Appendix – Carbon Footprint Metrics, Methodology and Underlying Data

1. **Total Carbon Emissions**
    tons CO_2e - Measures the absolute greenhouse gas footprint of a portfolio in tons of carbon-dioxide equivalents (tCO_2e). This measures the total annualized greenhouse gas emissions for which an equity portfolios is responsible, based on the "ownership principle" in the Greenhouse Gas Protocol. This is done by summing up the proportionate carbon emissions of companies in the portfolio based on the investor's ownership share.

$$\sum_n^i \frac{\$investment}{issuer's\_full\_mcap_i} * issuer's\_emissions_i$$

2. **Relative Carbon Footprint**
    tons CO2e /$M invested – Expresses the greenhouse gas footprint of an investment sum. Normalized measure of a portfolio's contribution to climate change that enables comparison with a benchmark, between portfolios and between individual investments. Metrics is Total Carbon Emissions expressed as per currency invested.

3. **Carbon Intensity**
    tons CO_2e /$M "owned" revenue – Expresses the carbon efficiency of a portfolio and allows investors to measure how much greenhouse gas emissions per dollar of revenue are generated. It is based on the ratio of portfolio carbon emissions normalized by the investor's claims on sales.

$$\frac{\sum_n^i \frac{\$investment_i}{issuer's\_full\_mcap_i} * issuer's\_emissions_i}{\sum_n^i \frac{\$investment_i}{issuer's\_full\_mcap_i} * issuer's\_sales_i}$$

4. **Weighted Average Carbon Intensity**
    tons CO_2e /$M revenue – The Weighted Average Carbon Intensity measures a portfolio's exposure to carbon intensive companies. As companies with higher carbon intensity are likely to face more exposure to carbon related market and regulatory risks, this metrics can serve as a proxy for a portfolio's exposure to potential climate change-related risks.

    This metrics is applicable across asset classes, including fixed income, as it's not based on equity ownership basis and does not result in a footprint. It's the sum product of the portfolio weights and Carbon Intensities.

$$\sum_n^i portfolio\_weight_i * issuer's\_carbon\_intensity_i$$

5. **Background on Greenhouse Gas Emissions**
    Greenhouse gas (GHG) emissions are classified as per the Greenhouse Gas Protocol and are grouped in categories called Scope 1, Scope 2 and Scope 3.

    *   **Scope 1** GHG emissions are those directly occurring "from sources that are owned or controlled by the institution, including: on-campus stationary combustion of fossil fuels; mobile combustion of fossil fuels by institution owned/controlled vehicles; and "fugitive" emissions."

- **Scope 2** emissions are "indirect emissions generated in the production of electricity consumed by the institution."

- **Scope 3** emissions are all the other indirect emissions that are "a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution" such as commuting; embodied emissions from extraction, production, and transportation of purchased goods; outsourced activities; contractor-owned vehicles; and line loss from electricity transmission and distribution". In the tool, Scope 3 emissions are conceptually divided into (a) upstream emissions, i.e. emissions stemming from a company's supply chain and (b) downstream emissions, i.e. emissions from product "use phases" during their life cycle.

6. **Carbon Dioxide Equivalents**

   CO_2e is the shorthand for carbon dioxide equivalents. It is the standard unit in carbon accounting to quantify greenhouse gas emissions, emissions reductions and carbon credits. It is expressed in tons and written as tCO_2e.

   One ton of carbon dioxide has become the standard unit for greenhouse gases and emissions of gases other than carbon dioxide are converted according to their global warming potential. Greenhouse gases that have the greatest influence on atmospheric warming include

   - Carbon dioxide
   - Methane
   - Nitrous oxide
   - Water vapour
   - Tropospheric ozone
   - Chlorofluorocarbons (CFCs)
   - Hydrofluorocarbons (HFCs)
   - Perfluorocarbons (PFCs)
   - Sulphur hexafluoride

   Each has a different contribution to the greenhouse effect with some have a greater global warming potential than others. This is expressed in the global warming potential coefficient (GWP):

   - Carbon dioxide (CO_2) GWP: 1
   - Methane (CH_4) GWP: 21
   - Nitrous oxide (N_{20}) GWP: 310
   - Hydrofluorocarbons (HFCs) GWP: 140-11'700
   - Perfluorcarbons (PFCs) GWP: 6'500-9'200
   - Sulphur hexafluoride (SF_6) GWP: 23'900

   GWP are based on a 100-year *time horizon.*

   To keep accounting equivalent, each ton of greenhouse gas is divided by its global warming potential and expressed in tCO_2e. CO_2e was an important breakthrough in finding climate change policy and solutions for global warming because it provides a standard unit that can be measured, has a price in many geographies and is agreed on by all stakeholders.

7. **Carbon Emissions Calculations and Emission Source**

   The Analysis is based on direct and indirect company emissions (Scope 1 and Scope 2). Scope 3 emissions are only being reported in the specific subsection and on an industry level as currently the definition and the measurement and disclosure is not consistently applied by companies. All data comes from South Pole Group, the global leader in investment climate impact assessments. It

is based on South Pole Group's database for greenhouse gas emissions of about 40'000 companies, the largest in the market. The database feeds real-time data into the YourSRI tool via an API.

In the report, the source of the emissions data is indicated as follows:
- **DC – Disclosed:** reported by the company in documents such as CSR reports, its website or other means of communication, CDP or regulatory databases and being validated and approved by South Pole Group.

- **AP – Approximated:** In cases where the company does not disclose any carbon data or the reported data has been classified as not trustworthy by South Pole Group, a robust carbon estimation methodology is being applied; this system has been developed by researchers from ETH Zürich and carbon experts from South Pole Carbon

The tool uses the latest consistently available annual greenhouse gas emissions. As GHG emissions are reported until the end of any given year for the previous business or calendar year, the mapping is typically t minus 2. For most comparable results, a matching of annualized greenhouse gas emissions is recommended with year-end holding information."

8. **Attribution Analysis**

In the attribution analysis of carbon footprints, negative values represent areas that contribute to a smaller footprint relative to the benchmark, while positive values contribute to a larger footprint. From the perspective of an investor aiming to reduce greenhouse gas exposure, a negative value is therefore the desired outcome.

- **Sector Allocation:** This measures the impact of a manager's decisions to over- or underweight sectors in the portfolio relative to a benchmark. Negative values come from underweighting sectors with higher carbon footprints than the benchmark **or** overweighting sectors with carbon footprints lower than the benchmark.

- **Stock Selection:** This measures the impact of a manager's security selection within a sector relative to a benchmark. Negative values come from selecting companies (within a sector) with lower footprints relative to those in the benchmark. The weight of the sector in the portfolio determines the size of the effect.

- **Interaction:** This measures the combined impact of a manger's allocation and stock selection within a sector. For example, overweighting a sector with a lower carbon footprint relative to the benchmark results in negative interaction, while underweighting a sector with lower relative carbon footprint leads to a positive interaction effect.

9. **Data Protection**

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