

Climate Solutions Investments and Impact Measurement Framework



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Clarification note

This document outlines NN Group's definition of climate solution investments and its methodology for measuring the estimated emissions avoided by these investments. It details the data sources, methods, and assumptions used in this calculation.

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Important legal information

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Introduction

NN Group is committed to achieving net-zero greenhouse gas emissions for its proprietary investment portfolio by 2050. As a participant in the IIGCC Paris Aligned Investment Initiative (PAII), NN Group helped develop the Net Zero Investment Framework (NZIF), which offers comprehensive guidance for investors seeking to support net-zero objectives. The framework identifies investment in climate solutions as a key strategy for supporting the transition to a carbon-neutral economy.

To underpin our commitment, NN Group has developed an internal framework to define 'climate solutions investments' as part of its proprietary investments' portfolio. We followed the guidance from the NZIF, Net-Zero Asset Owner Alliance (NZAOA) and sought alignment with the EU Taxonomy where possible. Taking a precautionary approach, we have defined climate solutions as investments in economic activities that contribute to climate change mitigation or adaptation.

We have developed an impact measurement framework based on a combination of available international standards to better understand the positive impact that our investments in climate solutions have on the environment. As an indicator

of the positive impact of the investees (companies, projects and assets) in our climate solutions portfolio, we report the estimated emissions that they have avoided. It is important to note that we do not use this calculation as an offset in our carbon footprint calculation for our investments.

Additionally, our calculation does not account for any negative impact that our climate solution investments may have on society and the environment. The calculated emissions avoided and other metrics should always be referred to as estimated, and never as actual.

Definition climate solutions

In defining climate solutions per asset class, we support our definitions with external certifications, asset labels, and environmental standards where possible and relevant. Our definitions include our specification of valuations:

- **Renewable energy infrastructure:** Investments in infrastructure funds with a clear focus on climate change and/or energy transition and investments in projects (equity/debt) for renewable energy infrastructure, such as solar, offshore and onshore wind, hydrogen, storage, energy efficiency and other renewable energy technologies. Valuation for infrastructure equity is based on market value and for infrastructure debt on outstanding loan balances.
- **Certified green buildings:** Within our real estate portfolio (equity/debt), our definition is limited to assets with at least an Energy Performance Certificate (EPC) of Class A, or if EPC is not available a high level of building certification (BREAAAM or HQE certification of at least 'Excellent', or LEED or DGNB of at least 'Gold'). Investments that finance assets in (re)development and refurbishments with a stated objective of meeting these EPC or building certification levels are also included. Valuation for certified green buildings is based on market value (Net Asset Value) for equity investments and on outstanding loan balances for debt investments. As of 2025, debt investments include the renovation of existing buildings.
- **Green bonds:** the green bonds we invest in are in line with the NN Green, Social and Sustainability Bond Standard which is aligned with the ICMA's Green Bond Principles and needs to be applied in addition to the basic Responsible Investment (RI) criteria as described in the NN RI Framework Policy and related standards. Valuation of the green bonds is based on nominal values.
- **Other:** Investments that do not fall into any of the categories above, including investments in unlisted entities. For example, impact private equity funds that target and report on clearly defined climate impact KPIs, or funds that have a broader ESG focus, but where clean

and renewable energy projects account for a substantial part of the fund. Valuation is based on market value.

Impact measurement methodology

Definition

As mentioned, the indicator of positive impact we use for our climate solutions is estimated emissions avoided. This indicator aims to disclose the amount of emissions that would have been emitted if investments had been allocated according to a benchmark. The benchmark is defined differently per climate solutions investment type and so emissions avoided is also calculated differently.

