Greenhouse Gas Emissions of BNG Bank Loan Portfolio

Reporting year 2022

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Management summary

Since the 2015 Paris Climate Conference, the banking sector has been involved in contributing to the realization of the ambitions of the Paris Agreement. Given the scale of the climate challenge and the crucial role of the banking industry, and the financial sector in general, in facilitating the net zero carbon transition, the Partnership for Carbon Accounting Financials (PCAF) was created.

The first method for carbon accounting for Dutch financials was launched in November 2017 followed by yearly updates. Measuring and disclosing the Greenhouse Gas (GHG) emissions associated with the lending and investment activities of financial institutions are necessary conditions for transparency and accountability. But PCAF is not only about measuring and disclosing the carbon footprint of a financial institutions portfolio. It's also about setting targets, developing strategies, and taking action by these institutions to align their portfolio with the Paris Climate Agreement and by monitoring on an annual basis if organizations are making progress towards achieving the targets set by themselves.

BNG Bank committed itself to PCAF in 2019. In 2018, preparing itself for joining the PCAF initiative, BNG Bank asked Telos[1], to adapt the PCAF methodology in such a way that it could be used to measure the GHG emissions associated with the bank's public sector loan portfolio.

Based on this PCAF methodology adapted for public banks, the GHG emissions of the bank's loan portfolio have been calculated and disclosed in the BNG Annual Reports for reporting years 2019, 2020, and 2021.[2] For some sectors certain amendments to the methodology were made in reporting year 2021 (in comparison to reporting year 2019 and 2020). Finding opportunities to improve the methodology, for instance by changing the calculation methodology or using other data sources, is an ongoing process. These improvements in quality of the PCAF methodology also can be seen as a further contribution from BNG Bank to the development of the PCAF methodology. For reporting year 2022, again some methodological changes have been implemented by Het PON & Telos. The reasoning behind and justification for these changes are being discussed in detail in this report. Because certain amendments to the methodology were implemented by Het PON & Telos, the GHG emissions of the sectors for which the methodology was changed were recalculated not only for reporting year 2022, but also for reporting years 2019 and 2021. Reporting year 2019 is the reference year for BNG Bank and will always be recalculated in case of amendments to the methodology. In addition, each year the GHG emissions of the most recent year and one year earlier will be (re)calculated. In current report the overview tables will contain the results of reporting years 2019, 2021, and 2022 and enables the bank to monitor the development of the GHG emissions over time.

[1] At that time Telos was an independent research institute, based at Tilburg University. In January 2020 Het PON and Telos have merged into one organization called Het PON & Telos. At the same moment this new institute , Het PON & Telos, became official partner of Tilburg University.
[2] https://www.bngbank.com/Financials/Annual-report

The current report describes the results as well as the methodology of the GHG emissions assessment of BNG Bank's loan portfolio for reporting year 2022. The climate impact has been (re)calculated in line with the harmonized approach for the financial sector in the Netherlands 2019.[3]

Current report contains direct (scope 1) as well as indirect GHG emissions (scope 2 and if available scope 3). These GHG emissions are calculated based on available information, such as energy consumption, travel behavior, and purchased materials. For the calculation appropriate emission factors have been used. Besides the calculation of the GHG emissions, a ratio between outstanding loan portfolio per client and the total balance sheet of the respective client has been used for the attribution of BNG Bank loans to the total assets of GHG emitting clients. This results in the attributed GHG emissions for BNG Bank's loans. These attributed GHG emissions are presented in current report. The total GHG emissions can be divided into direct (scope 1) as well as indirect GHG emissions (scope 2 and if available scope 3). In Table S-2 the following GHG emissions are presented: total GHG emissions (sum of scopes 1, 2, and 3) of all sectors, GHG emissions of only scopes 1 and 2 of all sectors, and GHG emissions of only scopes 1 and 2 of four sectors, namely social housing associations, municipalities, healthcare institutions, and educational institutions.

For BNG Bank it has been possible, because of its unique position in the market, to cover 91.3% of its portfolio in this GHG emission report, as illustrated in Table S-1. The coverage rate increased from 90.5% to 91.3% in comparison to reporting year 2021.
In the climate action plan, BNG Bank focuses on the GHG emissions of scopes 1 and 2 of four sectors, namely social housing associations, municipalities, healthcare institutions, and educational institutions. The coverage rate for these scopes (1 and 2) by these four sectors is 95% for reporting year 2022.

As can be seen in Table S-2, BNG Bank's loan portfolio for reporting year 2022 has a total emission of 2,533 kiloton CO_2 equivalent. In comparison to reporting year 2021 the total emissions have decreased by 126 kiloton (-4.7%). The reduction was mainly due to a reduction of GHG emissions for the municipalities (-69 kiloton CO_2 equivalent) and for the healthcare sector (-22 kiloton CO_2 equivalent). For the healthcare sector the reduction was largest for scope 1 (-13 kiloton CO_2 equivalent) and for municipalities the reduction was largest for scope 3 (-60 kiloton CO_2 equivalent). Unfortunately, data quality of scope 3 for municipalities is poor (score 4), therefore we should be somewhat cautious about drawing conclusions based on these data.

The loan portfolio covered by the GHG footprint calculation has grown from 72 to 80 billion Euro in four years. During these four years, the three largest sectors (social housing sector, municipalities, and healthcare sector) have shown a reduction in the GHG emissions by 301 kiloton.

As a result of an increased loan portfolio covered by the GHG footprint calculation and a reduction in the absolute GHG emissions, the relative emissions of all sectors (ton CO_2-

[3] Accounting GHG emissions and taking action: harmonised approach for the financial sector in the Netherlands PCAF The Netherlands, report 2019

eq/million Euro) have decreased from 39.1 ton per million Euro for reporting year 2019 to 31.8 ton per million Euro for reporting year 2022. The relative emissions of all sectors (ton CO_2-eq/million Euro) have decreased from 34.2 ton per million Euro for reporting year 2021 to 31.8 ton per million Euro for reporting year 2022 (-7.0%). Per million Euro, the municipalities and water authorities have the highest GHG emissions. During the last four years, the water authorities have shown a large decrease in the relative emissions.

The absolute and relative decrease of GHG emissions of BNG's loan portfolio is positive. Many factors play a role in explaining why this development is taking place. It can be due to changes at the side of the bank, such as changes in clients, changes in the outstanding loan volumes, changes in the total balance sheet of the clients, and changes in the ratio outstanding loan volume / total balance sheet.
However, the goal is to reduce GHG emissions through actions that are taken or investments that are done by the clients. If a decrease is seen at client level, this can be a result of the fact that more and more investments are made to make real estate more sustainable. Attention for energy savings grows and there are also more investments made in renewable energy. These developments can be seen all around us. Across all sectors, more and more actions are taken to achieve the climate agreement target of 49% reduction in GHG emissions in 2030 compared to 1990. These actions are partly reflected in this report. However, some actions are taken by the clients, but are not yet visible in the results of this report because of these changes are not represented in the used data source. For example, the actions that are taken to make mobility more sustainable at municipalities and provinces is not visible yet.

Several other external factors can influence the GHG emissions, such as the weather, the current energy crisis due to the war between Ukraine and Russia, and the COVID-19 crisis. The effect of the energy crisis is probably small in current report, because most recent used data is from the year 2021.
The winter of 2019/2020 was the second warmest since recording began.[4] The winter of 2020/2021 was also a mild winter. Mild winters often result in lower natural gas use and may affect scope 1 in current report.
Higher energy prices due to the energy crisis may accelerate the generation of renewable energy and actions to save energy. We may see the effect in the coming years.
The worldwide COVID-19 crisis started in the beginning of 2020 and was still present in the year 2021. Also in the year 2021, various measures were taken to control this crisis. This COVID-19 crisis still influenced the results of reporting year 2022. In the year 2022, the influence of the COVID-19 crisis will probably be less than in the year 2021 and it is possible that next year some GHG emissions may increase again.

Nevertheless, the absolute and relative decrease of GHG emissions that is seen in the result of this report is a positive development. By longitudinal monitoring of the GHG footprint of the bank's loan portfolio, the results will show whether the reduction is temporary or a long term positive development.

[4] https://www.knmi.nl/nederland-nu/klimatologie/maand-en-seizoensoverzichten/2020/winter

Table S-1 Total outstanding loans of BNG Bank and part covered in the GHG assessment for reporting years 2019, 2021, and 2022[5]

Market segment	Sector	Loan portfolio (million EUR)			Loan portfolio Covered with GHG footprint (%)		
		2022	**2021^**	**2019**	**2022**	**2021**	**2019**
Social housing	Social housing associations*	43,336	41,791	38,739	98.5	98.7	98.9
	Others	67	71	9	0.0	0.0	0.0
Public sector	Municipalities*	27,272	27,402	26,033	99.9	99.8	99.8
	Provinces	337	357	137	100.0	100.0	100.0
	Water authorities	204	193	233	100.0	100.0	100.0
	Joint regulations	1,935	2,066	2,014	35.6	0.0	0.0
	Others	1,344	1,371	1,290	0.0	0.0	0.0
Healthcare	Healthcare*	6,860	7,130	6,973	86.9	86.3	87.4
Education*	PO	69	38	17	26.8	52.9	100.0
	VO	192	177	146	70.8	67.3	65.3
	MBO	152	165	217	96.8	96.3	99.3
	HBO	50	62	92	100.0	100.0	99.7
	WO	273	299	210	99.3	99.2	98.8
	Others	257	265	272	0.0	0.0	0.0
Networks	Drinking water utilities	677	686	811	87.7	88.0	0.0
	Others	731	471	435	0.0	0.0	0.0
Mobility	Mobility	1,229	1,398	1,512	86.1	87.5	58.5
Energy	Energy	836	662	541	0.0	0.0	0.0
Environment	Environment	745	792	759	0.0	0.0	0.0
Financial institutions	Financial institutions	226	235	157	0.0	0.0	0.0
Others		320	351	120	19.0	18.0	0.0
Remaining				911			0.0
Total		**87,112**	**85,982**	**81,628**	**91.3**	**90.5**	**88.5**

* In the climate action plan, BNG Bank focuses on the GHG emissions of scope 1 and 2 of 4 sectors, namely social housing associations, municipalities, healthcare institutions, and educational institutions.
The coverage rate for these scopes (1 and 2) by these four sectors is 95% for reporting year 2022.
^In current report, data of reporting year 2020 is not included. The decisions has been made to calculate 3 years. The reference year (reporting year 2019) an the two most recent years which are reporting years 2021 and 2022 for current report.

[5]Reference date for reporting year 2022 is 31-12-2021, reference date for reporting year 2021 is 31-12-2020, and reference date for reporting year 2019 is 31-12-2018.

Table S-2 Absolute and relative GHG emissions for reporting years 2019, 2021, and 2022

Market segment	Sector ^	Part covered with GHG footprint (million EUR)			GHG emissions (ton CO_2-eq)			Relative GHG emissions (ton CO_2-eq/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Social housing	Social housing associations	42,782	41,231	38,302	563,942	574,234	664,218	13.2	13.9	17.3
Public sector	Municipalities	27,230	27,359	25,973	1,610,878	1,679,491	1,725,922	59.2	61.4	66.5
	Provinces	337	357	137	10,573	11,292	5,449	31.4	31.6	39.8
	Water authorities	204	193	233	19,117	24,807	39,419	93.8	128.4	169.0
	Joint Regulations	689	0	0	17	-	-	0.03	-	-
Healthcare	Healthcare	5,962	6,151	6,096	259,129	280,856	344,455	43.5	45.6	56.5
Education	Education	623	656	627	26,207	35,148	33,918	42.1	53.6	54.1
Networks	Drinking water utilities	593	603	0	26,300	29,803	-	44.3	49.4	-
Mobility	Mobility	1,058	1,223	885	16,894	23,471	14,017	16.0	19.2	15.8
Others	Others	61	63	0	206	264	-	3.4	4.2	-
Total scopes 1, 2, and 3	**All sectors**	**79,539**	**77,836**	**72,253**	**2,533,263**	**2,659,366**	**2,827,398**	**31.8**	**34.2**	**39.1**
Total scopes 1 and 2	**All sectors**	**79,539**	**77,836**	**72,253**	**1,113,567**	**1,174,759**	**1,333,326**	**14.0**	**15.1**	**18.5**
Total scopes 1 and 2*	**Social housing Municipalities Healthcare Education***	**76,597**	**75,397**	**70,998**	**1,057,676**	**1,104,306**	**1,282,762**	**13.8**	**14.6**	**18.1**

^ Avoided emissions need to be reported separately from actual emissions, therefore the avoided emissions that have been calculated for this report are not included in this table, but are presented separately in chapter 25 and 26.

*The totals for scope 1 and 2 are reported for the sectors in total, but also for the sectors social housing, municipalities, healthcare, and education together.

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1 Introduction

Since the 2015 Paris Climate Conference, the Dutch financial sector has been involved in contributing to the realization of the ambitions of the Paris Agreement. Banks play a crucial role in the realization of these ambitions. Not only because they represent most of the worldwide available capital, but also because the largest banks have still invested heavily in the fossil fuel sector, specifically, nearly $4.6 trillion since the Paris Climate Agreement. This is equivalent to $1.8 billion for every day since the end of 2015, not showing a downward trend and lacking assessment of the carbon impact of that finance.[6]

1.1 A Partnership for Carbon Accounting Financials: PCAF

The Partnership for Carbon Accounting Financials: PCAF is a global partnership of financial institutions that work together to develop and implement a harmonized approach to assess and disclose the GHG emissions associated with their loans and investments.[7]

In 2015, the Dutch Carbon Pledge (PCAF) started with eleven institutions under the leadership of ASN bank. These financial institutions wanted to take responsibility and come with new and meaningful steps to keep global warming under safe levels. Since then, more financial institutions from the Netherlands have joined forces under PCAF to develop and implement open-source methodologies to measure the GHG emissions of all asset classes within their loan and investment portfolios.[8] At the beginning of 2019, BNG Bank formally committed themselves to the PCAF initiative.

Building on the GHG accounting activities in the Netherlands and North America, ABN AMRO, Amalgamated Bank, ASN Bank, Global Alliance for Banking on Values (GABV), and Triodos Bank decided to launch a global initiative to develop a global GHG accounting standard and increase the number of financial institutions applying this standard to over 250 institutions worldwide, and ultimately to make GHG accounting common practice within the financial industry.[9]

In October 2022, 318 financial institutions have committed to measure and disclose the GHG emissions associated with their portfolio of loans and investments with total financial assets of $ 80.1 trillion.[10]

All financial institutions have experienced great value in assessing and disclosing their GHG emissions of their loans and investments, as this triggers an institution-wide discussion on climate change and the role of the financial institution to facilitate the transition towards a low-carbon society.

[6] https://carbonaccountingfinancials.com/about
[7] https://carbonaccountingfinancials.com/about
[8] https://carbonaccountingfinancials.com/about
[9] https://carbonaccountingfinancials.com/about#our-mission
[10] https://carbonaccountingfinancials.com/financial-institutions-taking-action#overview-of-financial-institutions

1.2 BNG Bank and PCAF

BNG Bank committed itself to PCAF in May 2019. In 2018, preparing itself for joining the PCAF initiative, BNG Bank asked Telos[11] to measure the GHG emissions associated with the bank's public loan portfolio, using the PCAF methodology. In 2019, the necessary activities have been executed in two steps. First, a scoping study was carried out to test how well the portfolio of BNG Bank was covered by the PCAF Asset Classes[12]. The results of this scoping study showed that particularly loan portfolio of the municipalities (the public sector loans) was not covered by the PCAF methodology at that time. Therefore, a new methodology for this specific sector had to be developed.

In the first half of 2019 this methodology was developed and the results have been discussed with the chairman of the Dutch PCAF group. In line with the open source nature of PCAF, this new methodology has been made publicly available by adding it to the 2019 PCAF Harmonized approach for the financial sectors in the Netherlands.[13]

For the reporting years 2019, 2020, and 2021 the GHG emissions of the bank's loan portfolio have been calculated and disclosed in the BNG Bank Annual Report.[14] For some sectors certain amendments to the methodology were made in reporting years 2020 and 2021 (in comparison to the previous reporting year(s)). Finding opportunities to improve the methodology, for instance by changing the calculation methodology or using other data sources, is an ongoing process. These improvements in quality of the PCAF methodology also can be seen as a further contribution from BNG Bank to the development of the PCAF methodology. For reporting year 2022, again some amendments to the methodology have been implemented by Het PON & Telos. The reasoning behind and justification for these changes are discussed in detail in this report.

