



# Impact reporting methodology

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## Introduction

In addition to outlining the allocation of green bond proceeds to green loans, the objective of KommuneKredit's Green Bond Impact Report is to demonstrate the expected environmental impact of green loans financed through the issuance of green bonds in alignment with our Green Bond Framework.

This document describes the methodology applied in calculating the expected environmental impact of our green loan portfolio 2022.

## Expected environmental impact

Our [Green Bond Impact Report](#) illustrates the expected environmental impacts from projects to which green bond proceeds have been allocated. The impacts are based on our customers' ex-ante

estimates of expected annual outcome for an average year in the project's lifecycle. As a result, the Green Bond Impact Report does not guarantee that the expected/reported impact will materialise in practise. The figures should therefore be applied with caution. The indicators are selected based on an analysis of relevance to our green bond investors.

The expected environmental impact of financed projects is quantified where possible, focusing on the first two environmental objectives of the EU Taxonomy, 'Climate change mitigation' and 'Climate change adaptation'<sup>1</sup>. The green loan categories 'Clean Transportation', 'Green Buildings', and 'Energy' lie well within the climate mitigation objective, and expected environmental impacts

are thus reported in reduced/avoided CO<sub>2</sub>e emissions. Projects in the green loan categories 'Sustainable Water and Wastewater Management' and 'Pollution Prevention and Control' focus on both climate mitigation and adaptation but are better described under the upcoming objective of the EU Taxonomy, 'Sustainable use and protection'. The effects of these categories mostly relate to environmental considerations. Still, some climate mitigation effects are readily reported. Lastly, our category 'Climate Adaptation',

## Get in touch

We welcome any comments, suggestions, or questions you may have regarding our impact report. Please send an email to [bk@kommunekredit.dk](mailto:bk@kommunekredit.dk).



## Key reporting principles

We follow the impact reporting principles of the Nordic Public Sector Issuers Position Paper on Green Bond Impact Reporting, 2020.

- We calculate CO<sub>2</sub>e emissions using scope 1 and scope 2 as defined by the Greenhouse Gas Protocol.
- We apply a conservative approach to the selection and calculation of emission baselines.
- We report on the impact share that is attributable to KommuneKredit's financing.
- We apply a portfolio approach.
- We provide an impact assessment with the reservations that not all related data can be obtained and that the reported impact is reliant on our customers' ex ante estimate of physical activity data.

<sup>1</sup> Note that KommuneKredit's Green Bond Framework 2022 aligns with the International Capital Markets Association's (ICMA) [Green Bond Principles](#) (GBP) 2021. Nevertheless, to accommodate and reflect emerging regulation, our green loan eligibility criteria were, as a starting point, based on the EU Taxonomy's Technical Screening Criteria (TSC) of the Climate Change Mitigation Objective. KommuneKredit engaged an independent technical consultant to help conduct a general level assessment of the loan categories and criteria against the TSC and Do No Significant Harm criteria ('DNSH'). Moreover, CICERO Shades of Green, now a part of S&P Global, provided a voluntary assessment of the EU Taxonomy alignment vis-à-vis the TSC of the Climate Mitigation Objective as part of the second party opinion of the Framework.

belongs to the 'Climate change adaptation' objective.

The environmental impact that we report on is therefore divided into three sub-categories.

- The climate adaptation impact (qualitative)
- The environmental impact (qualitative/quantitative)
- The greenhouse gas emissions (GHG) reduced/avoided (quantitative).

Our impact reporting is dependent on data as reported to us by our customers. With regard to the first two categories, the expected environmental impact is a direct disclosure of the data that we have received from our customers. The third category regarding reduced/avoided GHG is calculated by KommuneKredit using the reported physical activity data from our customers (for example,

number of MWh)<sup>2</sup>. The CO<sub>2</sub>e emissions reduced/avoided calculated by KommuneKredit could therefore differ from other applied methodologies. Due to the conservativeness of KommuneKredit's approach, the figures that we report will be on the lower side. Data provided by the customer on each individual loan is available [here](#).

#### Impact per invested DKK

Figures are presented on the impact per invested DKK. These figures present the estimated environmental impact of projects to which green bond proceeds have been allocated. It is a readily comparable parameter but should be used with some reservation.

The practice of reporting environmental impact varies between issuers of green bonds. The share of eligible projects in a Green Bond Framework that focus on the CO<sub>2</sub>e effect and climate adaptation,

or general environmental considerations, will vary. Moreover, how far along the recipients of the green bond proceeds are in the green transition will affect the applied baselines for CO<sub>2</sub>e emission calculations. Impact per invested DKK is therefore presented at an aggregate level and for each category eligible in the Green Bond Framework.