We report the indicator together with the:

- % of climate solutions included in the calculation as a proportion of climate solutions investments (EUR) for which impact could have been calculated, and
- PCAF Data Quality as defined in the PCAF Financed Emissions Standard for different asset classes

The methodology to calculate emissions avoided draws on several market standards and guidance, such as the Partnership for Carbon Accounting Financed Emissions (PCAF) Standard, the ICMA Harmonised Framework for Impact Reporting and the Nordic Public Sector Issuers Position Paper on Green Bonds Impact Reporting. While we were guided by the principles of these standards and guidance, we are using this framework to clarify the decisions we made in calculating the impact.¹

Scope

Emissions avoided are estimated for the companies, projects and assets (investees) NN Group invests in through our climate solutions investments at the end of previous reporting year. Due to data availability, the percentage of investments for which we report impact figures varies per climate solutions investment category. An overview of the climate solutions portfolio at year-end 2024 is provided in Table 1.

Table 1: Investments in climate solutions (in EUR million)

	2024	2023	2021 (base year)
Renewable energy investments	2,035	1,255	567
– of which infrastructure equity	924	354	44
– of which infrastructure debt	1,111	901	523
Certified green buildings ¹	5,020	5,323	3,817
– of which direct and equity investments	4,498	4,722	3,236
– of which debt investments	522	601	581
Green bonds	5,646	4,091	637
Other ²	99	83	41
Total	12,800	10,752	5,062

1. Relates to buildings within NN's non-listed real estate portfolio; the residential mortgage portfolio of NN is not covered in this category.

2. Other included non-infrastructure (private equity)

Source: Derived from NN Group Annual Report 2024, page 154

¹ We are also aware of the methodology proposed by the [GHG Protocol and World Resources Institute](#). However, the data granularity needs to improve in order to implement this methodology at the financial institution level.

Data gathering process and data quality

The data gathering process and methodology is defined by investment type and depends on how a specific climate solution investment is managed. It also differs per climate solution investment type (outlined below). The data is requested from asset managers that manage climate solutions and, in general, each manager is asked to provide an audit report that describes their data management processes related to the data reported to us. If such reports are not available, the manager is requested to provide supporting evidence for a couple of underlying investments.

The data to calculate emissions avoided, such as energy production, capacity or consumption data, often does not go through such a rigorous assurance process as financial data. So, while it can still provide insights, it is difficult to integrate such data into investment decision-making. We aim to enhance the rigour of our approach and encourage our asset managers to do the same with respect to non-financial data.

To assist in gauging the quality of the underlying data, for each asset class, a PCAF data quality score is assigned based on PCAF guidance.

The data collection and calculation process is subject to limited assurance.

Renewable energy investments

We follow PCAF guidance for renewable energy investments, defining estimated emissions avoided as emissions that would have occurred if investments had been attributed to electricity generated by the least economically efficient energy generation facility.

Firstly, we collect installed capacity and annual electricity production for operational assets broken down by country via external asset managers managing the portfolio on our behalf. If actual electricity production figures are not available, while PCAF recommends using P50 value², we decided to be more cautious and use P90 10-year estimated electricity production figures³. In cases where project parties do not provide figures for the estimated electricity production, this is calculated by multiplying (1) the annual load hours of wind, solar or hydro by (2) the project capacity (kW). Such data comes from project's financial model, Lender Technical Advisor (LTA) report or annual operational reports.

In order to estimate the annual renewable energy produced at the portfolio level we use the following formula:

$$\text{Renewable energy produced}_p = \sum_a \text{Attribution factor}_a \times \text{renewable energy produced}_a$$

where 'p' stands for portfolio and 'a' for asset

By multiplying renewable energy produced per asset with a country-specific emission factor for each country where a project has assets in operation, we obtain estimated emissions avoided per asset. It is assumed that our investment in the project or investee is attributed equally to each country where the project or investee has eligible assets. PCAF recommends using the operating margin (OM) measured in gCO₂eq/kWh as the emission factor. In using the OM, the assumption is that the electricity generated by the renewable energy project (irrespective of the technology it uses) will replace the electricity generated by the least economically efficient energy generation facility. The OM is used in the methodology because the assessment is backward-looking (it measures avoided emissions over the previous financial year). In order to make forward-looking calculations, we would need to look at the combined margin (CM) which takes the future energy mix into account together with the current mix. The country-level OM data is retrieved from the [UNFCCC International Financial Institution \(IFI\)](#).

