carrier are derived by multiplying the amount of energy produced with the specific IPPC emission factor. This calculation replaces the Scope 1 Climate Impact Model data.

- Scope 3 upstream emissions of energy utilities: For calculating these emissions, the model-based Scope 3 upstream emissions are complemented by the emissions from purchased electricity. Purchased electricity is the electricity which is bought by the utility and sold to the electricity user. If the energy split into energy carriers is known, the emissions of each energy carrier are derived by multiplying the amount of energy produced with the specific IPPC emission factor. If the energy split is unknown, the emission factor of the regional electricity mix is applied.

- Scope 3 downstream emissions of energy companies: For energy companies, Scope 3 downstream GHG emissions are calculated based on their annual coal, crude oil and natural gas production volumes and multiplied with their specific IPCC emission factor. This calculation replaces the Scope 3 downstream Climate Impact Model data.

[4] Sources: IPCC, 2014: Annex III: Technology-specific cost and performance parameters. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Treeze, 2017; IPCC guidelines for national greenhouse gas inventories; own calculations

Step 2: Revenue segmentation into standard business activities

The revenue of each company in the Inrate coverage is divided into the standardized Inrate Business Activities. These are based on the IBAC, comprising around 330 activities and 110 sub activities. The segmentation of a company's revenues is based on its annual segmental reporting (see Figure 7).

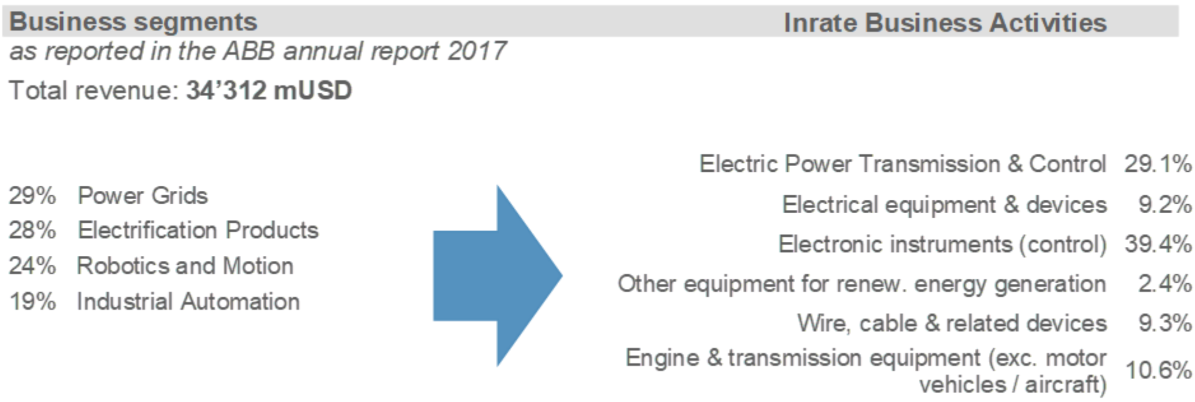

Figure 7: Example - ABB's business segments and corresponding standardized Inrate Business Activities.

Step 3: Corporate GHG intensity and total emission calculation

This last step derives corporate GHG intensities and total emissions by multiplying GHG intensities derived in step 1 – the Inrate Climate Impact Model – and revenues derived in step 2. Figure 8 shows an example of the corporate GHG intensity and total emissions calculation.

	GHG intensities in tCO2eq/mUSD of selected Inrate Business Actvities				Total intensity in tCO2eq/mUSD		Total emissions in tCO2eq/year
	Electronic instruments (control)	**Electric power transmission & control**	**Engine & transmission equipment**	**…**		multiplied by revenue (mUSD)	
Scope 1	34	40	36	…	36		1'235'232
Scope 2	55	1'863	68	…	583		20'003'896
Scope 3 upstream	371	521	378	…	416	34'312	14'273'792
Scope 3 downstream	388	666	167	…	440		15'097'280
Total	**848**	**3'090**	**648**	**…**	**1'475**		**50'610'200**
Activity percentage	39.4%	29.1%	10.6%	…	100%		

Figure 8: Example - Calculating ABB's GHG emission profile. Sources: ABB Annual Report (2017); Climate Impact Model (2020).

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