#### Calculating CO<sub>2</sub>e emissions

The environmental impact of projects under our Green Bond Framework (2022) is calculated based on physical activity data compared to an alternative scenario where the project has not taken place or displaces some other more CO<sub>2</sub>e-intensive practice. To calculate the climate impact from projects financed by KommuneKredit through our Green Bond Framework (2022), baseline emission factors and project emission factors therefore need to be established.

#### Calculating CO<sub>2</sub>e emissions

Two types of emission factors need to be established to calculate CO<sub>2</sub>e emissions:

- Baseline emission factors (emission factor for the alternative scenario).
- Project emissions factors (emission factor for the expected emissions from the project in question).

The reported CO<sub>2</sub>e impact per primary physical activity data is exclusively linked to the baselines as presented in the following. At KommuneKredit we therefore update our emission factors for CO<sub>2</sub>e emissions calculations annually. The emission factors for CO<sub>2</sub>e emission calculations are established based on the following screening criteria, in prioritised order:

<sup>2</sup> However, with the following exceptions: CO<sub>2</sub>e data is directly delivered by the customer concerning loans in the Pollution Prevention and Control category, infrastructure investments in the Clean Transportation category and where the production of biogas is the primary focus for projects in the Sustainable Water and Wastewater Management category.

1. Factors recommended by the [Nordic Position Paper on Green Bonds Impact Reporting](#)
2. Utilise readily available national average emission factor for the primary physical activity data analysed
3. Calculate national average emission factor for the primary physical activity data analysed
4. Utilise readily available international average emission factor for the primary physical activity data analysed
5. If unavailable or data is too uncertain, no CO<sub>2</sub>e emission reduced/avoided is reported.

The baseline emission factors and the project emission factors that we apply in our impact calculations are summarised in the table to the right and described in more detail in the following sections.

### Baseline and project emission factors summarised

<b>Baseline emission factors</b>	<b>Emission factor</b>	<b>Unit of measurement</b>
Diesel-fuelled passenger car	138	gCO <sub>2</sub> e/km
Electricity consumption	315	kgCO <sub>2</sub> e/MWh
Heat consumption excluding district heating and heat pumps	94	kgCO <sub>2</sub> e/MWh
Heat consumption including district heating and heat pumps	84	kgCO <sub>2</sub> e/MWh

  

<b>Project emission factors</b>	<b>Emission factor</b>	<b>Unit of measurement</b>
Transportation with 0 direct tailpipe emissions	0	gCO <sub>2</sub> e/km
Geothermal heat pumps	41	kgCO <sub>2</sub> e/MWh
Ground water heat pumps	79	kgCO <sub>2</sub> e/MWh
Variable electricity generation, e.g., wind and solar power projects	0	kgCO <sub>2</sub> e/MWh
Biomass as a heat source	6	kgCO <sub>2</sub> e/MWh
District heating projects	72	kgCO <sub>2</sub> e/MWh

## Baseline emission factors

### Electricity

A common baseline for electricity is used throughout the green categories in our Green Bond Framework. The Nordic Public Sector Issuers have in their [Position Paper on Green Bonds Impact Reporting](#) calculated a baseline emission factor for electricity using the International Financial Institution's (IFI) Harmonized Framework methodology. The emission baseline is an average of two margins, a grid Operating Margin (OM) and a Build Margin (BM) from potential new generation capacity that is affected by the project. The default combination of OM and BM (50%:50%) for all electricity-related projects is used to reflect an open Nordic electricity system interconnected to neighbouring northern European systems. The OM and BM from the European mainland mix, including the UK and Norway, establishes the base for the baseline emission factor. The resulting default baseline

emission factor for electricity is 315 kg CO<sub>2</sub>e/MWh.

### District heating

A significant share of projects financed by the issuance of Green Bonds at KommuneKredit target district heating investments. Projects categorised as 'Energy' are loans for investments in, and ongoing maintenance of, distribution infrastructure and clean energy generation to ensure that customers receive district heating. Projects in the Green Building category will also rely on district heating data.