We do not take into account the total production and emissions avoided by our investees. We attribute them only to NN's share of the investment as do our asset managers, one level lower, for their share in an investment in a specific project. We calculate the attribution factor as follows: Estimated avoided emissions are then calculated as:

$$\text{Attribution factor}_a = \frac{\text{Outstanding amount}_a}{\text{Total equity} + \text{debt}_a}$$

$$\text{Outstanding debt amount}_a = \text{debt} - \text{repayments}$$

$$\text{Outstanding investment amount}_a = \% \text{ ownership share} \times \text{equity value}$$

where 'a' stands for asset

where the outstanding debt amount represents the current face value of debt funded by NN and equity value represents the market value of equity owned by NN

$$\text{Avoided emissions}_p$$

$$= \sum_a \text{Attribution factor}_a \times \text{electricity production}_a \times \text{operating margin}_c$$

where 'p' stands for portfolio, 'a' for asset and 'c' for country where the electricity producing asset is located

In order to put the renewable energy produced in context, we estimate the number of home equivalents that can be supplied with the estimated renewable energy generated by our portfolio. We use the following formula to calculate this:

$$\text{Household eq supplied}_a = \frac{\text{Electricity production}_a}{\text{Electricity consumption per household}_c}$$

where 'a' stands for asset and 'c' for country

where the average electricity consumption per dwelling comes from [Odyssey-Mure Project](#). This data reflects average electricity consumption per dwelling across European countries so the scope is assets based in Europe. The terms dwelling and household are used interchangeably.

² PCAF (2025). [The Global GHG Accounting and Reporting Standard Part A: Financed Emissions](#). Third Edition, page 71

³ The P90 10-year value should be interpreted as a predicted value of electricity production that has a 90% probability of being exceeded in an average year over a 10-year period.

For investments in renewable energy, we receive production and generation data from external asset managers. At the same time, we know the total equity plus debt of the project or investee company and the outstanding amount of our investment. Accordingly, the PCAF data quality score for renewable energy investments is Score 3.⁴

However, the PCAF data quality score does not capture the fact that for our equity investments, we primarily rely on actual production and generation data, while, for our debt investments, we rely on projections.

⁴ PCAF (2025). [The Global GHG Accounting and Reporting Standard Part A: Financed Emissions](#). Third Edition, page 71

Green buildings

For our investments in green buildings, we define estimated emissions avoided as the difference between estimated emissions from investments in climate solutions and those from properties of a similar size taking the average emission intensity of the country in which they are located and sector in which they operate. This relies on the definition provided in the Position Paper on Green Bonds Impact Reporting by Nordic Public Sector Issuers.⁵

For equity investments in green buildings, we calculate emission and energy intensity data for only those assets that have emissions and energy consumption data available for the whole floor area of the building for the entire year. If such information is not available, GRESB does not provide emission and energy intensity data and we do not report emissions avoided and energy saved for those assets. GRESB also only provides data for standing assets, meaning that assets in development are excluded from our analysis. Furthermore, as we invest in many green buildings indirectly through funds, we estimate emissions avoided only for those assets for which we have enough asset-level financial and sustainability data. It should also be noted that funds reporting to GRESB for the first time are also not required to publish their data on the GRESB portal. We remain engaged with asset managers to increase data coverage.

The following formula is used for green buildings:

$$\text{Energy consumption intensity}_a = \frac{\text{Energy consumption}_a}{\text{Area}_a}$$

$$\text{Emission intensity}_a = \frac{\text{GHG emissions}_a}{\text{Area}_a}$$

where 'a' stands for asset
area is gross floor area (GFA) as used by GRESB

We compare emission and energy intensity per asset with the average CO2 emission factor and energy intensity of buildings in the corresponding sector and country to obtain energy saved per m2 and emissions avoided per m2. The source of this data is the PCAF European building emission factor database created by Guidehouse Netherlands B.V. on behalf of PCAF.