1.3 From GHG footprint to action

Measuring and disclosing the GHG emissions associated with the lending and investment activities of financial institutions are necessary conditions for transparency and accountability. But PCAF is not only about measuring and disclosing the GHG emissions of a financial institutions portfolio. The aim is also to identify and set carbon footprint reduction targets, and take actions (Figure 1).

[11] At that time Telos was an independent research institute, based at Tilburg University. In January 2020 Het PON and Telos have merged into one organization called Het PON & Telos. At the same moment this new institute , Het PON & Telos, became official partner of Tilburg University.

[12] Zoeteman, B., & Wentink, C. (2019). Rapport Scoping Studie CO2 footprint BNG Bank portefeuille volgens PCAF methode. Tilburg, Telos.

[13] PCAF, The Netherlands., (2019). Accounting GHG emissions and taking action: Harmonised approach for the financial sector in the Netherlands. Navigant, 2019. p90-91.

[14] https://www.bngbank.com/Financials/Annual-report

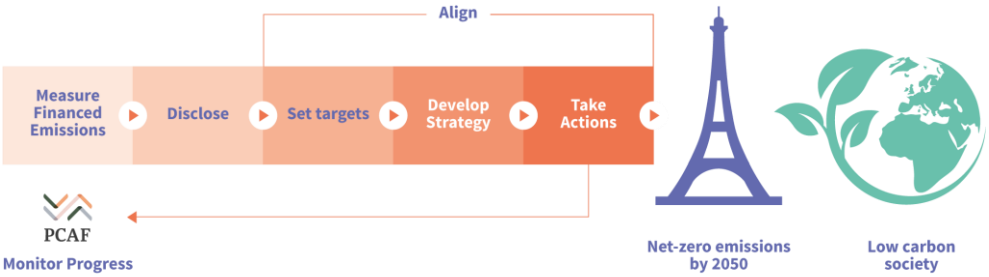

Figure 1. Visualization from GHG footprint to action

As part of her strategy 'Road to impact', BNG Bank measures and reports not only her carbon footprint but also on her social impact, so that she can work on continuously improving this impact. For this, she uses the Sustainable Development Goals (SDGs) as her guiding principles. BNG Bank mainly targets five SDGs on which she can maximize the impact by helping her clients with good health and well-being (SDG 3), quality education (SDG 4), affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and climate action (SDG 13).[15] To actually take steps on climate, BNG Bank has published her climate action plan in 2022. This plan sets out the steps BNG Bank will take to reduce GHG emissions in the sectors social housing, municipalities, healthcare, and education.

1.4 Reading guide

This report describes the methodology and the outcome of the GHG emissions assessment of BNG Bank's loan portfolio.

Chapter 2 describes the PCAF methodology in general and chapter 3 up to 14 describe the methodology for the sectors mentioned below. Chapter 15 up to 27 contain the results of the coverage rate and the absolute and relative GHG emissions for each sector in the loan portfolio.
The following sectors are included in this report:

- Social housing sector;
- Public sector: Municipalities, Provinces, Water authorities, and Joint regulations;
- Healthcare sector;
- Drinking water utilities;
- Educational institutions;
- Mobility projects and other projects.

In addition, in this report, the avoided GHG emissions of some of the wind power and solar energy projects have been measured and disclosed:

- Avoided emissions from wind farms and solar parks.

In comparison to last year, the methodology of the following sectors has been further developed:

- Social housing sector;

[15] https://sdgs.un.org/goals

- Public sector: Scope 1 and 2 for Municipalities and Provinces, Scope 1 for water authorities;
- Healthcare sector.

The following sectors have been added:
- Public sector: Joint regulations;
- Avoided emissions from solar parks.

The details about the reasoning behind and the justification for the improvements in methodology are discussed in the individual chapters.

This report contains the GHG emissions of reporting years 2019 (reference year), 2021, and 2022. In the management summary and in chapter 27, the loan portfolio, coverage rate, and GHG emissions are shown for the reporting years 2019, 2021, and 2022. That enables the bank to monitor the development of the GHG emissions over time. For each of the reporting years, the reference date for the loan portfolio was ultimo of the year. For the calculation of the GHG emissions the latest data that were available has been used. These data are either from 2020 or 2021. In some tables of these report the totals of scope 1 and 2 are presented separately for the sectors social housing, municipalities, healthcare and education to match with the climate action plan of BNG Bank.

The methodology of reporting year 2022 is described in chapter 3 up to 14. For the methodology of the reporting years 2019 and 2021 we refer to the methodology approach report, released in October 2020[16] and to the report released in October 2021.[17] Results of the reporting years 2019 and 2021 are taken from the previous reports with exception of the sectors of which the methodology has been changed.

The final overview of all the calculations of reporting years 2019, 2021, and 2022 can be find in the datafiles mentioned in the factsheet below.

List of the calculation sheets	Note	Location
Bankcijfers 2021 BNG (2).xlsx	Reporting year 2022	Werkmap\Bankcijfers\BNG
Bankcijfers 2020 BNG (2).xlsx	Reporting year 2021	Werkmap\Bankcijfers\BNG
Bankcijfers 2018 BNG (3).xlsx	Reporting year 2019	Werkmap\Bankcijfers\BNG

[16] Mulder, R., Roovert, I. van, Dagevos, J., Verhoeven, L., Wentink C. (2020), Loan Portfolio Climate Impact of BNG Bank & NWB Bank, Methodological approach report 2020

[17] Roovert, I. Dagevos, J., Verhoeven, L., Kroeze, J., de Jongh, F., Agterbosch, S. (2021), GHG Emissions of BNG Bank Loan Portfolio, Reporting year 2021.

2 PCAF methodology

The methodology that has been used in this study, is based on the GHG Protocol and the harmonized approach for the financial sector in the Netherlands[18] (PCAF The Netherlands, report 2019 and update report 2020). The report has four overall reporting guidelines:

- Purpose: meet the specific carbon footprint goals of the financial institution; for instance, because the financial institution is working towards a specific carbon footprint target or to monitor the effectiveness of its wider strategic goals in this area;
- Frequency: at least disclose annually, in line with the financial reporting cycle;
- Form of reporting: In publicly available reports such as (semi) annual reports, website;
- Past performance: disclose the carbon footprint of multiple comparable time periods (e.g., years).

2.1 Scopes

The GHG Protocol is the basis for carbon accounting. In line with PCAF and the GHG Protocol, the methodology used in this report is respecting basic accounting principles of Completeness, Consistency, Transparency, Prudence, Balance, and Accuracy. The GHG protocol defines three different scopes all entities may report about separately (see Figure 2). In the present report these scopes are defined from the perspective of the reporting financial institution like BNG Bank and focusses on all the direct and indirect GHG emissions BNG Bank is responsible for outside of its own walls by financing different types of organizations. The emissions resulting from a reporting company's loans and investments fall under Scope 3 downstream emissions (see the blue circle in Figure 2). In the PCAF methodology scope 1, 2, and 3 refer to the scopes from the viewpoint of the investee, project, company or government.

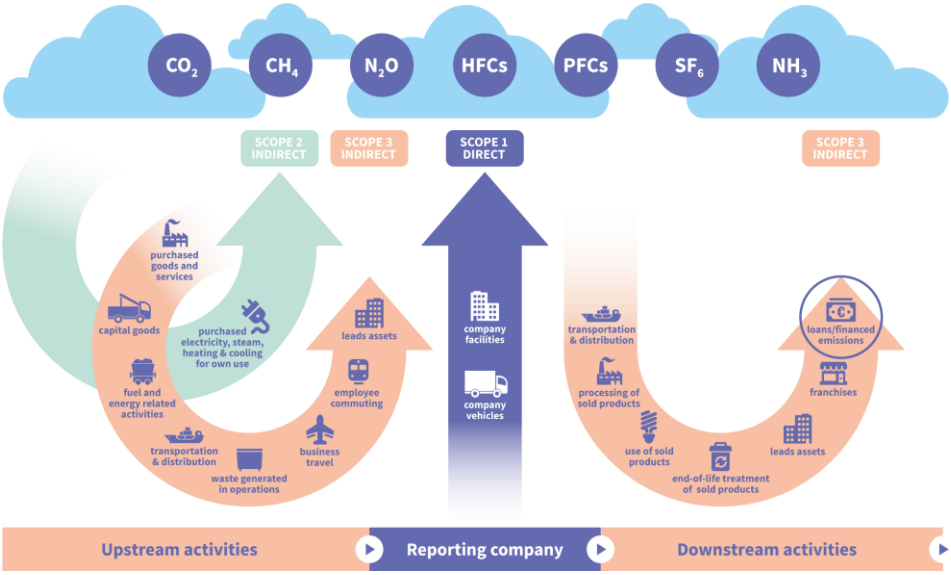

Figure 2. The scope definitions from the GHG Protocol (Image created from GHG Protocol).

[18] https://carbonaccountingfinancials.com/standard

According to the GHG Protocol Corporate Value Chain Accounting and Reporting Standard, the carbon footprint of any financial institution should include:

- Scope 1: All direct GHG emissions that occur from sources owned or controlled by the reporting company, such as natural gas use, and fuel for company vehicles of the investee, project, company or government.
- Scope 2: Indirect emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the investee, project, company or government. Scope 2 emissions physically occur at the facility where the electricity, steam, heating, or cooling is generated.
- Scope 3 covers all other indirect emissions (not included in Scope 2) that occur in the value chain of the investee, project, company or government. Scope 3 can be broken down into upstream emissions that occur in the supply chain (for example, from production or extraction of purchased materials) and downstream emissions that occur as a consequence of using organization's products or services.

Disclosure of total generated emissions data is mandatory for scope 1 and 2. Disclosure of emissions intensity data (ton CO_2-eq per million EUR) for scope 1 and 2 is voluntary. For scope 3 emissions, disclosure of total generated data is mandatory when relevant and available (i.e., recommended by the methodology). Disclosure of scope 3 emissions intensity data (ton CO_2-eq per million EUR) is voluntary. When not provided, institutions should explain why they are not able to provide this.

2.2 Attribution

The GHG footprint of BNG Bank has been calculated based on the GHG emissions of individual organizations. The GHG emissions of an individual organization have been multiplied by the proportional share of the outstanding loan volume with BNG Bank in the total balance sheet of the client, using the following formula:

$$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$

In the end, the separate scopes and the sum of the scopes of all individual organizations have been aggregated.

When interpreting the results in this report, it is important to realize that especially in smaller sectors changes in the ratio outstanding loan volume / total balance sheet between years have an effect on the change in GHG emissions attributable to the bank.
It can happen that an increase or decrease in the absolute GHG emissions between years is a result of a change in the ratio outstanding loan volume/ total balance sheet rather than for example structural changes in energy consumption at sector level. The total balance sheet has an influence on the absolute and relative GHG emissions.

2.3 Data quality

An important element of carbon accounting is the quality of data on emissions attributed to loans and investments. Different asset classes present unique challenges and opportunities with respect to emissions data. This section provides some overarching principles about the quality and preferred hierarchy of emissions data.

High quality emissions data is defined as follows:

- Emissions data is consistent, both across entities and across time;
- Emissions data reflects the underlying emissions generating activities of the entity and are not impacted by unrelated factors;
- Emissions data is accompanied by a relevant level of assurance.

It is possible that emissions data do not meet all the criteria listed above. This depends on the specific properties of the loan and investment, such as: type of loan/investment, the sector or market best practice. To comply with PCAF's reporting guidance, participating institutions are asked to publish the existing PCAF hierarchy of the data quality according to Table 2-1. The table is a guide to disclose data quality scores in total and per asset class. However, in the report Financed Emissions, The global GHG accounting & reporting standard Part A, a more detailed table is presented per asset class that can be used to determine the data quality per sector.[19] These asset class specific tables are used as a reference for current report.

The data quality presented in each chapter is valid for all calculated years. In this report, data quality scores are rounded to a whole number. Because the data source and calculation method can differ between scopes and items within a scope. Several data quality scores are given to a sector. In the general factsheets, the choice for the data quality score is explained. In the factsheets per datafile, only a score for data quality is given to data on energy and GHG emissions. For other used data no score is given, but information about data quality is described. In paragraph 15.2, the data quality scores per sector are explained and summarized.

Table 2-1 Generic data quality table

Data quality (highest to lowest)	Description
1	Audited GHG emissions data or actual primary energy data
2	Non-audited GHG emissions data, or other primary data
3	Averaged data that is peer/(sub)-sectorspecific
4	Proxy data on the basis of region or country
5	Estimated data with very limited support

[19] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

2.4 Calculating GHG emissions is an ongoing process

Comparability and transparency of carbon accounting requires uniform disclosure, following the same guidelines and methods and ideally using the same metrics.[20] However, the methodology used in this report is not yet a set and fixed method. Methodology development is an ongoing process in which we are continually looking for improvements.
The total GHG footprint that is presented in chapter 27 of this report is definitely not conclusive. By improving the method or using better data sources, the world of today may look different next year. If the method is improved, the results of the earlier years will be recalculated so comparison in time will be possible.

[20] Accounting GHG emissions and taking action: harmonised approach for the financial sector in the Netherlands. PCAF The Netherlands, report 2019

3 Social housing sector approach

3.1 Scope 1 and 2

3.1.1 Adjustments in methodology

The methodology for the social housing sector has been changed in comparison to previous years. Previously the building natural gas consumption was estimated based on natural gas use per m^2 usable area for private dwellings in the Netherlands, type of dwelling, building year, floor area, and energy labels. Electricity consumption was estimated based on the average electricity use per occupant of private dwellings in the Netherlands, type of dwelling, floor area, and number of occupants. To calculate energy consumption for a social housing association quite a lot of calculation steps and assumptions had to be made. Part of the natural gas use per social housing association was then classified as district heating based on the number of dwelling per municipality with district heating. For reporting year 2022, actual building energy consumption (natural gas use, electricity use, and use of district heating) has been available from the Microdata of the Dutch Central Bureau of Statistics (CBS). The use of this actual building energy consumption has reduced the number of calculation steps and assumptions that have to be made.

When the results of the previous and new method are compared, it can be seen that the GHG emissions decreased by using the new method. It can be concluded that with the previous method the GHG emissions were overestimated. The differences between the results of the new and previous method are presented in Table 3-1.

Table 3-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference * (%)	New 2019	Previous 2019	Difference * (%)
Scope 1 Natural gas	362,637	595,848	-39.1	427,086	727,284	-41.3
Scope 2 Electricity	195,410	280,362	-30.3	220,563	325,880	-32.3
Scope 2 District heating	16,187	21,780	-25.7	16,569	26,506	-37.5

*The difference is calculated with the following formula: (New - Previous)/Previous*100

3.1.2 General factsheet

Topic	Description
Scopes covered	For the social housing sector scope 1 and 2 have been covered. Scope 1 covers natural gas use and scope 2 covers electricity use and district heating.
Portfolio covered	The coverage rate of the social housing sector for reporting year 2022 is 98.6%.
Data	Data on the electricity use and natural gas use is based on register data from the Microdata of the Dutch Central Bureau of Statistics (CBS). The data on natural gas use is based on connection registers of energy network companies. It is based on actual natural gas consumption, and therefore reliable. Natural gas use per social housing association house is available in the CBS Microdata and aggregated to the municipality level. Per municipality the natural gas use by social housing association houses is known.