For simplicity's sake, and as most recipients of the district heating projects that we finance are at the household level, household alternative heat generation is utilised for the calculation of baselines. Two baselines are established for district heating, one where the data points omit the share of heat consumption that is coupled to district heating

and household heat pumps and one that includes them. It is assumed that general district heating projects do not substitute other district heating projects or household heat pumps, but that heat-related emissions from a specific building in the Green Building category includes all heat sources. Both baselines are calculated using the following data sources:

- Total heat output of alternative heat sources<sup>3</sup> from the Danish Energy Agency's 'Klimastatus- og fremskrivning 2022'<sup>4</sup> datasets forming the basis for the report, available [here](#).
- Heat efficiency values from the Danish Energy Agency's 'Technology Data', available [here](#).
- Nationally determined CO<sub>2</sub>e emission baselines where available for the heat source in question as presented by the Danish Business Authority<sup>5</sup>. Where unavailable, international baselines are

utilised. Specifically, the average electricity CO<sub>2</sub>e emission factor recommended by the Nordic Public Sector Issuers and the US Environmental Protection Agency (EPA) Center for Corporate Climate Leadership's Emission Factors for Greenhouse Gas Inventories concerning biomass<sup>6</sup>, available [here](#).

### Clean Transportation

A single baseline has been established for Clean Transportation, as the expected CO<sub>2</sub>e emissions resulting from investments within this green loan category, with the exception of electrified passenger cars, are reported directly by the green loan recipient. When calculating the impact of investments in electrified passenger cars, we utilise an average CO<sub>2</sub>e emission factor for the average Danish diesel-fuelled passenger car, which is 138 g CO<sub>2</sub>e per km. This emission factor is directly reported by [the Danish Energy Agency](#).

<sup>3</sup> Alternative heat sources include fuel oil, natural gas, biogas, biomass, other renewable sources, direct electricity heating and, lastly, district heating and heat pumps, which are included where relevant.

<sup>4</sup> Updated version only available in Danish.

<sup>5</sup> The Danish Business Authority's [Klimakompasset](#).

<sup>6</sup> Biogenic CO<sub>2</sub>e emissions are not included as they are considered 'outside of scopes' by the GHG Protocol Corporate Accounting and Reporting Standard.

## Project emission factors

Projects that are financed with the proceeds from our green bonds do not necessarily imply a positive climate impact or carbon neutrality. Within the green loan categories that our Green Bond Framework 2022 encompasses, there are investments that are important to the sustainable transition of society, although not for reducing CO<sub>2</sub>e emissions, for example, cloudburst protection and coastal protection.

The project emission factors relevant to each green loan category in our Green Bond Framework are described below, with the exception of the green loan category 'Climate Adaptation', which is not relevant for the calculation of carbon emissions.

### Clean Transportation

As noted earlier, we calculate the CO<sub>2</sub>e emission reductions for electrified pas-

senger cars utilising an emission factor provided by the Danish Energy Agency. Note, however, that our green loan portfolio 2022 does not contain investments for electric cars.

### Green Buildings

For the construction of new buildings, the baseline for avoided CO<sub>2</sub>e emissions is based on the average energy framework<sup>7</sup> of existing buildings. However, the average energy framework in existing Danish buildings has not been possible to acquire or calculate. A conservative estimate will therefore be utilised. The Department of the Built Environment at Aalborg University has calculated the average heat consumption per heated m<sup>2</sup> in Danish buildings since before 1960 and until 2021 in the report "[BUILD Rapport 2021:08](#)". The report concludes that the average heat consumption in kWh/m<sup>2</sup>/year is 50 after 2016. It is assumed that the total energy framework will be higher, as it will also

include the energy needed for ventilation and cooling. 50 kWh/m<sup>2</sup>/year can therefore form a conservative baseline for calculating avoided emissions.

The calculated CO<sub>2</sub>e impact per kWh/m<sup>2</sup>/year does not include the potential reduction in average electricity consumed. Instead, the baseline solely includes the average CO<sub>2</sub>e emitted per MWh reduced from household heat consumption. By utilising the baseline emission factor as presented in the table on p. 4, including district heating and heat pumps, a conservative estimate of the CO<sub>2</sub>e reduced is therefore calculated.

For building renovations, a baseline for CO<sub>2</sub>e emissions will consider both electricity savings and heat consumption at the household level. For electricity, the baseline of 315 kgCO<sub>2</sub>e/MWh will be applied. For heat consumption, the baseline of 84 kgCO<sub>2</sub>e/MWh will be applied.

### Sustainable Water and Wastewater Management

Two types of investments that imply CO<sub>2</sub>e reduction/avoidance is financed within the Sustainable Water and Wastewater Management category; Ground water heat pumps and the production of biogas. Intrinsic heat in ground water can be utilised to produce energy in the water supply system. At a wastewater treatment plant, the treatment of sludge can produce biogas. The two options differ in how their baseline is acquired.