We use emission factors specific to the sector and country of the asset as these are usually two primary variables when making investment decisions.

$$\text{Energy saved per m2} = \text{Energy intensity}_a - \text{energy intensity}_{c,s}$$

$$\text{Emissions avoided per m2} = \text{emission intensity}_a - \text{emission factor}_{c,s}$$

where 'a' stands for asset, 'c' for country and 's' for sector

To calculate emissions avoided and energy saved by the portfolio, the following formula is used:

$$\text{Energy saved}_p = \sum_a \text{Attribution factor}_a \times \text{area}_a \times \text{energy saved per m2}_a$$

$$\text{Emissions avoided}_p = \sum_a \text{Attribution factor}_a \times \text{area}_a \times \text{emissions avoided per m2}_a$$

where attribution factor is calculated as:

$$\frac{\text{NN Gross Asset Value}_a}{\text{Asset level property value}_a}$$

where 'p' stands for portfolio and 'a' for asset

where NN Gross Asset Value (GAV) is the GAV attributable to NN based on reporting date of latest asset level GAV data (if available) or latest financial reporting date and asset level property value is asset current market value. Due to data availability, we use GAV instead of net asset value (NAV). As we do not know a property's value when the equity or debt investment was made, we follow PCAF guidance and use the latest property value available.

By calculating energy saved and emissions avoided in this way, we assume that if the investment in a particular asset had not been made, it would have been made in an asset from the same country and the same sector.

⁵ Nordic Public Sector Issuers, 2020, [Position Paper on Green Bonds Impact Reporting](#) (kuntarahoitus.fi)

For debt investments in green buildings, the process is different as there is no GRESB data available for debt investments. So instead of using actual consumption and emission data, we estimate these figures using country- sector- and EPC-label-specific emission and energy factors. This means the scope for calculating emissions avoided and energy saved is restricted to properties with an EPC label.

As a result, the energy saved and emissions avoided for real estate debt investments are calculated using the following formulas:

$$\begin{aligned} \text{Energy saved}_p &= \sum_a \text{Attribution factor}_a \times \text{area}_a \\ &\quad \times (\text{energy intensity}_{c,s,EPC} \\ &\quad - \text{energy intensity}_{c,s}) \\ \text{Emissions avoided}_p &= \sum_a \text{Attribution factor}_a \times \text{area}_a \\ &\quad \times (\text{emission factor}_{c,s,EPC} \\ &\quad - \text{emission factor}_{c,s}) \end{aligned}$$

where 'p' stands for portfolio, 'a' for asset, 'c' for country and 's' for sector

where EPC stands for EPC label, and attribution factor is calculated as follows:

We use the building emission factors from the PCAF European building emission factor database⁶. If the emission factor for a specific country, sector or EPC label is not available, we exclude properties related to these countries, sectors or EPC labels.

In both, equity and debt methodologies, country- and sector-specific energy intensities and emission factors used as benchmarks are derived directly from the CRREM Global Pathways.⁷ In the methodology for debt investments, energy

intensities and emission factors dependent on energy labels are derived from national EPC rating bands.

For both asset classes, we needed to make further adjustments to the data because the PCAF database provides more granular data on building types than is available for our portfolio. Table 2 maps building types from our portfolio to building types taken from PCAF.

⁶ PCAF European Building emissions factor database, [login page](#)

⁷ Decarbonisation Pathways – CRREM Global

Table 2: Mapping NN property types and PCAF building types

NN property type	PCAF building type	NN-adjusted PCAF building type
Cinema		Non-residential total
Hotel / Hospitality	Hotel	Hotel
Land		Non-residential total
Leisure	Leisure/Lodging	Leisure/Lodging
Logistics	Distribution warehouse cold	Non-residential total
Logistics	Distribution warehouse warm	Non-residential total
Regional distribution		Non-residential total
Intermodal		Non-residential total
Office	Office	Office
Other		Non-residential total
Parking		Non-residential total
Post asset		Non-residential total
Residential	Single-family house (SFH)	Residential total
Residential	Multi-family home	Residential total
Multi family	Multi-family home	Multi-family home
Single family	Single-family home	Single-family home
Senior living	Single-family home	Residential total
Senior living	Multi-family home	Residential total
Retail	Retail – high street	Non-residential total
Retail	Retail – shopping centre	Non-residential total
Retail	Retail – warehouse	Non-residential total
Malls	Retail – shopping centre	Retail – shopping centre
Care home	Healthcare	Healthcare