	The data on electricity use is based on connection registers of energy network companies, based on actual energy consumption and therefore reliable. Electricity use per social housing association house is available in the CBS Microdata and aggregated to the municipality level. Per municipality the electricity use by social housing association houses is known. The data on district heating is based on connection registers of energy network companies, collected by the Dutch Central Bureau of Statistics (CBS). It is based on actual energy consumption, and therefore reliable. The use of district heating is available on municipality level. Per municipality the district heating use by houses owned by the social housing associations are known. Data on the number of houses per social housing association per municipality come from the "Inspectie van de leefomgeving en transport". This data is audited and therefore reliable.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Natural gas; - Electricity (unknown source); - District heating (STEG).
Calculation steps	**Scope 1: Natural gas** The use of natural gas per social housing association is unknown. Therefore, an estimation had to be made. To make this estimation as accurate as possible, a few calculations had to be made. The CBS Microdata has information on natural gas consumption of all Dutch houses. Within the CBS Microdata database, this dataset has been combined with a dataset that has information about homeowners. For this calculation only houses owned by social housing associations has been used. The definition of a house used by CBS is: *the smallest unit of use located within one or more buildings and suitable for residential purposes, accessed by a private entrance from the public road, a yard or a shared traffic area. Examples include detached houses, single-family houses, apartment or porch houses, student houses.* *All residential objects in the Basic Registration of Addresses and Buildings (BAG) with at least a residential function and possibly one or more other use functions are considered as a house*. So both self-contained and non-self-contained homes are included in this data. Per municipality, the natural gas use for all houses owned by social housing associations has been calculated. Outside the CBS Microdata database, the natural gas use per social housing association has been calculated. From the CBS data it is only known how many houses are owned by social housing associations per municipality. The "Inspectie van de leefomgeving en transport" has data on the number of independent and non-independent houses per social housing association per municipality. According to this data the percentage of houses owned by the social housing associations has been calculated per municipality. This percentage has been multiplied by the total number of houses owned by all the social housing associations per municipality (CBS data) to result in the number of houses owned per social housing association per municipality. This extra calculation step has been performed because the total number of houses owned by all the social housing associations per municipality from the CBS data did not correspond to the total number of houses owned by all the social housing associations per municipality from the "Inspectie van de leefomgeving en transport". Because the energy consumption data comes from CBS, also the total number of houses owned by all the social housing associations per municipality from CBS has been used to calculate the number of houses owned by social housing associations per municipality. The natural gas use per municipality for all houses owned by social housing associations has been multiplied by the ratio of the number of houses of one particular social housing association versus total number of houses of all social housing associations in one municipality. For each social housing association the natural gas use per municipality has been added up to result in the total natural gas use for that particular social housing association. Unfortunately, no data is available about the car fleet of the social housing associations, therefore this is not taken into account in scope 1. The natural gas use in Nm^3 has been multiplied by the emission factor for natural gas to result in kg GHG emissions. These emissions have been divided by 1000 to result in ton GHG emissions.

	Scope 2: District heating The use of district heating per social housing association is unknown. Therefore, an estimation had to be made. To make this estimation as accurate as possible, a few calculations had to be made. The CBS Microdata has information on the use of district heating of all Dutch houses. Within the CBS Microdata database, this dataset has been combined with a dataset with information about homeowners. For this calculation only houses owned by social housing associations has been used. The definition of a house used by CBS is: *the smallest unit of use located within one or more buildings and suitable for residential purposes, accessed by a private entrance from the public road, a yard or a shared traffic area. Examples include detached houses, single-family houses, apartment or porch houses, student houses.* *All residential objects in the Basic Registration of Addresses and Buildings (BAG) with at least a residential function and possibly one or more other use functions are considered as a house*. So both self-contained and non-self-contained homes are included in this data. Per municipality, the use of district heating for all houses owned by social housing associations has been calculated. Outside the CBS Microdata database, the use of district heating per social housing association has been calculated. From the CBS data it is only known how many houses are owned by social housing associations per municipality. The "Inspectie van de leefomgeving en transport" has data on the number of independent and non-independent houses per social housing association per municipality. According to this data the percentage of houses owned by the social housing associations has been calculated per municipality. This percentage has been multiplied by the total number of houses owned by all the social housing associations per municipality (CBS data) to result in the number of houses owned per social housing association per municipality. This extra calculation step has been performed because the total number of houses owned by all the social housing associations per municipality from the CBS data did not correspond to the total number of houses owned by all the social housing associations per municipality from the "Inspectie van de leefomgeving en transport". Because the energy consumption data comes from CBS, also the total number of houses owned by all the social housing associations per municipality from CBS has been used to calculate the number of houses owned by social housing associations per municipality. The use of district heating per municipality for all houses owned by social housing associations has been multiplied by the ratio of the number of houses of one particular social housing association versus total number of houses of all social housing associations in one municipality. For each social housing association the use of district heating per municipality has been added up to result in the total district heating use for that particular social housing association. The use of district heating in GJ has been multiplied by the emission factor for district heating (STEG) to result in kg GHG emissions. These emissions have been divided by 1000 to result in ton GHG emissions. **Scope 2: Electricity use** The use of electricity per social housing association is unknown. Therefore, an estimation had to be made. To make this estimation as accurate as possible, a few calculations had to be made. The CBS Microdata has information on electricity use of all Dutch houses. Within the CBS Microdata database, this dataset has been combined with a dataset that has information about homeowners so only houses owned by social housing associations have been used. The definition of a house used by CBS is: *the smallest unit of use located within one or more buildings and suitable for residential purposes, accessed by a private entrance from the public road, a yard or a shared traffic area. Examples include detached houses, single-family houses, apartment or porch houses, student houses.* So both self-contained and non-self-contained homes are included in this data. *All residential objects in the Basic Registration of Addresses and Buildings (BAG) with at least a residential function and possibly one or more other use functions are considered as a house*. Per municipality, the electricity use for all houses owned by social housing associations has been calculated. Outside the CBS Microdata database, the electricity use per social housing association has been calculated. From the CBS data it is only known how many houses are owned by social housing associations per municipality. The "Inspectie van de leefomgeving en transport" has data on the number of independent and non-independent houses per social housing association per

	municipality. According to this data the percentage of houses owned by the social housing associations has been calculated per municipality. This percentage has been multiplied by the total number of houses owned by all the social housing associations per municipality (CBS data) to result in the number of houses owned per social housing association per municipality. This extra calculation step has been performed because the total number of houses owned by all the social housing associations per municipality from the CBS data did not correspond to the total number of houses owned by all the social housing associations per municipality from the "Inspectie van de leefomgeving en transport". Because the energy consumption data comes from CBS, also the total number of houses owned by all the social housing associations per municipality from CBS has been used to calculate the number of houses owned by social housing associations per municipality. The electricity use per municipality for all houses owned by social housing associations has been multiplied by the ratio of the number of houses of one particular social housing association versus total number of houses of all social housing associations in one municipality. For each social housing association the electricity use per municipality has been added to result in the total electricity use for that particular social housing association. The electricity use in kWh has been multiplied by the emission factor for unknown electricity to result in kg GHG emissions. These emissions have been divided by 1000 to result in ton GHG emissions. For unknown electricity it is advised by CO2emissiefactoren.nl to use the emission factor of 0.405 kg CO_2 equivalent per kWh from January 2018 because of a method change for the average power mix. To have no differences between reporting years in this report due to a change in the emission factor the emission factor of the year 2018 has been used for reporting year 2019, while the energy consumption data was from the year 2017. After calculating scope 1 and 2 GHG emissions, this total amount has been multiplied by the percentage of loan of the social housing associations in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a social housing association is 25%, 25% of scope 1 and 2 GHG emissions of that social housing association have been allocated to BNG Bank. Unfortunately, the total balance sheet data of the year 2021 was not available at the moment of these calculations. Therefore, for reporting year 2022, the GHG emissions attributed to the bank have been calculated based on the total balance sheet of the year 2020. In summary, for reporting year 2019, total balance sheet data of the year 2018 have been used. For reporting years 2021 and 2022, total balance sheet data of the year 2020 have been used because for reporting year 2022 the total balance sheet data of the year 2021 was not available. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR.
Avoided emissions	The PCAF harmonized approach states that for the asset class mortgages: "A mortgage on a house that is climate positive, i.e., generating more energy than it consumes, could be seen as avoided emissions." There is no data available about climate-positive houses or property that generates more energy than it consumes owned by social housing associations. Avoided emissions are therefore not taken into account in current report.
Asset class specific considerations	For the social housing sector the methodology of asset class 'Mortgages' is followed. Energy use of financed buildings (scope 1 and 2) are covered.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the social housing sector the total absolute GHG emissions have been calculated in ton. The relative emissions have been calculated by dividing the absolute GHG emissions by the amount of loans with a GHG footprint. This results in ton CO_2-eq / mln Euro.

Limitations	Unfortunately, we have no data available about which house belongs to which social housing association. Therefore, the energy use (natural gas use, electricity use, and district heating) per social housing association has to be estimated based on the ratio of the number of houses of one particular social housing association versus total number of houses of all social housing associations in one municipality. The accuracy of the data can be improved when it is known which house belongs to which social housing association. This will have no effect on the GHG emissions of the sector in total before the GHG emissions are attributed to the bank, but influences the GHG emissions at sector level attributed to the bank. The most recent data on energy consumption of social housing associations available from CBS is from the year 2020. Therefore, the data used for current report is from the year 2020 instead of 2021.
Data quality estimate	Scope 1 and 2: data quality score 2. The GHG emissions are calculated based on primary data on actual building energy consumption. The data quality score 2 applies to the overall sector. See option 1b in Table 5-15 on page 98 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[21] At the level of individual social housing associations, the data quality score would be 3, because it is not known which house belongs to which social housing association.

3.1.3 Factsheet per data source used

Topic	Description
Data	Total balance sheet
Data files	Original files: dVi2018 H3.xlsx dVi2020 H3.xlsx Edited file: Balanstotaal 2018 en 2020.xlsx
Data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit woningcorporaties
Year	2018 and 2020 For reporting year 2019, the outstanding loan and total balance sheet of 2018 have been used. For reporting year 2021, the outstanding loan and total balance sheet of 2020 have been used. For reporting year 2022, the outstanding loan of 2021 has been used, but the total balance sheet of 2020 has been used, because the total balance sheet of 2021 was not available. It is preferable to use the same year for the outstanding loan and the total balance sheet. Unfortunately, this was not possible for reporting year 2022, therefore, the total balance sheet of the previous year has been used.
Last update	Not applicable
Date of download	2018: 7-10-2022 2020: 5-10-2022
Link to webpage	https://data.overheid.nl/dataset/verantwoordingsinformatie-woningcorporaties
Filters used to obtain the datafile	Sheet: data 3.1 Column B (Soort_instelling) selected on TE Column C (DAEB_Indicatie) selected on O Column D (Jaar) selected on 2018 or 2020 Column E (Balanskant) selected on PASSIVA Column F (Balanstype) selected on PASSIVA
Internal location	Original files: Werkmap\Woningcorporaties\Ruwe data Edited file: Werkmap\Woningcorporaties\Voorbewerking data For some housing associations, the annual report has been used as a source for the total balance sheet. The annual reports are located in the following folder: Werkmap\Woningcorporaties\Jaarverslagen

[21] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Data quality	Score 1 Audited data per social housing association specific.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	For a few social housing associations total balance sheet data was missing in the used data file. For these social housing associations the total balance sheet data have been taken from the annual reports. When data of the needed year was missing, data of the previous year has been used.
Print Screens	In folder: Werkmap\Woningcorporaties\Printscreens\ 20221007 dvi 2018 H3.png 20221005 dvi 2020 H3.png

Topic	Description
Data	Natural gas use of social housing associations
Data files	Original file: Output microdata aardgas en elektra verbruik.xlsx Edited file: Energieverbruik 2017 2019 en 2020 aangepast voor gebruik in SQL.xlsx
Data Source	CBS Microdata (received by e-mail)
Year	2017- 2019- 2020
Last update	Not applicable
Date of download	25-8-2022
Link to webpage	https://www.cbs.nl/nl-nl/onze-diensten/maatwerk-en-microdata/microdata-zelf-onderzoek-doen/microdatabestanden/energieverbruik-energiegebruiken-van-woningen
Filters used to obtain the datafile	Not applicable
Internal location	Original file: Werkmap\Woningcorporaties\Ruwe data Edited file: Werkmap\Woningcorporaties\Voorbewerking data
Data quality	Score 2 The GHG emissions are calculated based on primary data on actual building energy consumption. The data quality score 2 applies to the overall sector. See option 1b in Table 5-15 on page 98 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[22]
Unit of measurement	Nm^3
Selections	Not applicable
Data transformation	To perform the calculations the following transformations have been done: Data of the year 2017 was transformed to the 2018 municipality division; Data of the year 2020 was transformed to the 2021 municipality division.
Data missing	For the years 2017, 2019, and 2020 the following number of social housing associations are missing in the final results of GHG emissions: 2017: 24 from the 314 social housing associations in the loan portfolio; 2019: 27 from the 312 social housing associations in the loan portfolio; 2020: 24 from the 304 social housing associations in the loan portfolio.
Print Screens	Werkmap\Woningcorporaties\Printscreens\ 25-8-2022_output aangepast vrijgegeven_8741_jkrz.msg

[22] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Topic	Description
Data	Electricity use of social housing associations
Data files	Original file: Output microdata aardgas en elektra vebruik.xlsx Edited file: Energieverbruik 2017 2019 en 2020 aangepast voor gebruik in SQL.xlsx
Data Source	CBS Microdata (received by e-mail)
Year	2017- 2019- 2020
Last update	Not applicable
Date of download	25-8-2022
Link to webpage	https://www.cbs.nl/nl-nl/onze-diensten/maatwerk-en-microdata/microdata-zelf-onderzoek-doen/microdatabestanden/energieverbruik-energiegebruiken-van-woningen
Filters used to obtain the datafile	Not applicable
Internal location	Original file: Werkmap\Woningcorporaties\Ruwe data Edited file: Werkmap\Woningcorporaties\Voorbewerking data
Data quality	Score 2 The GHG emissions are calculated based on primary data on actual building energy consumption. The data quality score 2 applies to the overall sector. See option 1b in Table 5-15 on page 98 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[23]
Unit of measurement	kWh
Selections	Not applicable
Data transformation	To perform the calculations the following transformations have been done: Data of the year 2017 was transformed to the 2018 municipality division; Data of the year 2020 was transformed to the 2021 municipality division.
Data missing	For the years 2017, 2019, and 2020 the following number of social housing associations are missing in the final results of GHG emissions: 2017: 24 from the 314 social housing associations in the loan portfolio; 2019: 27 from the 312 social housing associations in the loan portfolio; 2020: 24 from the 304 social housing associations in the loan portfolio.
Print Screens	Werkmap\Woningcorporaties\Printscreens\ 25-8-2022_output aangepast vrijgegeven_8741_jkrz.msg

Topic	Description
Data	District heating of housing associations
Data files	Original files: Stadverwarming 2017.xlsx Stadsverwarming 2019.xlsx Stadsverwarming 2020.xlsx Edited file: Energieverbruik 2017 2019 en 2020 aangepast voor gebruik in SQL.xlsx
Data Source	CBS Microdata (received by e-mail)
Year	2017- 2019- 2020
Last update	Not applicable
Date of download	11-10-2022

[23] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Link to webpage	https://www.cbs.nl/nl-nl/onze-diensten/maatwerk-en-microdata/microdata-zelf-onderzoek-doen/microdatabestanden/energieverbruik-energiegebruiken-van-woningen https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83878NED/table
Filters used to obtain the datafile	Not applicable
Internal location	Original files: Werkmap\Woningcorporaties\Ruwe data\Microdata stadsverwarming Edited file: Werkmap\Woningcorporaties\Voorbewerking data
Data quality	Score 2 The GHG emissions are calculated based on primary data on actual building energy consumption. The data quality score 2 applies to the overall sector. See option 1b in Table 5-15 on page 98 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[24]
Unit of measurement	GJ
Selections	Not applicable
Data transformation	To perform the calculations the following transformations have been done: Data of the year 2017 was transformed to the 2018 municipality division; Data of the year 2020 was transformed to the 2021 municipality division.
Data missing	Not applicable
Print Screens	Not applicable

Topic	Description
Data	Number of houses owned by housing associations per municipalities
Data file	Original files: dvi2017 H2.xlsx and dvi2017hoofdstuk1.xlsx dvi2019 H2.xlsx dvi2020 H2.xlsx Edited files: 20221021 aantal woningen 2017 aangepast 11-1-2023.xlsx 20221021 aantal woningen 2019.xlsx 20221021 aantal woningen 2020.xlsx
Data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2017- 2019- 2020
Last update	Not applicable
Date of download	18-10-2022
Link to webpage	https://data.overheid.nl/dataset/verantwoordingsinformatie-woningcorporaties-dvi2020-hfd21
Filters used to obtain the datafile	Filters obtained for 2017: DEAB_Indicatie: J & N; Woongelegenheid: J; Soort verhuureenheid: Huurwoning, Onzelfstandige wooneenheid; Prijsklasse: : Onder huurtoeslaggrens, Boven huurtoeslaggrens, Geen prijsklasse, Betaalbaar, Goedkoop; Omschrijving: Aantal einde jaar; Zelfstandig: J & N. Filters obtained for 2019 and 2020: DEAB_Indicatie_Ultimo: J & N; Soort_Instelling_Ultimo: TI; EenheidSoort: WoonZelfst & WoonOnzelfst.
Internal location	Original files: Werkmap\Woningcorporaties\Ruwe data Edited files: Werkmap\Woningcorporaties\Voorberwerking data
Data quality	Score 1 Audited data per social housing association specific.