Ground water heat pumps displace either individual heat production in households as a part of the district heating network or internal energy needs in the water supply system. As such, the baseline for ground water heat pumps is either the kgCO<sub>2</sub>e/MWh emitted by the average Danish household that is not connected to the district heating network, see tabel p. 4, or the common baseline for electricity. If the purpose of the ground water

<sup>7</sup> Energy Framework is a factor that determines the total energy need (heating, ventilation, cooling and domestic hot water).

heat pump is to produce district heating, the general baseline is 84 kgCO<sub>2</sub>e/MWh. If the financed ground water heat pump projects produce energy for internal energy needs, the emission factor is calculated using the average heat efficiency of approximately four divided by the emission factor for electricity (315 kgCO<sub>2</sub>e/MWh divided by 4), which in 2022 equals 79 kgCO<sub>2</sub>e/MWh.

CO<sub>2</sub>e reduction ensured by biogas is reported by the recipient of the green loan. It is noted that a large share of the projects categorised within the category Sustainable Water and Wastewater Management strive to optimise facilities that collect, treat, supply, and purify water or wastewater and in doing so reduce energy consumption, CO<sub>2</sub>e emissions, improve health measures or further ensure the general water supply in Denmark. Data concerning energy consumption at the individual plant and average energy used for the supply are not readily available.

The resulting reduced/avoided CO<sub>2</sub>e emissions for energy efficiency in water or wastewater projects are therefore not reported.

### Energy

The distribution, pipelines, storage of energy and associated infrastructure are considered integral to the continued provision of district heating. The average CO<sub>2</sub>e emission of 72 kgCO<sub>2</sub>e/MWh from Danish district heating is applied, directly reported in Klimakompasset's underlying emission factors. A heat distribution loss of 10% is assumed.

Project emission factors for direct investments in the production of heat are dependent on the source of heat production. Electricity generation from wind and solar are considered CO<sub>2</sub>e neutral. Biomass produces very little CO<sub>2</sub>e emissions within scopes, as biomass primarily emits biogenic emissions. The project emission baseline is sourced from [EPA](#). Geothermal heat

pumps have an average heat efficiency of 7.6<sup>8</sup>, resulting in an average emission of 41.45 kgCO<sub>2</sub>e/MWh, using the general baseline for electricity emissions.

### Pollution Prevention and Control

CO<sub>2</sub>e reduction ensured by projects categorised as pollution prevention and control is reported by the recipient of the green loan.

### Collected Data and Climate Impact Calculation

The table on next pages summarises the data collected for KommuneKredit's green bond impact reporting as well as the climate impact calculation applied in the reporting.

<sup>8</sup> [Technology Data](#)

## Collected data and climate impact calculation

Category	Collected data	Climate impact calculation
<b>Clean transportation</b>	<ul style="list-style-type: none"> <li>Number of km of new train lines, etc. created.</li> <li>Passenger-kilometres in new means of transportation.</li> <li>Estimated reduction in car use and car kilometres.</li> <li>Project's effect on increased resilience to climate change.</li> <li>Number of charging points installed or upgraded.</li> </ul>	<p><i>Diesel-fuelled kilometres displaced</i>            (Passenger-kilometres in new means of transportation) * (Baseline emission factor for Diesel fuelled passenger car)</p>
<b>Green buildings</b>	<ul style="list-style-type: none"> <li>Heated surface area in square metres.</li> <li>Annual energy avoided in MWh compared to the relevant building code (for new buildings).</li> <li>Annual energy reduced in MWh compared to the pre-investment situation (for refurbishments).</li> <li>Annual energy production on-site, in MWh.</li> <li>Estimated annual heating consumption avoided, measured in kWh/m<sup>2</sup>/year.</li> </ul>	<p><i>Construction of buildings or acquisition</i>            ((Average heat consumption per heated m<sup>2</sup> in Danish buildings (kWh/m<sup>2</sup>/year))            – (Estimated annual heating consumption avoided, measured in kWh/m<sup>2</sup>/year))            * (Heated surface area in square metres) * (Heat consumption including district heating and heat pumps (kgCO<sub>2</sub>e/MWh))</p> <p><i>Major renovation/Energy Efficiency</i>            (Annual energy reduced in MWh compared to the pre-investment situation (for refurbishments)) * ((Heat consumption including district heating and heat pumps (kgCO<sub>2</sub>e/MWh)) or (Baseline emission factor for Electricity consumption (kgCO<sub>2</sub>e/MWh))</p> <p><i>Energy production on-site</i>            (Annual energy production on-site, in MWh) * ((Baseline emission factor for Electricity consumption (kgCO<sub>2</sub>e/MWh))</p>