As calculation methods are different for equity and debt investments, the PCAF data quality score is also different. For both asset classes, the benchmark is based on building type and location. If we apply the PCAF data quality score based on the benchmark, both asset classes would receive Score 4. However, if we apply the score to the underlying data we have on properties, the scores differ per asset class. For equity investments, we receive primary data from GRESB. GRESB provides asset-level energy and emissions data as reported by asset managers. Since various asset managers use different emission factors, we take a precautionary approach and apply Score 2 to avoided-emission data from equity investments. On the other hand, for debt investments, we calculated avoided emissions from properties with an EPC label. This corresponds to Score 3 as defined by PCAF.⁸

⁸ PCAF (2025). *The Global GHG Accounting and Reporting Standard Part A: Financed Emissions*. Third Edition, page 80

Green bonds

Investments in green bonds are managed by our external asset manager. The manager calculates emissions avoided and installed capacity according to the methodology published in its impact report.⁹

As the green bond portfolio has exposure to a large number of issuers, emissions avoided are defined as annual tCO₂ avoided and reported by bond issuers. The benchmark is dependent on issuer methodology.

Impact figures are reported for bonds in portfolio at year-end while impact figures refer to the whole year. The asset manager collects impact data from issuers' impact reports and engages with the issuer if the reporting does not follow best practice, there is key information missing or any further clarification is needed. Data collection is described in more detail in the impact report. Issuer impact reports are usually not audited and so the asset manager sense-checks the data. A bond will not be in scope for impact calculation if the issuer's impact report has not yet been published or if the quality of the impact data is too low. Furthermore, in the case of some issuers, emissions avoided might not be a relevant Key Performance Indicator (KPI).

Issuers usually publish impact reports when they have allocated all an issue's proceeds or one year after the issuance of the bond. If the issuer allocated proceeds and published an impact report after full allocation, but publishes no further impact reports, the asset manager continues to use the last available reported impact data. Such provisional impact data, as well as if the issuer only reports expected impact, is used only if the methodology for calculating it is reasonable. Cumulative reported impact is deduced into the annual impact.

We do not apply the PCAF data quality score to this asset class because the PCAF Standard does not provide a data quality score for green bonds. The fact that the methodology to calculate the impact of our green bond investments is heavily reliant on the issuers' methodologies also compounds the difficulty of using the data quality score.

⁹ Goldman Sachs Green and Social Bond Funds Impact Report 2024 (p48-49)

Other

The climate solutions investment type that NN Group labels as Other include investments in unlisted entities. These are primarily investments in private equity funds.

Private equity funds often invest across multiple industries and sectors. In searching to achieve positive impact, they often apply different theories of change to different types of investment, also leading to different KPIs. This means that emissions avoided is not necessarily the most suitable metric for each investment.

We report emissions avoided only for those underlying companies where the funds we invest in report emissions avoided. Similar to the approach to impact reporting we apply for green bond investments, we take figures as reported by the fund managers and their investee companies. This means that the methodology to calculate emissions avoided can differ from one fund and/or investee to another. In order to better understand the data we receive, we prefer to work with managers who are transparent about how they calculate their impact figures.

The impact is attributed to our share of any investment. Equity value represents the market value of equity owned by NN. These values are validated using the periodic financial reporting from the fund manager.

$$\text{Attribution factor}_a = \frac{\text{Outstanding amount}_a}{\text{Total equity} + \text{debt}_a}$$

$$\begin{aligned} \text{Outstanding investment amount}_a \\ = \% \text{ ownership share} \times \text{equity value} \end{aligned}$$

where 'a' stands for asset

We do not apply the PCAF data quality score to this asset class for the same reasons we do not apply it to our green bond investments.