[24] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Unit of measurement	Number of dwellings
Selections	Not applicable
Data transformation	To perform the calculations the following transformations have been done: Data of the year 2017 was transformed to the 2018 municipality division; Data of the year 2020 was transformed to the 2021 municipality division.
Data missing	Not applicable
Print Screens	Werkmap\Woningcorporaties\Printscreens\ 20221018 dvi 2017 H2.png 20221018 dvi 2019 H2.png 20221018 dvi 2020 H2.png 20221022 dvi 2017 H1.png

List of the calculation sheets	Location
Emissiefactoren_totaaloverzicht.csv Energiedata woco.csv Leningen woco BNG.csv Passiva woco.csv Woningen woningcorporaties per gemeente aangepast.csv	Werkmap\Woningcorporaties\Brondata voor SQL
PCAF_woco_BNG	Werkmap\Woningcorporaties\Scripts en database SQL
WOCO BNG Bank 2018.sql WOCO BNG Bank 2020.sql WOCO BNG Bank 2021.sql	Werkmap\Woningcorporaties\Scripts en database SQL
Relatieve_emissies_woco_BNG_2018.csv Scopestotaal_BNG_woco_2018.csv Toerekening_BNG_woco_2018.csv WOCO BNG 2020 afzonderlijke instellingen.csv WOCO BNG 2020 scopes totaal.csv WOCO BNG 2020 relatieve emissies totaal.csv WOCO BNG 2021 afzonderlijke instellingen.csv WOCO BNG 2021 scopes totaal.csv WOCO BNG 2021 relatieve emissies totaal.csv	Werkmap\Woningcorporaties\Data uit SQL\BNG
20221013 missende Woco's BNG Bank 2018.xlsx 20221013 missende Woco's BNG Bank 2020.xlsx 20221013 missende Woco's BNG Bank 2021.xlsx	Werkmap\Woningcorporaties\Missende data

4 Public sector: municipalities approach

4.1 Scope 1 and 2

4.1.1 Adjustments in methodology

The methodology that has been used for the calculations of scope 1 and 2 for municipalities has been changed in comparison to previous years. Previously, data on energy supply to the sector public administration and government was used at the aggregation level of a COROP area (a regional area within the Netherlands, larger than a municipality but smaller than a province). The energy supply at the level of COROP area had to be converted to the aggregation level of municipalities. To convert the data, the supply of natural gas and electricity to the public administration and government services sector per COROP area (CBS) was multiplied with the percentage of FTE working in municipalities relative to all FTE working in the public administration and government services sector per COROP area. The FTE per municipality was calculated by using FTE per size of municipality (5 different sizes) and the number of inhabitants per municipality. To calculate the natural gas and electricity use per municipality several calculations and assumptions were made. For calculating the GHG emissions of the vehicle fleet also the FTE per municipality was used. The aim of using the new method was to reduce the number of calculation steps.

In the new method, the energy supply to the sector public administration and government has been used on the aggregation level of municipalities instead of COROP area. The energy supply at the aggregation level of municipalities is not exclusively used by municipalities, for example in The Hague also the national government is located. In that case, the energy supply to the public administration and government is not only for the municipality as an organization. For this reason the percentage of employees working at municipalities versus employees working for the total sector of public administration and government has been used to calculate energy supply to the municipality as an organization. The percentage of employees working for municipalities versus employees working for the total sector of public administration and government has also been used in the calculation of the GHG emissions of the vehicle fleet.
To avoid double counting, scope 1 natural gas use and scope 2 electricity use have been subtracted from scope 3. As explained, the method for calculating scope 1 and 2 has been adapted and therefore also the result of scope 3 changes.

When the results of the previous and new method are compared, it can be seen that the GHG emissions for scope 1 and 2 have increased and therefore emissions for scope 3 have decreased by using the new method. It can be concluded that with the previous method the GHG emissions for scope 1 natural gas use and scope 2 electricity use were underestimated. According to the new method the GHG emissions for scope 1 vehicle fleet were also underestimated, still the new method is not very accurate. This is discussed in the section limitations in paragraph 4.1.2. The differences between the results of the new and previous method are presented in Table 4-1.

Table 4-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)	New 2019	Previous 2019	Difference* (%)
Scope 1 Natural gas	56,401	42,098	34.0	77,571	48,784	59.0
Scope 1 Vehicle fleet	6,500	4,792	35.7	6,433	4,386	46.7
Scope 2 Electricity	184,478	121,464	51.9	209,900	132,830	58.0
Scope 3 indirect emissions	1,432,112	1,468,389	-2.5	1,432,018	1,448,244	-1,1

*The difference is calculated with the following formula: (New - Previous)/Previous*100

4.1.2 General factsheet

Topic	Description
Scopes covered	For municipalities, scope 1 natural energy use, scope 1 fossil fuel use by company vehicles, scope 2 electricity use and scope 3 purchased goods and services are covered. Scope 1 emissions include the direct GHG emissions of the organization. For municipalities, these emissions result from the use of natural gas for heating of buildings and the use of fossil fuel for vehicles. The exact figures for these sources are unknown per municipality, therefore estimations have been made using multiple calculation steps in order to achieve the best result possible. Scope 2 emissions include the indirect GHG emissions from consumption of purchased electricity, heat or steam. The heat and steam use per municipality is unknown and therefore scope 2 only contains the use of purchased electricity. As exact figures per municipality are unknown, estimations have been made using multiple calculation steps.
Portfolio covered	Data is collected for all municipalities in the Netherlands. This means the portfolio coverage rate for this sector is 100%
Data	For scope 1 natural gas use and scope 2 electricity use, data of 2021 has been used. For scope 1 fossil use by company vehicles, the calculation has been made with partial use of 2020 data. The data used in this approach comes from multiple sources. Data regarding the number of employees working for SBI-code 8411 and the data about the number of employees working for the total public administration and government services sector comes from Lisa. Lisa is the national information system for jobs in the Netherlands and contains a database with data of all locations where paid work is done. This data was purchased on the municipality level. The data is supplied in the 2021 municipality division and therefore all other used data, like supply of energy to the public administration and government services sector has been reclassified to the 2021 municipality division to have data for all the municipalities that are present in the dataset of Lisa. Data regarding the number of employees working for the provincial government organization comes from A&O fonds provincies. A&O fonds provincies is an organization that provides practical tools, knowledge, and subsidies for governments. This data is available on the aggregation level of provinces. Data about the supply of energy to the sector public administration and government services comes from the Dutch Central Bureau of Statistics (CBS). The data covers the supply of electricity and natural gas to businesses and other utility buildings. The data is based on the connection register of the energy network and is therefore reliable. Data is divided by sector and region.

	Data about the number of company vehicles owned by companies per sector comes from the Dutch Central Bureau of Statistics (CBS). The data originally comes from motor vehicle registration (RDW) and is therefore reliable. Data about the number of kilometers driven with a vehicle per year comes from the Dutch Central Bureau of Statistics (CBS) and covers the average kilometers per year of a passenger vehicle with a Dutch registration. The original data comes from the online kilometer registration (OKR) of the RDW and is therefore reliable.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Natural gas; - Electricity (unknown source); - Passenger transport, Car, Fuel type unknown, weight class unknown.
Calculation steps	**Scope 1 natural gas and scope 2 electricity** For the sector public administration and government services, the supply of natural gas and electricity is known (CBS) at the aggregation level of municipalities and includes both municipalities and other governmental authorities. To calculate scope 1 and 2 for municipalities, several calculation steps have been made. The number of employees that work for the total public administrations and government services sector is known for each municipality, as well as the number of employees that work for a general government administration per municipality. General government administrations include municipalities, as well as provinces and ministries (also known as SBI-code 8411). Therefore, we have subtracted the number of employees working for the provincial government organization from the total number of employees working for general government administrations for all provincial capitals except for the municipality of The Hague. For the municipality of The Hague, we have used the number of employees working for the municipality according to their website, because also the national government and therefore a lot of the ministries are located in the municipality of The Hague. The supply of natural gas and electricity to the public administration and government services sector is known per municipality (CBS). The percentage of number of employees working for each municipality (SBI-code 8411) relative to the number of employees working for the total public administration and government services sector in each municipality has been multiplied by the supply of natural gas and electricity to the public administration and government services sector. This results in the supply of natural gas and electricity to the municipality as an organization. The amount of natural gas per municipality has been multiplied by the emission factor for natural gas (Table 14-1) and the amount of electricity has been multiplied by the emission factor for electricity (Unknown source; Table 14-1). The amount of GHG emissions has been divided by the factor 1000, to result in ton GHG emissions for scope 1 (natural gas) and scope 2 (electricity). **Scope 1 fossil fuel for company vehicles** Scope 1 emissions also includes the fossil fuel emissions of company vehicles. This calculation has also started with the number of employees that work for the total public administrations and government services sector as well as the number of employees that work for a general government administration (SBI-code 8411), both per municipality. The number of company vehicles used in the total public administration and government services sector is known (CBS Statline). To calculate the total number of company vehicles for the municipalities, the number of company vehicles used by the total public administration and government services sector has been multiplied by the percentage of employees working at municipalities relative to all employees working for the Dutch public administration and government services. The total number of company vehicles for Dutch municipalities has been multiplied by the percentage of employees working for that municipality, relative to all

	employees working for Dutch municipalities to result in the number of company vehicles per municipalities. This has been multiplied by the number of kilometers driven per company vehicle (all fuel types) and multiplied by the emission factor for passenger transport, car, fuel type unknown, weight class unknown (Table 14-1). The GHG emissions have been divided by the factor 1000, to result in ton GHG emissions for company vehicles. After calculating the scope 1 and 2 GHG emissions, this total amount has been multiplied by the percentage of loan of the municipalities in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a municipality is 25%, 25% of scope 1 and 2 GHG emissions of that municipality has been allocated to BNG Bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR. The final calculated values for scope 1 and 2 and total balance sheet have been reallocated to the municipality division of 2021, for all years calculated.
Avoided emissions	The description of CBS states the following: The table of natural gas and electricity supply to the public grid contains figures on the supply of electricity and natural gas to companies and other utility buildings. This includes supply through the public grid, including supply from the public grid to company grids. Electricity produced by companies themselves and used for their own consumption is therefore not included in these figures. When a municipality invests in renewable energy, the electricity consumption from the energy network will reduce. Indirectly, therefore, investments in renewable energy should be reflected in a decrease of scope 2 electricity in current report. In addition, local and regional public authorities can make investments that lead to avoided emissions. This is not included in this report.
Asset class specific considerations	The approach for municipalities is in line with the public loan approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the municipalities the total absolute GHG emissions are calculated in ton. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in ton CO_2-eq / mln Euro.
Limitations	A risk of double counting arises from that local and regional government related collaborations, companies, and projects might be included in the financial and emission reporting of municipalities and provinces. This can only be assessed by individual entities, and this has not been corrected for in this report. Limitations of the current method are that the supplies of natural gas and electricity to the municipality as organization are unknown. It is therefore calculated according to the estimated number of employees working for the general government administrations per municipality and the total number of employees working for the total public administration and government services sector per municipality. The general government administrations include municipalities, as well as provinces and ministries amongst others (also known as SBI-code 8411). We corrected the number of employees working for the general government

	administrations for the provincial capitals, but not for other municipalities that might contain employees of other governments than municipalities. There is also no data registered about company vehicles (number of vehicles, type of vehicle, type of fuel etc.) per municipality. The best possible result is achieved by using the current model(s). Many municipalities are working on making their operations more sustainable. Part of this development is making their vehicle fleet more sustainable. For example, municipalities are purchasing more electric cars when they replace cars. In the calculation method in this project, this development is not visible. As a result, the GHG emissions caused by company vehicles are a relative rough estimate and may deviate from the actual situation due to developments in the field of making the municipalities vehicle fleet more sustainable. Besides cars, municipalities also own other means of transport, such as scooters and (electric) bikes. The use of these means of transport is not included in the calculated GHG emissions for company vehicles.
Data quality estimate	Scope 1 natural gas and scope 2 electricity: data quality score 4. The GHG emissions are calculated based on energy supply to the public administration and government services sector at the aggregation level of municipalities. This is not only energy supply to the municipalities, but also other governmental authorities. Therefore, data is used on the basis of region and data quality score is 4. Scope 1 vehicle fleet: data quality score 5. The GHG emissions are calculated based on average vehicle information. Vehicle make, model, and type are unknown and distance traveled is based on local or regional statistical data. Therefore, data quality score is 5. See option 3b in Table 5-16 on page 106 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[25]

4.1.3 Factsheet per data source used for scope 1 and 2

Topic	Description
Data	Number of employees working for the public administrations and government services sector
Data file	LISA-statistiek_(ordernr_202200020)_sector O.xlsx
Data Source	Lisa; het werkgelegenheidsregister van Nederland
Year	2018-2020-2021
Last update	June 2022
Date of download	Data purchased on 29-06-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 2 Data from LISA are based on observations/measurements of all locations of companies. Self-employed persons are taken into account as well. This makes it possible to present an overview of employment on both geographic and sectoral level.
Unit of measurement	Number of employees
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\FW Bestelling LISA-data (ordernummer 202200020).msg

[25] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Topic	Description
Data	Number of employees working for a general government administration
Data file	LISA-statistiek_(ordernr_202200019)_8411.xlsx
Data Source	Lisa; het werkgelegenheidsregister van Nederland
Year	2018-2020-2021
Last update	June 2022
Date of download	Data purchased on 21-06-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	SBI08-omschrijving: O-8411-Algemeen overheidsbestuur
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 2 Data from LISA are based on observations/measurements of all locations of companies. Self-employed persons are taken into account as well. This makes it possible to present an overview of employment on both geographic and sectoral level.
Unit of measurement	Number of employees
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\FW Bestelling LISA-data (ordernummer 202200019).msg

Topic	Description
Data	Number of employees working at provinces
Data file	20220926 berekening sbi 8411 zonder provincies_aangepast_18-1-23.xlsx in sheet: Banen provinciehoofdsteden
Data Source	A & O Fonds Provincies
Year	2018-2020-2021
Last update	June 2022
Date of download	21-09-2022
Link to webpage	https://personeelsmonitorprovincies.onderzoek.nl/index.cfm?action=main.report
Filters used to obtain the datafile	No filters used
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 2 Data is directly acquired from provinces, using a questionnaire. Data quality is therefore indicated as high.
Unit of measurement	Number of employees
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\Banen provinciehoofdsteden

Topic	Description
Data	Supply of energy to the public administration and government services sector at the aggregation level of municipalities
Data file	20221007 levering aardgas en elektriciteit sector O gemeenten.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	7-10-2022
Date of download	7-10-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82538NED/table?ts=1601410027649
Filters used to obtain the datafile	Onderwerp: Geleverd aardgas, geleverde elektriciteit Perioden: 2018 – 2020 - 2021 Regio's: Gemeenten per provincie Bedrijfstakken/branches: Bedrijfstakken 1e digit (SBI 2008), O Openbaar bestuur en overheidsdiensten
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 4. Highly reliable data, because of the manner of registration. There are multiple control and correction methods used, which can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net. The supply of energy is not only to the municipalities, but to the total public administration and government services sector at the aggregation level of municipality. Therefore, the data quality score is 4 because it is data on the basis of region.
Unit of measurement	Natural gas: 1000 Nm^3 Electricity: 1000 kWh
Selections	Not applicable
Data transformation	The data has been transformed from the original municipality division to the 2021 municipality division. The missing values have been replaced with values from previous years, as described in the original data file on tab 'Data voor herindelen' in order to transform the data to the municipality division of 2021.
Data missing	For several municipalities, the data was missing and has been replaced by data from previous or coming years, see the original data file, tab 'Data voor herindelen' for the changes made in the original data.
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\ 20221007 levering aardgas, elektriciteit via openbaar net sector O gemeenten v1.PNG 20221007 levering aardgas, elektriciteit via openbaar net sector O gemeenten v2.PNG 20221007 levering aardgas, elektriciteit via openbaar net sector O gemeenten v3.PNG