Category	Collected data	Climate impact calculation
<b>Sustainable Water and Wastewater Management</b>	<ul style="list-style-type: none"> <li>Number of person equivalents (PE) of water or wastewater the plant processes, identifying any increase that can be attributed to the investment.</li> <li>Energy needs per processed m<sup>3</sup>, measured in kWh/m<sup>3</sup>.</li> <li>Annual water savings, in m<sup>3</sup>.</li> <li>Annual volume of wastewater treated or avoided, in m<sup>3</sup>.</li> <li>Resulting increase in capacity of facilities, m<sup>3</sup>/year.</li> <li>Reductions in emissions of methane, nitrogen, and phosphorus.</li> <li>Qualitative description of weather-related or climate-related problems that will be mitigated by the investment.</li> <li>Square meters adapted to weather-related or climate-related problems.</li> <li>Estimated annual increase in electricity/district heat distribution/production, measured in MWh/year.</li> <li>Estimated amount of biogas produced in a year, in MWh/year.</li> <li>Estimated CO<sub>2</sub>e emission avoided/reduced due to biogas production, in tCO<sub>2</sub>e/year.</li> </ul>	<p><i>Increase in district heat production</i>        ((Baseline emission factor for Heat consumption excluding district heating and heat pumps (kgCO<sub>2</sub>e/MWh)) - (Project emission factor for Groundwater heat pump (kgCO<sub>2</sub>e/MWh))) * (Estimated annual increase in electricity/district heat distribution/production, measured in MWh/year)</p> <p><i>Increase in renewable energy for internal electricity needs</i>        ((Baseline emission factor for Electricity consumption (kgCO<sub>2</sub>e/MWh)) - (Project emission factor for Groundwater heat pump (kgCO<sub>2</sub>e/MWh))) * (Estimated annual increase in electricity/district heat distribution/production, measured in MWh/year)</p> <p>CO<sub>2</sub>e emission reduced/avoided due to the production of biogas is reported by the loan recipient</p>
<b>Energy</b>	<ul style="list-style-type: none"> <li>Estimated annual increase in district heat distribution, in MWh/year.</li> <li>Estimated annual increase in renewable energy share of district heating, in MWh.</li> <li>Estimated annual energy reduced/avoided in MWh.</li> </ul>	<p><i>Increase in distributed district heating</i>        ((Baseline emission factor for Heat consumption excluding district heating and heat pumps (kgCO<sub>2</sub>e/MWh)) - (Project emission factor for District heating projects (kgCO<sub>2</sub>e/MWh))) * ((Estimated annual increase in district heat distribution, in MWh/year) * 90% (Heat loss))</p> <p><i>Increase in renewable energy share of district heating</i>        ((Baseline emission factor for Heat consumption excluding district heating and heat pumps (kgCO<sub>2</sub>e/MWh)) - ((Project emission factor for Geothermal heat pumps (kgCO<sub>2</sub>e/MWh)) or (Project emission factor for Biomass as a heat source (kgCO<sub>2</sub>e/MWh)) or (Project emission factor for Variable electricity generation, e.g., wind and solar power projects (kgCO<sub>2</sub>e/MWh)))) * (Estimated annual increase in renewable energy share of district heating, in MWh)</p> <p><i>Annual energy reduced/avoided</i>        ((Baseline emission factor for Electricity consumption (kgCO<sub>2</sub>e/MWh)) * (Estimated annual energy reduced/avoided in MWh))</p>

Category	Collected data	Climate impact calculation
<b>Pollution prevention and control</b>	<ul style="list-style-type: none"> <li>▪ Waste that is prevented, minimised, reused or recycled before and after the project in pct. of total waste and/or in absolute amount in tonnes p.a.</li> <li>▪ Annual absolute (gross) amount of waste that is separated and/or collected and treated (including composted) or disposed of (in tonnes p.a. and in pct. of total waste).</li> <li>▪ Annual energy generation, in MW.</li> <li>▪ CO<sub>2</sub>e emission reductions resulting from the financed project</li> <li>▪ Qualitative description of environmental effects.</li> </ul>	CO <sub>2</sub> e reduction ensured by projects categorised as pollution prevention and control is reported by the recipient of the financing.
<b>Climate adaption</b>	<ul style="list-style-type: none"> <li>▪ Physical climate risk addressed and expected adaptation-related outcome (quantified if possible).</li> <li>▪ Qualitative description of weather-related or climate-related problems that will be mitigated by the investment.</li> <li>▪ Square meters adapted to weather-related or climate-related problems.</li> </ul>	Not relevant.

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