Topic	Description
Data	Number of company vehicles owned by companies in the public administration and government services sector
Data file	2017: 20200929 Ruwe data bedrijfsbestelautos O sector.xlsx 2019: 20230118 ruwe data bedrijfsautos 2019.xlsx 2020: 20220610 ruwe data bedrijfsautos 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020 Data from 2017 is used for reporting year 2019 Data from 2019 is used for reporting year 2021 Data from 2020 is used for reporting year 2022

Last update	2017: 24-01-2022 2019: 24-01-2022 2020: 24-01-2022
Date of download	2017: 13-10-2022 2019: 18-1-2023 2020: 10-06-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81481NED/table?ts=1626174554210
Filters used to obtain th datafile	Onderwerp: Bedrijfsbestelauto's Bedrijfstakken/branches: O Openbaar bestuur en overheidsdiensten Bedrijfsgrootte/leeftijd bestelauto: Totaal Perioden: 2020
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 2 The research method of this data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/bezit-en-gebruik-bestelauto-s The additional research report can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/aanvullende%20onderzoeksbeschrijvingen/bezit-en-gebruik-bestelauto-s Data comes from motor vehicle registration (RDW) and data is checked on content, quality and usability by CBS
Unit of measurement	Number of company vehicles
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\ 20220610 bedrijfsautos_2020.png 20230118 bedrijfsautos 2019.png 20221310 bedrijfsautos 2017.png

Topic	Description
Data	Average kilometers driven with a passenger vehicle with a Dutch registration per year
Data file	Ruwe data km bedrijfswagens 2017.xlsx 20230118 ruwe data km bedrijfsautos 2019.xlsx 20220610 ruwe data km bedrijfswagens 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020 Data from 2017 is used for reporting year 2019 Data from 2019 is used for reporting year 2021 Data from 2020 is used for reporting year 2022
Last update	2017: 10-11-2021 2019: 10-11-2021 2020: 10-11-2021
Date of download	2017: 13-10-2022 2019: 18-1-2023 2020: 10-06-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71107ned/table?ts=1626174732075
Filters used to obtain the datafile	Gewichtsklasse leeggewicht: Totaal Leeftijd voertuig: Totaal Tenaamstelling: Bedrijf Brandstofsoort: Alle brandstofsoorten

	Onderwerp: Gemiddelde jaarkilometrage Perioden: 2020
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Data quality	Score 2 The research method of this data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/verkeersprestaties-personenauto-s The original data comes from the online kilometer registration (OKR) of the RDW. This data is reliable.
Unit of measurement	Kilometers
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\ 20220610 km bedrijfswagens_2020.png 20230118 km bedrijfswagens 2019.png 20221013 bedrijfsautos km 2017.png

Topic	Description
Data	Total balance sheet municipalities
Data file	20220922 passiva gemeenten 2021.xlsx
Data Source	CBS Statline
Year	2021
Last update	22-09-2022
Date of download	17-10-2022
Link to webpage	https://iv3statline.cbs.nl/#/IV3/nl/dataset/45054NED
Filters used to obtain the datafile	Gemeenten: allemaal Verslagsoort: Jaarrekening Categorie: Ultimo Onderwerp: 2e plaatsing Taakveld/balanspost: Passiva
Internal location	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data This folder also contains data from previous years: 2018: 20201014 totaal passiva per Gemeente doorgerekend 2018.xlsx Passiva 2018 heringedeeld naar 2021.xlsx 2020: 20210928 passiva gemeenten 2020.xlsx Passiva 2020 voor herindelen aangevuld met 2019.xls
Data quality	Score 2 High quality data. The data is directly delivered to CBS by municipalities from internal accounting systems. The data has not been edited by CBS.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 1 en 2\Printscreens\iv3

List of the calculation sheets	Location
20221010 leningportefeuille BNG gemeenten opmaak voor SQL.xlsx	Werkmap\Gemeenten\Scope 1 en 2\Ruwe data
Aardgas_elektra_gemeente.csv Banen_8411-gemeente_aangepast_18-1-23.csv Banen_sectorO_gemeente.csv Bedrijfsautos_aangepast.csv Emissiefactoren_totaaloverzicht.csv KM_bedrijfsautos_aangepast.csv Passiva_gemeente.csv portefeuilleBNG_gemeente.csv	Werkmap\Gemeenten\Scope 1 en 2\Brondata voor SQL
PCAF gemeente BNG	Werkmap\Gemeenten\Script + database
BNG gemeente 2018 (2).sql BNG gemeente 2020 (2).sql BNG gemeente 2021 (2).sql	Werkmap\Gemeenten\Script + database
20230120_BNG scope 1 en 2 2018.csv 20230120_BNG scope 1 en 2 2020.csv 20230120_BNG scope 1 en 2 2021.csv	Werkmap\Gemeenten\Scope 1 en 2\Data verkregen uit SQL
BNG 20230119 scope 3 gemeente 2018.xlsx BNG 20230119 scope 3 gemeente 2020.xlsx BNG 20230119 scope 3 gemeente 2021.xlsx	Werkmap\Gemeenten\Scope 3

4.2 Scope 3

4.2.1 Adjustments in methodology

The methodology to calculate scope 3 for municipalities did slightly change in comparison to last year. The calculated emission factor in kg CO_2-eq / Euro expenditure has changed for the three calculated years. Last year, it was chosen to use the most recent available data. The data on GHG emissions to the air by the Dutch economy is two years behind, while data on the monetary value of all produced goods and services in the Netherlands is only one year behind. Last year, for example, the GHG emissions to the air by the Dutch economy of 2019 were divided by the monetary value of all produced goods and services in the Netherlands of 2020 for reporting year 2021. However, the effect of COVID-19 on the GHG emissions to the air by the Dutch economy and the monetary value of all produced goods and services in the Netherlands has shown that to determine the emission factor, the same year should be used. Because the data on GHG emissions to the air by the Dutch economy is two years behind, for current report, the emission factor has been based on the year 2017 for reporting year 2019, the year 2019 for reporting year 2021, and the year 2020 for reporting year 2022. The differences between the results of the new and previous method are minor and are presented in Table 4-1 in paragraph 4.1.1.

4.2.2 General factsheet

Topic	Description
Scopes covered	Scope 3 covers all other indirect emissions. Some examples of scope 3 activities that are prominent in government activities include emissions from employee commuting, business travel, and outsourced contractor activities. The scope 3 emissions per municipality are unknown, but they can be estimated by the annual spending of municipalities (IV3/COFOG; classification of the function of government).
Portfolio covered	Data is collected for all municipalities in the Netherlands. This means the coverage rate for this sector is 100%.
Data	Data about the standard business classification ('standaard bedrijfsindeling') comes from the Dutch Central Bureau of Statistics (CBS). CBS uses the standard business classification to classify business units by their main activity. Data about GHG emissions by the Dutch economy to the air also comes from the Dutch Central Bureau of Statistics (CBS). The data contains emissions of harmful substances to the air. The data is based on the environmental accounts. Environmental accounts links the system of national accounts and environmental statistics. Environmental accounts include both physical and monetary data on the environment. The main sources for the environmental accounts are the environmental statistics (mainly emission registrations), the energy statistics (mainly Dutch energy balance) and the national accounts. Data on GHG emissions by the Dutch economy is two years behind and most recent data is from 2020. Therefore, for scope 3 data from the years 2017, 2019, and 2020 have been used for the calculations of reporting years 2019, 2021, and 2022, respectively. The national accounts contain data on the monetary value of all produced goods and services in the Netherlands. These data come from the Dutch Central Bureau of Statistics (CBS). Because the GHG emissions by the Dutch economy are divided by the monetary value of all produced goods and services in the Netherlands, data of the monetary value of all produced goods and services in the Netherlands of the years 2017, 2019, and 2020 have been used for the calculations of reporting years 2019, 2021, and 2022, respectively. Data on the expenses of municipalities come from the Dutch Central Bureau of Statistics (CBS). The municipalities are the source for these data themselves. They

	deliver the data directly to CBS in an uniform prescribed format. CBS does not check or edit these data. The OECD has developed the Classification of the Function of Government (COFOG) which classifies government expenditure data from the System of National Accounts by the purpose for which the funds are used. Municipal budgets are divided into 48 tasks (second level), clustered in 9 divisions (first level). The tasks indicate the purpose of the expenditure. The following tasks are included: management and support; safety; traffic, transport and water management; economy; education; sport, culture and recreation; social domain; public health and environment; public housing, spatial planning and urban renewal. The expenditures are also classified by economic categories. This indicates the type of expenditure. The following categories are included: salaries and social charges; taxes; goods and services; transfers; interest and dividends; financial transactions; settlements.
Grid emission factors	No emission factors have been used from chapter 14. The emissions factor (kg CO_2-eq / Euro) has been calculated by dividing the GHG emissions to the air by the Dutch economy (kg CO_2-eq) by the monetary value of all produced goods and services in the Netherlands (Euro)
Calculation steps	For the calculation of scope 3 only one economic category is relevant: "Goods and Services". This category describes the expenses of municipalities for goods and services for which they pay, either in a purchase or in hire construction. A number of subcategories can be distinguished. The following categories have been used in the calculation of scope 3: Category 3.1 describes expenses on the purchase or sale of areal positions; Category 3.2 are the purchases of sustainable goods and services. These are goods with a lifespan longer than one year; Category 3.5 describes the insourced employees; Category 3.8 contains other goods and services, such as tools, food, and other expenses. To calculate the GHG emissions for scope 3 for municipalities, it is necessary to have a value per subcategory mentioned above (3.1, 3.2, 3.5, and 3.8) that links GHG emissions (per kg) to expenses (in Euro). To come to this value per category (in kg CO_2-eq/Euro) as a first step, the most appropriate production sector(s) (the standard business format; SBI codes; CBS) has to be linked to the four mentioned categories. In a next step, using the environmental accounts, the expenses have been linked to the emission data. First, we had a closer look at the description of the 4 mentioned categories (3.1, 3.2, 3.5, and 3.8).[26] According to the detailed description, the most appropriate production sector(s) have been linked to the category (Table 4-2). Category 3.1 has been linked to only one sectoral production category, whereas categories 3.2, 3.5, and 3.8 have been linked to multiple sectoral production categories. The share of each production sector per subcategory is unknown. Therefore, the share of each production sector per category has been assumed by the researchers of Het PON & Telos. The weighing has been done based on an estimate of the relative share of the various relevant industries in the expenditure per subcategory (Table 4-3).

[26] https://findo.nl/content/30---Goederen-en-diensten

Table 4-2. The categories with the linked sectoral production category

Category	SBI code
3.1	Rental and trading real estate (L)
3.2	Industry (C); construction industry (F); wholesale and retail, and repair of motor vehicles (G); rental and trading of real estate (L); consultancy, research, rental of movable property, other services (M/N); public administration, public services and compulsory social security (O).
3.5	Consultancy, research, rental of movable property, other services (M/N); public administration, public services and compulsory social security (O).
3.8	Extraction of minerals (B); industry (C); production, distribution and trading of electricity, natural gas, steam and chilled air (D); water collection and distribution; waste and waste water management and remediation (E); rental of movable property and other services (N); public administration, public services and compulsory social security (O).

Table 4-3. The share of each production sector per subcategory

Category	Share per SBI code
3.1	100% L
3.2	20% C-F-G-L 10% M/N 10% O
3.5	50% M/N 50% O
3.8	20% B-C-D-E 10% N 10% O

Based on the method described above the composition per production sectors has been known per subcategory (in %)(A). Using the environmental accounts, the total GHG emissions has been known per production sector (in kg) and the annual monetary value per production sector has been known (in Euro). So per production sector the kg GHG emissions per Euro has been calculated (B). Knowing A and B for each subcategory the specific kg GHG emissions per Euro expenditure (C) has been calculated.

For reporting year 2022, this resulted in the values for kg CO_2 per Euro (C) presented in Table 4-4. To have insight in how this has changed over the years also the values used for reporting years 2021 and 2019 are shown.

Table 4-4 The kg CO_2 equivalent per euro that is used in the calculation

Reporting year	2022	2021	2019
Category 3.1	0.006 kg CO_2-eq / Euro	0.007 kg CO_2-eq / Euro	0.009 kg CO_2-eq / Euro
Category 3.2	0.20 kg CO_2-eq / Euro	0.21 kg CO_2-eq / Euro	0.22 kg CO_2-eq / Euro
Category 3.5	0.03 kg CO_2-eq / Euro	0.03 kg CO_2-eq / Euro	0.03 kg CO_2-eq / Euro
Category 3.8	0.47 kg CO_2-eq / Euro	0.48 kg CO_2-eq / Euro	0.52 kg CO_2-eq / Euro

The IV3 spending database of all municipalities has been used (CBS, Statline). From this database the categories 3.1, 3.2, 3.5, and 3.8 have been selected. Only the positive expenditures have been taken into account. The expenditure of the municipality per sub-function and category has been multiplied by the kg CO2-eq per Euro (C). This has resulted in kg GHG emissions per expenditure (D). Per

	municipality these values for all the subfunctions x subcategories have been added up to result in scope 3 per municipality in kg. This has been divided by 1000 to result in ton GHG emissions. Finally, the GHG emissions have been calculated per municipality. The expenses on natural gas use and electricity use are supposedly also included in the spending on category 3.8. Therefore in the end, the scope 1 (natural gas) and scope 2 (electricity) emissions have been subtracted from the total scope 3 emissions to avoid double counting. After calculating scope 3 GHG emissions, this total amount has been multiplied by the percentage of loan of the municipalities in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a municipality is 25%, 25% of the scope 3 GHG emissions of that municipality has been allocated to BNG Bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR. To calculate the emission factors for category 3.1, 3.2, 3.5, and 3.8 data of the years 2017, 2019, and 2020 have been used for reporting years 2019, 2021, and 2022, respectively. However, expenditure of the municipalities, outstanding loans, and total balance sheet of the municipalities have been used of the years 2018, 2020, and 2021 for reporting years 2019, 2021, and 2022, respectively.
Avoided emissions	Not applicable
Asset class specific considerations	The approach for municipalities is in line with the public loan approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet}\ (\boldsymbol{equity} + \boldsymbol{debt})}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Limitations	A risk of double counting arises from that local and regional government related collaborations, companies, and projects might be included in the financial and emission reporting of municipalities and provinces. This can only be assessed by individual entities, and this has not been corrected for in this report. An uncertainty in the method described under calculations earlier in this factsheet is that the exact share of each production sector per category is unknown. It was not possible to specify this by more detailed information from several municipalities. Therefore, a share was assumed by the researchers of Het PON & Telos. Another limitation is the possible double counting in scope 1 and 2 in comparison to scope 3. However, by using the current model(s), the best result possible is achieved. As described in the section “calculation steps” the GHG emissions of scope 1 and 2 are subtracted from the GHG emissions of scope 3 because it is assumed that the expenses on natural gas use and electricity use are included in the spending on category 3.8. The emission factor (kg CO_2-eq / Euro) has been calculated with data from the years 2017, 2019, and 2020 for reporting years 2019, 2021, and 2022, respectively, because more recent data was not available.
Data quality estimate	Scope 3: data quality score 4. The GHG emissions are calculated based on economic activity. The expenses made in the categories 3.1, 3.2, 3.5, and 3.8 were multiplied by a value for kg CO_2-eq / Euro.

	The value for kg CO_2-eq / Euro has been calculated based on proxy data on the basis of country. Therefore, data quality is score 4.

4.2.3 Data Factsheet per datafile used

Topic	Description
Data	Standard business format: description per sectoral production category. The description of the sectoral production categories in this document is used to link categories of municipalities their finances to one or more sectoral production categories.
Data file	2022EP06 SBI Structuur.pdf
Data Source	CBS
Year	2022
Last update	2022
Date of download	31-10-2022
Link to webpage	https://www.cbs.nl/nl-nl/onze-diensten/methoden/classificaties/activiteiten/sbi-2008-standaard-bedrijfsindeling-2008/de-structuur-van-de-sbi-2008-versie-2018-update-2022
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Gemeenten\Scope 3
Data quality	Not applicable
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope3\Printscreens\20223110 SBI codes.PNG

Topic	Description
Data	GHG emissions to the air by the Dutch economy
Data file	05092022 emissies naar lucht 2017 2019 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020
Last update	03-12-2021
Date of download	05-09-2022
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/83300NED/table?dl=5932E
Filters used to obtain the datafile	Onderwerp: Broeikasgassen (klimaatverandering); Broeikasgas-equivalent Perioden: 2017, 2019, 2020 Nederlandse economie: Economische activiteiten A, B, C, D, E, F, G-I, J, K, L, M-N, O-Q, R-U
Internal location	Werkmap\Gemeenten\Scope 3\Ruwe Data
Data quality	Score 4 The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/milieurekeningen Data is based on environmental accounts. Important sources for the environmental accounts are environmental statistics, such as emission registrations, energy statistics (Dutch energy balance) and a macro economic system used by CBS. It is data on the basis of country and therefore data quality score is 4.
Unit of measurement	GHG emissions: mln kilogram
Selections	Not applicable
Data transformation	Calculations made with the data are described in the section calculation steps of municipalities (scope 3).

Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 3 \Printscreens\20220905 emissies naar lucht 2017 2019 2020.PNG

Topic	Description
Data	The monetary value of all produced goods and services in the Netherlands
Data file	20221028 bbp 2017 2019 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020
Last update	24-06-2022
Date of download	28-10-2022
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/84087NED/table?ts=1601538240382
Filters used to obtain the datafile	Perioden: 2017/2019/2020 Onderwerp: BBP vanuit de productie: Waarde prijsniveau 2015 Bruto toegevoegde waarde basisprijzen; A, B-E, B, C, D, E, F, G-I, J, K, L, M-N, O-Q, R-U
Internal location	Werkmap\Gemeenten\Scope 3\Ruwe data
Data quality	Score 3 Based on registered production statistics. The data quality has increased due to a number of checks and control functions in the method. The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/nationale-rekeningen
Unit of measurement	Mln Euro
Selections	Not applicable
Data transformation	Calculations made with the data are described in the section calculation steps of municipalities (scope 3)
Data missing	Not applicable
Print Screens	In folder: Werkmap\Gemeenten\Scope 3\Printscreens\20221028 bbp 2017 2019 2020.PNG

Topic	Description
Data	Expenses of all Dutch municipalities per IV3/COFOG code
Data file	20210923 iv3 2018 gemeente.xlsx 20210923 iv3 2020 gemeente.xlsx 20220922 iv3 2021 gemeente.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	2018: 23-09-2019 2020: 22-09-2021 2021: 22-09-2022
Date of download	23-09-2021; 22-09-2022
Link to webpage	2018: https://iv3statline.cbs.nl/#/IV3/nl/dataset/45042NED/table?ts=1632405676148 2020: https://iv3statline.cbs.nl/#/IV3/nl/dataset/45050NED/table?ts=1632405785668 2021: https://iv3statline.cbs.nl/#/IV3/nl/dataset/45054NED/table
Filters used to obtain the datafile	Onderwerp: 2e plaatsing Taakveld/balanspost: alle taakvelden 0 t/m 8 Categorie: Lasten: L3.1 grond, L3.2 Duurzame goederen, L3.5.1. Ingeleend personeel, L3.8 Overige goederen en diensten Verslagsoort: Jaarrekening
Internal location	Werkmap\Gemeenten\Scope 3\Ruwe data
Data quality	Score 2 High data quality. Data is directly supplied by municipalities from internal accounting systems. Provinces deliver the data to CBS, the data has not been edited by CBS.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	2018: Data of municipalities 'Zederik', 'Vianen' and 'Leerdam' are missing 2020: Data of municipalities 'Hof van Twente' and 'Renswoude' are missing
Print Screens	In folder: Werkmap\Gemeenten\Scope 3\Printscreens\iv3

List of the calculation sheets	Location
BNG 20230119 scope 3 gemeente 2018.xlsx	Werkmap\Gemeenten\Scope 3
BNG 20230119 scope 3 gemeente 2020.xlsx	Werkmap\Gemeenten\Scope 3
BNG 20230119 scope 3 gemeente 2021.xlsx	Werkmap\Gemeenten\Scope 3

5 Public sector: provinces approach

5.1 Scope 1, 2, and 3

5.1.1 Adjustments in methodology

The methodology to calculate scope 1 and 2 has slightly changed for provinces. For current report, the delivered natural gas and electricity to the public administration and government services sector at aggregation level of provinces have been multiplied by the percentage of the number of employees working at the province organization versus the number of employees working at the total public administration and government services sector in the whole province. Previous years, the number of employees (in FTE) working at the province organization was divided by the total number of employees (in numbers) working at the total public administration and government services sector to calculate this percentage. This underestimated this percentage by mistake, because FTE was divided by total number of employees. This also affected the GHG emissions for the vehicle fleet because this percentage was used to divide the number of vehicles in possession of the total province organization over the twelve provinces. For this reason scope 1 and 2 for provinces has been recalculated for the reporting years 2019 and 2021.
To avoid double counting, scope 1 natural gas use and scope 2 electricity use have been subtracted from scope 3. As explained, the method for calculating scope 1 and 2 has changed and therefore also the result of scope 3 has changed.
As explained in paragraph 4.2.1. the method to calculate scope 3 has changed in the same way as for the municipalities.

When the results of the previous and new method are compared, it can be seen that the GHG emissions for reporting year 2019 have increased for scope 1 and 2 and therefore emissions for scope 3 have decreased by using the new method. It can be concluded that with the previous method the GHG emissions for scope 1 and scope 2 were underestimated. For reporting year 2021, the GHG emissions have decreased for scope 1 natural gas use and have increased for scope 2 electricity use. These results did not only change because of the adjustments in the methodology, but also because the preliminary data of CBS have changed. According to the new method, the GHG emissions for scope 1 vehicle fleet were underestimated, still the new method is not very accurate. This is discussed in the section limitations in paragraph 4.1.2. for municipalities and is also actual for provinces. The differences between the results of the new and previous method are presented in Table 5-1.

Table 5-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)	New 2019	Previous 2019	Difference* (%)
Scope 1 Natural gas	152	161	-5.6	93	87	6.9
Scope 1 Vehicle fleet	33	28	17.9	13	11	18.2
Scope 2 Electricity	708	679	4.3	345	325	6.2
Scope 3 indirect emissions	10,400	10,100	3.0	4,998	5,150	-3.0

*The difference is calculated with the following formula: (New - Previous)/Previous*100

5.1.2 General approach

The method to calculate scope 1, 2, and 3 for provinces is the same as the method to calculate scope 1, 2, and 3 for municipalities. The only exception is that for provinces, the number of employees working for the province is known, while for the municipalities the number of employees working for the municipality is not exactly known.

For scope 1 natural gas use and scope 2 electricity use, data of the year 2021 has been used for the calculations.

For scope 1 fossil fuel use by company vehicles, data of the year 2020 has been used for the calculations. Data for the year 2020 on the number of company vehicles and kilometers was the most recent available data.

For scope 3, most recent data on GHG emissions to the air by the Dutch economy was of the year 2020.

The approach for provinces is in line with the public loan approach in the PCAF methodology.

The general factsheet of municipalities show that data quality score is 4 for scope 1 natural gas use, scope 2 electricity use, and scope 3 and data quality score is 5 for scope 1 vehicle fleet. This also applies to the provinces.

Emission factors for natural gas, electricity, and company vehicles

Emission factors for company vehicles have been used. In chapter 14 of this report, is explained which emission factors have been used and why these emission factors have been used.

5.1.3 Factsheet per data source used

Topic	Description
Data	Number of employees working in the public administration and government services sector per province
Data file	20201001 ruwe data lisa banen overheid 2018.xlsx 20210705 ruwe data lisa banen overheid 2020.xlsx 20220905 ruwe data lisa banen overheid 2021.xlsx
Data Source	Lisa; het werkgelegenheidsregister van Nederland
Year	2018-2020-2021
Last update	July 2022 Last update for 2018 and 2020 unknown
Date of download	2018: 23-11-2020 2020: 05-07-2021 2021: 05-09-2022
Link to webpage	https://www.lisa.nl/data/gratis-data/overzicht-lisa-data-per-provincie
Filters used to obtain the datafile	Welke provincies: allemaal Welke jaren: 2021 Welke sectoren: Overheid Welke gegevens: Banen totaal
Internal location	Werkmap\Provincies\Scope 1 en 2\Ruwe data
Data quality	Score 2 Data from LISA are based on observations/measurements of all locations of companies, and not only one company as a whole. Self-employed persons are taken into account as well. This makes it possible to present an overview of employment at every geographic and sectoral level.
Unit of measurement	Number of people
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\ 20220905 banen overheid.PNG Werkmap\Provincies\Scope 1 en 2\Printscreens\2018\ 20201123 overzicht lisa data.png Werkmap\Provincies\Scope 1 en 2\Printscreens\2020\ 20210705 printscreen overheidsbanen per provincie.png

Topic	Description
Data	Number of employees working at the province
Data file	Not applicable
Data Source	A & O Fonds Provincies
Year	2018-2020-2021
Last update	June 2022
Date of download	21-09-2022
Link to webpage	https://personeelsmonitorprovincies.onderzoek.nl/index.cfm?action=main.report
Filters used to obtain the datafile	No filters used
Internal location	Werkmap\Provincies\Scope 1 en 2\Printscreens\Banen provincie
Data quality	Score 2 Data is directly acquired from provinces, using a questionnaire. Data quality is therefore indicated as high.
Unit of measurement	Number of people
Selections	Not applicable

Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\Banen provincie

Topic	Description
Data	Supply of energy to the public administration and government services sector at the aggregation level of province
Data file	20221007 ruwe data levering aardgas, elektriciteit via openbaar net sector O.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	7-10-2021
Date of download	7-10-2021
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82538NED/table?ts=1597657120347
Filters used to obtain the datafile	Onderwerp: Geleverd aardgas, geleverde elektriciteit Perioden: 2021 Regio's: Provincies Bedrijfstakken/branches: Bedrijfstakken 1e digit (SBI 2008), O Openbaar bestuur en overheidsdiensten
Internal location	Werkmap\Provincies\Scope 1 en 2\Ruwe data
Data quality	Score 4. Highly reliable data, because of the registration manner. Different control and correction methods are used, which can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net. The supply of energy is not only to the province organization, but to the total public administration and government services sector at the aggregation level of provinces. Therefore, the data quality score is 4 because it is data on the basis of region.
Unit of measurement	Natural gas: 1000 Nm^3 Electricity: 1000 kWh
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\20221007 levering aardgas, elektriciteit via openbaar net sector O provincies.PNG

Topic	Description
Data	Number of company vehicles owned by companies in the public administration and government services sector.
Data file	20201001 ruwe data bedrijfsbestelautos O sector landelijk 2017.xlsx 20230118 ruwe data bedrijfsautos 2019.xlsx 20220610 ruwe data bedrijfsautos 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020 Data from 2017 is used for reporting year 2019 Data from 2019 is used for reporting year 2021 Data from 2020 is used for reporting year 2022
Last update	2017: 24-01-2022 2019: 24-01-2022 2020: 24-01-2022
Date of download	2017: 11-11-2022

	2019: 18-01-2021 2020: 10-06-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81481NED/table?ts=1626174554210
Filters used to obtain the datafile	Onderwerp: Bedrijfsbestelauto's Bedrijfstakken/branches: O Openbaar bestuur en overheidsdiensten Bedrijfsgrootte/leeftijd bestelauto: Totaal Perioden: 2020
Internal location	Werkmap\Provincies\Scope 1 en 2\Ruwe data
Data quality	Score 2 The research method of this data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/bezit-en-gebruik-bestelauto-s The additional research report can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/aanvullende%20onderzoeksbeschrijvingen/bezit-en-gebruik-bestelauto-s Data comes from motor vehicle registration (RDW) and data is checked on content, quality and usability by Statistics Netherlands
Unit of measurement	Number of company vehicles
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\ 20220610 bedrijfsautos_2020.PNG Werkmap\Provincies\Scope 1 en 2\Printscreens\2020 20230118 bedrijfsautos 2019.PNG Werkmap\Provincies\Scope 1 en 2\Printscreens\2018 Aantal bedrijfswagens sector O 2017.PNG

Topic	Description
Data	Average kilometers driven with a passenger vehicle with a Dutch registration per year
Data file	20201001 ruwe data km bedrijfswagens 2017.xlsx 20230118 ruwe data km bedrijfsautos 2019.xlsx 20220610 ruwe data km bedrijfswagens 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020 Data from 2017 is used for reporting year 2019 Data from 2019 is used for reporting year 2021 Data from 2020 is used for reporting year 2022
Last update	2017: 10-11-2021 2019: 10-11-2021 2020: 10-11-2021
Date of download	2017: 11-11-2022 2019: 18-01-2023 2020: 10-6-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71107ned/table?ts=1626174732075
Filters used to obtain the datafile	Gewichtsklasse leeggewicht: Totaal Leeftijd voertuig: Totaal Tenaamstelling: Bedrijf Brandstofsoort: Alle brandstofsoorten Onderwerp: Gemiddelde jaarkilometrage Perioden: 2020

Internal location	Werkmap\Provincies\Scope 1 en 2\Ruwe data
Data quality	Score 2 The research method of this data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/verkeersprestaties-personenauto-s The original data comes from the online kilometer registration (OKR) of the RDW. This data is reliable.
Unit of measurement	Kilometers
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\ 20220610 km bedrijfswagens_2020.PNG Werkmap\Provincies\Scope 1 en 2\Printsceens\2020 20230118 km bedrijfsautos 2019.PNG Werkmap\Provincies\Scope 1 en 2\Printsceens\2018 Km bedrijfswagens 2017.PNG

Topic	Description
Data	Total balance sheet of provinces
Data file	20220922 passiva provincies 2021
Data Source	CBS Statline
Year	2021
Last update	22-09-2022
Date of download	22-09-2022
Link to webpage	https://iv3statline.cbs.nl/#/IV3/nl/dataset/45056NED/table?ts=1663829482677
Filters used to obtain the datafile	Provincies: allemaal Verslagsoort: Jaarrekening Categorie: Ultimo Onderwerp: 2e plaatsing Taakveld/balanspost: passiva
Internal location	Werkmap\Provincies\Scope 1 en 2\Ruwe data This folder also contains data from previous years: 20210928 passiva 2020 provincie.xls 20201014 totaal passiva provincie doorgerekend 2018.xlsx
Data quality	Score 2 High quality data. The data is directly delivered to CBS by provinces from internal accounting systems. The data had not been edited by CBS.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 1 en 2\Printscreens\ Passiva provincies 2021_1.png Passiva provincies 2021_2.png Werkmap\Provincies\Scope 1 en 2\Printscreens\2020\ 20210928 printscreen passiva provincie 2020.PNG Werkmap\Provincies\Scope 1 en 2\Printscreens\2018\ Passiva provincies 2018 iv3 data_1.PNG Passiva provincies 2018 iv3 data_2.PNG Passiva provincies 2018 iv3 data_3.PNG

Topic	Description
Data	Expenses of all Dutch provinces
Data file	20210923 iv3 2018 provincie.xlsx 20210923 iv3 2020 provincie.xlsx 20220922 iv3 2021 provincie.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	22-09-2019, 22-09-2021, 22-09-2022
Date of download	23-09-2021; 22-09-2022
Link to webpage	2018: https://iv3statline.cbs.nl/#/IV3/nl/dataset/45043NED/table?ts=1602676730545 2020: https://iv3statline.cbs.nl/#/IV3/nl/dataset/45051NED/table?ts=1632307113240 2021:https://iv3statline.cbs.nl/#/IV3/nl/dataset/45056NED/table?ts=1663853031768
Filters used to obtain the datafile	Onderwerp: 2e plaatsing Taakveld/balanspost: alle taakvelden 0 t/m 8 Categorie: Lasten: L3.1 grond, L3.2 Duurzame goederen, L3.5.1. Ingeleend personeel, L3.8 Overige goederen en diensten Verslagsoort: Jaarrekening
Internal location	Werkmap\Provincies\Scope 3\Ruwe data
Data quality	Score 2 High data quality. Data is directly supplied by provinces from internal accounting systems. Provinces deliver the data to CBS, the data has not been edited by CBS.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 3\Printscreens\iv3 provincie

Topic	Description
Data	GHG emissions to the air by the Dutch economy
Data file	05092022 emissies naar lucht 2017 2019 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020
Last update	03-12-2021
Date of download	05-09-2022
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/83300NED/table?dl=5932E
Filters used to obtain the datafile	Onderwerp: Broeikasgassen (klimaatverandering); Broeikasgas-equivalent Perioden: 2017 2019 2020 Nederlandse economie: Economische activiteiten A, B, C, D, E, F, G-I, J, K, L, M-N, O-Q, R-U
Internal location	Werkmap\Provincies\ Scope 3\Ruwe data
Data quality	Score 3 The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/milieurekeningen Data is based on environmental accounts. Important sources for the environmental accounts are environmental statistics, such as emission registrations, energy statistics (Dutch energy balance) and a macro economic system used by Statistics Netherlands.
Unit of measurement	GHG emissions: mln kilogram
Selections	Not applicable
Data transformation	Calculations were made with the data as described in the section calculation steps of municipalities (scope 3).

Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 3\Printscreens\20220905 emissies naar lucht 2017 2019 2020.PNG

Topic	Description
Data	The monetary value of all produced goods and services in the Netherlands
Data file	20221018 bbp 2017 2019 2020.xlsx
Data Source	CBS Statline
Year	2017-2019-2020
Last update	24-06-2022
Date of download	28-10-2022
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/84087NED/table?ts=1601538240382
Filters used to obtain the datafile	Perioden: 2017/2019/2020 Onderwerp: BBP vanuit de productie: Waarde prijsniveau 2015 Bruto toegevoegde waarde basisprijzen; A, B, C, D, E, F, G-I, J, K, L, M-N, O-Q, R-U
Internal location	Werkmap\Provincies\Scope 3\Ruwe data
Data quality	Score 3 Based on registered production statistics. The data quality has increased due to a number of checks and control functions in the method. The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/nationale-rekeningen
Unit of measurement	Mln Euro
Selections	No specific selections
Data transformation	Calculations were made with the data as described in the section calculation steps of municipalities (scope 3)
Data missing	Not applicable
Print Screens	In folder: Werkmap\Provincies\Scope 3\Printscreens\20221028 bbp 2018 2020 2021.PNG

List of the calculation sheets	Location
Banen_Overheid.csv Banen_Provincie.csv Bedrijfsautos.csv Emissiefactoren_totaaloverzicht.csv Energielevering sector O.csv KM_Bedrijfsautos.csv Passiva.csv portefeuilleBNG_provincies.csv Provinciecode.csv	Werkmap\Provincies\Scope 1 en 2\Brondata voor SQL
PCAF provincie BNG	Werkmap\Provincies\Scope 1 en 2\Scripts en database SQL
PCAF provincie BNG 2018.sql PCAF provincie BNG 2020.sql PCAF provincie BNG 2021.sql PCAF provincie script aanmaken tabellen.sql	Werkmap\Provincies\Scope 1 en 2\Scripts en database SQL
20221014_BNG scope 1 en 2 2018.csv 20221014_BNG scope 1 en 2 2020 (2).csv 20221014_BNG scope 1 en 2 2021.csv	Werkmap\Provincies\Scope 1 en 2\CSVs verkregen uit SQL
BNG 20220905 scope 3 provincie 2018.xlsx BNG 20230119 scope 3 provincie 2020.xlsx BNG 20220905 scope 3 provincie 2021.xlsx	Werkmap\Provincies\Scope 3

6 Public sector: water authorities approach

6.1 Scope 1, 2, and 3

The climate monitor water authorities (Arcadis, 2022) forms the basis for the calculations for water authorities. This monitor is developed by Arcadis for the Union of Water Authorities (Unie van Waterschappen) and the NWB Bank. This monitor describes the emissions per scopes in detail, and per individual water authority. Therefore, the description of this approach is brief. For more information we refer to the 'klimaatmonitor waterschappen, verslagjaar 2021' (Arcadis, 2022).[27]

6.1.1 Adjustments in methodology

One adjustment has been made to the methodology of the water authorities. The GHG emissions of the sewage treatment plant are added to scope 1. This has a large impact on the total GHG emissions of the water authorities. The GHG footprint has become more complete. The differences between the results of the new and previous method are large and are presented in Table 6-1.

Table 6-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)	New 2019	Previous 2019	Difference* (%)
Scope 1	15,364	460	3,240	23,735	863	2,650

*The difference is calculated with the following formula: (New - Previous)/Previous*100

6.1.2 General factsheet

Topic	Description
Scopes covered	The report Climate monitor water authorities (Arcadis, 2022) covers all three scopes in detail. Table 6-2 shows the underlying themes of the scopes. All scopes presented by Arcadis in the report Climate monitor water authorities in Table 1[28] are also used for this report.

Table 6-2. The different scopes included in the water authorities approach

Direct CO_2 emissions	
Water treatment management	Scope 1
Water systems	Scope 1
Other	Scope 1
Own mobility, transport and maintenance	Scope 1
GHG emissions of the sewage treatment plant	Scope 1
Indirect CO_2 emissions	
Water treatment management	Scope 2
Water systems	Scope 2
Other	Scope 2

[27] https://unievanwaterschappen.nl/publicaties/klimaatmonitor-2021/

	Own mobility, transport and maintenance — Scope 2 Commuting — Scope 3 Outsourced transport and maintenance — Scope 3 Materials and raw materials — Scope 3
Portfolio covered	Data is collected for all 21 water authorities in the Netherlands. This means the portfolio coverage rate is 100%.
Data	Data has been used from the report Climate monitor water authorities (Arcadis, 2022). This monitor is developed by Arcadis for the Union of Water Authorities (Unie van Waterschappen) and the NWB Bank. This monitor describes the emissions in the three scopes for each individual water authority in detail. For the report Climate monitor water authorities the calculations are performed by using emission factors based on 'well to wheel' (WTW). The PCAF methodology prescribes to use emission factors based on 'tank to wheel' (TTW). Therefore, Arcadis has provided Het PON & Telos with the data from the Climate monitor water authorities calculated based on 'tank to wheel' (TTW). This data can be find in the file 'Overzicht CO_2-voetafdruk vj 2021 TTW.pdf'. Arcadis acquired the data from water authorities via a questionnaire, in which quantitative and qualitative data were collected.
Grid emission factors	The consumed fuel, warmth, and electricity can be converted to GHG emissions using grid emission factors. Within the Netherlands, CO2emissiefactoren.nl gives a list of widely accepted and uniform grid emission factors. The 'klimaatmonitor waterschappen' (Arcadis, 2022) uses the same emission factors from CO2emissiefactoren.nl. The only difference is that the monitor uses the 'well to wheel' (WTW) factors, and not the 'tank to wheel' factors (TTW). The PCAF harmonized approach prescribes to use the TTW values. Therefore, Arcadis has provided Het PON & Telos with the data from the Climate monitor water authorities calculated based on 'tank to wheel' (TTW).
Calculation steps	The file 'Overzicht CO_2-voetafdruk vj 2021 TTW.pdf' contains all TTW values. The values have been added up to result in the categories per scope that are shown in Table 6-1. For the exact calculation steps per scope, consult the Arcadis (2022) report[29]. After calculating scope 1, 2, and 3 GHG emissions, this total amount has been multiplied by the percentage of loan of the water authorities in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a water authority is 25%, 25% of scope 1, 2, and 3 GHG emissions of that water authority has been allocated to BNG Bank. The absolute GHG emissions and relative emission are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR.
Avoided emissions	Data on renewable energy use per water authority are available in the Arcadis (2022) report.[30]
Asset class specific considerations	The approach for water authorities is in line with the public loan approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.

[29] https://unievanwaterschappen.nl/publicaties/klimaatmonitor-2021/

[30] https://unievanwaterschappen.nl/publicaties/klimaatmonitor-2021/

Absolute vs. relative emissions	For the water authorities, the absolute GHG emissions are presented in tons / year. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in tons CO_2-eq / mln Euro.
Limitations	Not all the process emissions are in scope yet. It is desired by the water authorities and the national climate agreement, that these will be taken in consideration as well. For more information see Arcadis report p.46 and further.
Data quality estimate	The GHG emissions are calculated based on data received from the water authorities themselves, but the data is not audited. Therefore, data quality score is 2. The GHG emissions of methane and nitrous oxide from sewage treatment plants have been determined based on an IPCC model. This does not take into account the individual situations of the sewage treatment plants. But, data is sectorspecific. Therefore, data quality score is 3 for scope 1 GHG emissions from the sewage treatment plant.

6.1.3 Factsheet per data source used

Topic	Description
Data	Fuel, warmth and electricity use per water authority in TTW
Data file	Overzicht CO2-voetafdruk vj 2021 TTW.pdf
Data Source	Arcadis, 2022
Year	2021
Last update	September 2022
Date of download	Received by email from Arcadis at 20-9-2022
Link to webpage	Not public
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Waterschappen
Data quality	Score 2 and 3 The method for water authorities is scaled into data quality level 2, because of the detailed underlying information provided in the Arcadis (2022) study. Except for the GHG emissions from the sewage treatment plant. The extent of emissions of methane and nitrous oxide from sewage treatment plants are determined based on an IPCC model. This does not take into account the individual situations of the sewage treatment plants. But, data is sectorspecific. Therefore, data quality score is 3 for scope 1 GHG emissions from the sewage treatment plant.
Unit of measurement	Multiple
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	Not applicable

Topic	Description
Data	Total balance sheet per water authority
Data file	Totale passiva waterschappen 2021.xlsx
Data Source	Unie van Waterschappen, WAVES, ABF Research
Year	2021
Last update	18-7-2022
Date of download	6-10-2022
Link to webpage	https://live-waves.databank.nl/jive
Filters used to obtain the datafile	Waterschapsspiegel > Alle gegevens > Financiën > Gerealiseerd > Balans > Passiva All water authorities Year: 2021
Internal location	Werkmap\Waterschappen
Data quality	Score 2

	High data quality. Directly supplied by water authorities from internal accounting systems.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Waterschappen\Printscreens\ 20221004 totale passiva waterschappen.png

List of the calculation sheets	Location
Totaaloverzicht emissies waterschappen 2021 BNG Bank.xlsx	Werkmap\Waterschappen
BNG_Totaaloverzicht emissies waterschappen 2018 aangepast indeling.xlsx	Werkmap\Waterschappen\Vorige jaren
Totaaloverzicht emissies waterschappen 2020 BNG nieuwe indeling.xlsx	Werkmap\Waterschappen\Vorige jaren

7 Healthcare sector approach

7.1 Scope 1, 2, and 3

7.1.1 Adjustments in methodology

For reporting year 2021, the dataset of the Ministry of Health, Welfare and Sport from 2017 was used to calculate scope 1 and 2 GHG emissions, because for the years 2018 and 2019 only total costs for energy and maintenance were available, separate costs for natural gas and electricity were not available. Thus for reporting year 2021, we used outdated energy data for calculating the GHG emissions, which is not desirable in a field where more and more investments have been made in green energy and where the focus on energy saving is increasing.
Therefore, for reporting year 2022, the methodology was improved for scope 1 and 2. Energy consumption data has been received from Republiq. Republiq requested energy consumption data from the three largest network operators in the Netherlands (Enexis, Liander and Stedin) based on cadastral parcels owned by healthcare institutions. The new method is not reliant on old data anymore and removes several calculation steps and assumptions to convert energy costs into energy usage which should lead to more accurate GHG emission estimates.

A small adjustment was also made to the calculation of scope 3, which slightly changed the results. In the previous method, the average distance traveled per person per year with *other transport* than train, car, metro/tram/bus, bike, or travel on foot was not taken into account in the total distance. However, for reporting year 2022, this was added up to the total distance per person per year for all modes of transport together. When the percentage of distance for train, car, metro/tram/bus, bike, and on foot has been calculated the distance per transport mode has been divided by a larger total distance when *other transport* has been included. In the previous method *other transport* was left out of the total, but this year it has been included and this has reduced the percentage for train, car, metro/tram/bus, bike, and on foot.
In addition, in 2021, CO2emissiefactoren.nl introduced an emission factor for public transport general (bus, tram, metro average). In current report, this emission factor has also been used for the previous years. Previous years a calculated emission factor was used, and this emission factor deviated from the current used emission factor and slightly changed the results.

In the calculations of the previous years, the data for the healthcare sector was two years behind. In the new method, the data is only one year behind. In the dataset of the Ministry of Health, Welfare and Sport, that had been used for previous reports, data on total balance sheet of the health care institutions for the years after 2017 were not complete. Therefore, for current report, data on total balance sheet has been taken from the annual reports of the healthcare institutions. These two changes have also affected the results.

When the results of the previous and new method are compared, it can be seen that the GHG emissions have increased for scope 1 natural gas use, but have decreased for scope 2

electricity use. It can be concluded that with the previous method scope 1 GHG emissions were underestimated and scope 2 GHG emissions were overestimated.
The previous scope 3 GHG emissions were slightly overestimated for reporting year 2021 and slightly underestimated for reporting year 2019. The difference between the previous and new method were small and the calculation is not very accurate with a data quality score of 5. The differences between the results of the new and previous method are presented in Table 7-1.

Table 7-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)	New 2019	Previous 2019	Difference* (%)
Scope 1 Natural gas	163,256	126,427	29.1	200,218	127,837	56.6
Scope 2 Electricity	84,289	124,681	-32.4	90,504	116,970	-22.6
Scope 3 Commuting	33,311	35,653	-6.6	53,733	52,581	2.2

*The difference is calculated with the following formula: (New - Previous)/Previous*100

7.1.2 General factsheet

Topic	Description
Scopes covered	In the healthcare approach scope 1, 2 and part of scope 3 are covered. Scope 1 and 2 are based on energy consumption data obtained from the three largest network operators in the Netherlands (Enexis, Liander, and Stedin). Scope 3 in the current healthcare approach contains emissions from employee commuting.
Portfolio covered	The portfolio coverage rate for this sector is 86.9%. The new data source has a positive effect on the coverage rate.
Data	Energy consumption data from healthcare institutions are obtained from three largest network operators in the Netherlands (Enexis, Liander and Stedin). Data of the total balance sheet per healthcare institute per year, are coming from their own annual reports. Geographically based annual averages (provinces/NUTS2) for commuting distance data is coming from the Dutch Central Bureau of Statistics (CBS). Just as the Geographically based annual averages (provinces/NUTS2) for business travel distance and distance travelled per means of transportation data.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Natural gas - Electricity (unknown source) - Public Transport general (Bus/Tram/Metro average) - Train (unknown type) - Car (average type, weight class medium heavy, fuel mix 79.3% petrol, 15.8% diesel, 1.5% lpg, 3.0% petrol-hybrid, 0.2% electric)
Calculation steps	Scope 1 emissions are the direct GHG emissions of the organizations. For healthcare organizations, these emissions result from the use of natural gas for heating of buildings, or for disinfection of medical tools. Scope 2 emissions include the indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating or cooling consumed by the healthcare institution. Because steam, heating or cooling use per healthcare institution is unknown, scope 2 will be based on the emissions from purchased electricity.

	Energy consumption data was received from three largest network operators in the Netherlands based on cadastral parcels owned by healthcare institutions. The following steps has been performed by Republiq: 1. Inventory of all healthcare institutions; 2. Inventory of all cadastral parcels owned by healthcare institutions; 3. Inventory of all buildings owned by healthcare institutions; 4. Request to three network operators; 5. Processing consumption data; 6. Estimate missing consumption data; 7. Creating the overview of consumption data per healthcare institution. *Inventory of all healthcare institutions* BNG Bank has provided an overview of healthcare institutions from its portfolio at 31-12-2021, 31-12-2020, and 31-12-2018. *Inventory of all cadastral parcels owned by healthcare institutions* Republiq has inventoried the properties of the healthcare institutions via Kadaster. Kadaster has provided an overview of the cadastral parcels and associated rights for each institution. *Inventory of all buildings owned by healthcare institutions* In this step Republiq has looked for the buildings on the cadastral parcels from step 2. First, Republiq has matched the results from Kadaster with BAG (Basisregistratie Adressen en Gebouwen). Then, they have looked at whether they could link additional buildings by performing a spatial match. 1. For part of the parcels Kadaster provided an VBO-id (verblijfsobject-ID). This VBO-id is an unique ID for the building or buildings that are placed on the parcel. Republiq has joined the set from Kadaster with the BAG on VBO-id to find the corresponding addresses. 2. Republiq has performed a spatial match by combining a shapefile of cadastral parcels with a shapefile of all buildings in the Netherlands. This has resulted in a list with all parcels and the corresponding buildings placed on this parcel. Republiq has joined this list on parcel-ID with the result from Kadaster to obtain the buildings that are placed on the parcels in ownership of healthcare institutions. 3. Republiq has combined the results from the match on VBO-id and the spatial match to obtain a list with all parcels and corresponding addresses. If several healthcare institutions have rights for the same parcel, Republiq has let the right of ownership prevail over other rights. The result of this step has been an overview of 57,508 unique addresses with the corresponding institution. *Request to three network operators* Due to privacy reasons it is not allowed to provide energy consumption data for individual buildings. It is allowed to provide these for cluster of buildings (10 to 15 buildings). Republiq therefore has made clusters of the buildings, taking into account the owner of the buildings and the type of building. Where possible, clusters consisted only of buildings of the same owner. Clusters were made as followed: 1. The network operator has been assigned to the buildings. This was done on the basis of address details and the area division of the operators (see: https://data.overheid.nl/dataset/gebiedsbedrijven-netbeheers-elektriciteit--gas-en-water). Republiq only has requested energy consumption data from the three largest network operators (Enexis, Liander and Stedin). Together they provide approximately 95% of the buildings with energy data. For buildings that fall in an area of another operator Republiq has made an estimate of the energy consumption. 2. The request for energy consumption data was at the level of unique addresses. Republiq therefore has grouped the data by zip code, house number, and house number addition. The number of unique addresses has been counted per institution.

	3. Republiq has made clusters of at least 15 addresses. Where possible, they have created multiple clusters per institution. 4. Republiq has created joint clusters for healthcare institutions with fewer than 15 unique addresses. They have calculated the average surface area of the buildings per institution. Then they have created clusters of at least 15 buildings, in which the buildings of healthcare institutions with a comparable surface area ended up in the same cluster. *Processing consumption data* From the network operators Republiq has received per cluster the standard annual energy consumption (in Dutch standaard jaarverbruik (SJV)). They have divided this by the average surface of buildings from a cluster to obtain energy consumption data per m^2. The energy consumption data per m^2 has been assigned to the individual buildings belonging to a cluster. Next, Republiq has performed a check on outliers. When the electricity consumption of an establishment was higher than 200 kWh per m^2 or lower than 5 kWh per m^2, they have marked this as unreliable and have replaced this value with an estimated value. When the gas consumption of an establishment has been higher than 100 Nm^3 per m^2, they have marked this as unreliable and have replaced this value with an estimated value. *Estimate missing consumption data* Republiq has used the actual consumption data to calculate an average value for electricity usage and gas usage. This has been done per year for different classes of building years and surfaces. For the buildings with missing consumption data an estimation for gas and electricity has been assigned on the basis of the building period and surface class. *Overview per healthcare institution* For each healthcare institution Republiq has grouped the following measures: - Total electricity consumption (in kWh) - Total gas consumption (in m^3) The total energy consumption per healthcare institution has been converted into kg GHG emissions using the emission factor for electricity from unknown sources and natural gas use (see chapter 14). These GHG emissions in kg have been divided by 1000 to result in GHG emissions in ton. **Scope 3** Scope 3 should cover all other indirect emissions (not included in Scope 2). In the current report, scope 3 is incomplete and only emissions from employee commuting has been included in the calculations. From the datasets of the Ministry of Health, Welfare and Sport available for 2021 the number of employees in FTE were used for the calculations. According to the average distance a person travels per year by bus/tram/metro, train, bike, car as driver, car as passenger, foot, and other mode of transport (7 travel types), the percentage of travelling per travel type has been calculated. The average distance a person travels per year is available at province level (CBS statline). The average distance a person travels per year from and to work and for business is assigned to the healthcare institution based on the province in which the institution is located. For every type of transport (except for other mode of transport), the number of employees in fulltime-equivalent (FTE) has been multiplied by the average distance a person travels per year for work and by percentage of transport type to come to the number of kilometer travelled per year with the travel types (except for other mode of transport). Afterwards, the kilometers per year per travel type has been multiplied by the corresponding emission factor resulting in kilogram GHG emissions for each travel type. For car as driver and car as passenger the total kilometer travelled per year has been first divided by 1.39 (Conversion factor for passenger kilometers to vehicle kilometers (the average occupancy rate of vehicles is 1.39 per car)

	(CO2emissiefactoren.nl, 2021) and then this has been multiplied by the corresponding emission factor resulting in kilogram GHG emissions. The kilogram GHG emissions for each travel type has been added up to result in scope 3. These GHG emissions in kg have been divided by 1000 to result in GHG emissions in ton. After calculating scope 1, 2, and 3 GHG emissions, this total amount has been multiplied by the percentage of loan of the healthcare institutions in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a healthcare institution is 25%, 25% of scope 1, 2, and 3 GHG emissions of that healthcare institution has been allocated to BNG Bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions were divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR. For calculation of the coverage rate only the healthcare institutions were taken into account for whom it has been able to calculate at least scope 1 **and** 2.
Avoided emissions	The avoided emissions for the healthcare sector are not known and therefore not reported in this report. When a healthcare institution invests in renewable energy, the electricity consumption from the energy network will reduce. Indirectly, therefore, investments in renewable energy should be reflected in a decrease of scope 2 electricity in current report.
Asset class specific considerations	The approach for healthcare sector is in line with the 'Commercial real estate' approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the healthcare sector the total absolute GHG emissions are calculated in ton. The relative emissions were calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in ton CO_2-eq / mln Euro.
Limitations	It is not possible to assign actual consumption data to every building. For the buildings where this is not possible, Republiq has made an estimation of the consumption data. Ideally, emissions from other sources in the primary process of healthcare organizations should be taken into account as well. For example emissions of other gasses from ambulances and trauma helicopters used for medical procedures. Unfortunately, the data provided on these issues is insufficient to be able to make reliable estimations. Therefore, only natural gas use is taken into consideration under scope 1. Scope 3 should cover all other indirect emissions (not included in Scope 2). Only a small part of scope 3 is covered for the healthcare institutions. The part that is covered is based on proxy data and therefore data quality is poor. In the calculation of scope 3, the number of employees (in FTE) has a major impact on the results. The used mobility data from CBS is based on people that work 30 hours per week or more. It was not possible to choose a working week of 40 hours. So this selection of people is larger than the group of people that works between 36 and 40 hours per week (1 FTE). These mentioned factors have an effect on the data quality.
Data quality estimate	Scope 1 and 2: data quality score 3.

	The GHG emissions are based as much as possible on actual building energy consumption. However, due to privacy reasons it is not allowed to provide energy consumption data for individual buildings. It is allowed to provide these for cluster of buildings (10 to 15 buildings). Where possible, clusters consisted only of buildings of the same owner. If this was not possible, buildings of different owners have been clustered. For the buildings with missing consumption data an estimation for gas and electricity has been assigned on the basis of the building period and surface class. Because the actual building energy consumption had to be clustered and in some cases for the buildings with missing data an estimation was made the data quality score is 3. Scope 3: data quality score 5. The GHG emissions are calculated based on average vehicle information. Vehicle make, model, and type are unknown and distance traveled is based on local or regional statistical data. Therefore, data quality score is 5. See option 3b in Table 5-16 on page 106 of the report Financed Emissions, The global GHG accounting & reporting standard Part A.[31]

7.1.3 Factsheet per data source used

Topic	Description
Data	Energy consumption healthcare institutions
Data files	Original files (datafiles received from Republiq): 2. Energieverbruik zorginstellingen 2018.xlsx 3.Energieverbruik zorginstellingen 2020.xlsx 4.Energieverbruik zorginstellingen 2021.xlsx Edited files: 20221221 toewerk bestand aardgasverbruik en elektriciteitsverbruik naar totaal bestand voor SQL BNG Bank.xlsx
Data Source	Republiq
Year	2018-2020-2021
Last update	Not applicable
Date of download	21-9-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Original files: Werkmap\Zorg\Ruwe data Edited file: Werkmap\Zorg\Voorbewerking data
Data quality	Score 3 The GHG emissions are based as much as possible on actual building energy consumption. However, due to privacy reasons it is not allowed to provide energy consumption data for individual buildings. It is allowed to provide these for cluster of buildings (10 to 15 buildings). Where possible, clusters consisted only of buildings of the same owner. If this was not possible, buildings of different owners have been clustered. For the buildings with missing consumption data an estimation for gas and electricity has been assigned on the basis of the building period and surface class. Because the actual building energy consumption had to be clustered and in some cases for the buildings with missing data an estimation was made the data quality score is 3.
Unit of measurement	Natural gas use in Nm^3 Electricity use in kWh
Selections	Republiq has delivered the data at the level of the healthcare institutions so no selection was necessary
Data transformation	Republiq delivered the data at the level of the healthcare institutions so no transformation was necessary

[31] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

Data missing	For the years 2018, 2020, and 2021 the following number of health care institutions are missing in the final results of GHG emissions: 2018: 93 from the 399 health care institutions in the loan portfolio; 2020: 82 from the 389 health care institutions in the loan portfolio; 2021: 70 from the 375 health care institutions in the loan portfolio. This can be due to missing energy data or total balance sheet data.
Print screens	In folder: Werkmap\Zorg\Printscreens\20220921 downloaden van Republiq data zorginstellingen.png

Topic	Description
Data	Total balance sheet per healthcare institution
Data file	Original file: 20220909 passiva 2018-2020-2021.xlsx Edited file: 20221220 toewerk bestand passiva BNG Bank.xlsx
Data Source	Year reports of healthcare institutions
Year	2018, 2020 and 2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Original file: Werkmap\Zorg\Ruwe data Werkmap\Zorg\Jaarverslagen Edited file: Werkmap\Zorg\Voorbewerking data
Data quality	Score 2 Data is acquired from individual annual reports of the healthcare institutions. The source data in the annual report is audited.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	For the years 2018, 2020, and 2021 the following number of health care institutions are missing in the final results of GHG emissions: 2018: 93 from the 399 health care institutions in the loan portfolio; 2020: 82 from the 389 health care institutions in the loan portfolio; 2021: 70 from the 375 health care institutions in the loan portfolio. This can be due to missing energy data or total balance sheet data. If total balance sheet data has been missing for one of the three years (2018, 2020, and 2021), but data of one of the three years has been available this value has been used for the missing data.
Print screens	Not applicable

Topic	Description
Data	Concern codes and KvK data per healthcare institution
Data files	Original files: DigiMV2021_dataset_20220715_1600.xlsx DigiMV2020_prd_202111213_1200.xlsx DigiMV2019_20210816_concernbreed_deel1.xlsx DigiMV2018_20210816_concernbreed_deel1.xlsx x7conc_total_VOLLEDIG.xlsx. Edited file: 20220725 concerncodes en kvknummers This datafile shows which healthcare institution is located in which municipality. This data is needed to know in which province the healthcare institution is located to know the average distance a person travels per year from and to work and for business. We used data from 2017 up to and including 2021 to have a complete dataset.
Data Source	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
Year	2017 up to and including 2021
Last update	Unknown
Date of download	Several dates in July 2022
Link to webpage	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets
Filters used to obtain the datafile	Not applicable
Internal location	Original datafiles: Werkmap\Zorg\Ruwe data Edited datafile: Werkmap\Zorg\Voorbewerking data
Data quality	Score 2 Data is acquired by CIBG from individual annual reports of healthcare organizations. The source data in the annual report is audited, the composite dataset of CIBG is not.
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	In folder: Werkmap\Zorg\Printscreens\Download locatie datasets ministerie Volksgezondheid, Welzijn en Sport.png

Topic	Description
Data	Villages and cities overview in the Netherlands
Data file	Woonplaatsen _in_Nederland_2021_25072022_103720.xlsx
Data Source	CBS, Statline
Year	2021
Last update	1-4-2021
Date of download	25-7-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84992NED/table
Filters used to obtain the datafile	Woonplaatsen: Woonplaatsen op alfabet Onderwerp: gemeentenaam, gemeentecode, provincienaam, provinciecode
Internal location	Werkmap\Zorg\Ruwe data
Data quality	Not applicable
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable

Print screens	In folder: Werkmap\Zorg\Printscreens\woonplaatsen nederland 2021 v1.png t/m woonplaatsen nederland 2021 v10.png

Topic	Description
Data	Average mobility per person per year (part 1: data on province level)
Data file	Original file: Mobiliteit_per_persoon_persoonskenmerken_en-regio_s_11072022_133129.xlsx Sheet: Mobiliteit_per_persoon_persoo Edited file: 20220711 totaal afstanden per provincie.xlsx
Data Source	CBS, Statline
Year	2018-2019-2020-2021 For this report the years 2018, 2020, and 2021 have been used, but in case data of the year 2020 was missing sometimes data from the year 2019 has been used.
Last update	8-7-2022
Date of download	11-7-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84713NED/table?ts=1603811773192
Filters used to obtain the datafile	Populatie: 12 jaar of ouder Marge: waarde Regio's: provincies Reismotieven: van en naar het werk & zakelijk, beroepsmatig Persoonskenmerken: participatie: werkzaam 30 uur pw of meer Geslacht: totaal mannen en vrouwen Onderwerp: gemiddeld per persoon per jaar / afstand Perioden: 2018-2021
Internal location	Original file: Werkmap\Zorg\Ruwe data Edited file: Werkmap\Zorg\Voorbewerking data
Data quality	Score 3 With sample surveys, such as the ODiN, information is collected from only part of the population. The estimated results based on the sample data are generally not equal to the actual values and therefore have margins of inaccuracy. For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland
Unit of measurement	km
Selections	Not applicable
Data transformation	Some data was missing. See for the transformation Data missing
Data missing	For some provinces data was missing. If possible the missing data was filled with data from another year for that province. If data from another year was not available the missing values were filled with data from a larger region of the Netherlands from data file Mobiliteit_per_persoon_persoonskenmerken_motieven_en_regio_s_11072022_133807.xlsx E.g.: the data for province of Zeeland was missing, therefore data of West-Nederland was used. These adjustments are shown in the data file: Werkmap\Zorg\Voorbewerking data\20220711 totaal afstanden per provincie.xlsx sheet "invullen van missende data" and "data per provincie".
Print screens	In folder: Werkmap\Zorg\Printscreens\20220711 mobiliteit_per_persoon_afstand_perjaar_provincie.png

Topic	Description
Data	Average mobility per person per year (part 2: data on level of a region larger than province)
Data file	Original file: Mobiliteit_per_persoon_persoonskenmerken_motieven_en_regio_s_11072022_133807.xlsx Sheet: Mobiliteit_per_persoon_persoo Edited file: 20220711 totaal afstanden per provincie.xlsx
Data Source	CBS, Statline
Year	2018-2019-2020-2021 For this report the years 2018, 2020, and 2021 have been used, but in case data of the year 2020 was missing sometimes data from the year 2019 has been used.
Last update	8-7-2022
Date of download	11-7-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84713NED/table?ts=1603811773192
Filters used to obtain the datafile	Populatie: 12 jaar of ouder Marge: waarde Regio's: landsdelen: Noord-Nederland, Oost-Nederland, West-Nederland en Zuid-Nederland Reismotieven: van en naar het werk & zakelijk, beroepsmatig Persoonskenmerken: participatie: werkzaam 30 uur pw of meer Geslacht: totaal mannen en vrouwen Onderwerp: gemiddeld per persoon per jaar / afstand Perioden: 2018-2021
Internal location	Original file: Werkmap\Zorg\Ruwe data Edited file: Werkmap\Zorg\Voorbewerking data
Data quality	Score 3 With sample surveys, such as the ODiN, information is collected from only part of the population. The estimated results based on the sample data are generally not equal to the actual values and therefore have margins of inaccuracy. For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland
Unit of measurement	km
Selections	Not applicable
Data transformation	Not applicable
Data missing	Data in this file was used to fill up the missing values in data file: Mobiliteit_per_persoon_persoonskenmerken_en-regio_s_11072022_133129.xlsx Sheet: Mobiliteit_per_persoon_persoo
Print screens	In folder: Werkmap\Zorg\Printscreens\20220711 mobiliteit_per_persoon_afstand_perjaar_landsdelen.png

Topic	Description
Data	Transportation methods used per person per province
Data file	Mobiliteit_per_persoon_persoonskenmerken_vervoerwijzen_en_regio_s_18072022_120958 gewijzigd 20-2-2023 BNG.xlsx Sheet: Mobiliteit_per_persoon_persoo
Data Source	CBS, Statline
Year	2018-2019-2020-2021 For this report data of the years 2018, 2020, and 2021 have been used.
Last update	8-7-2022
Date of download	18-7-2022

Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84709NED/table?ts=1603813016233
Filters used to obtain the datafile	Populatie: 12 jaar of ouder Geslacht: totaal mannen en vrouwen Persoonskenmerken: werkzaam 30 uur pw of meer Vervoerswijzen: totaal / personenauto (bestuurder) / personenauto (passagier) / trein / bus-tram-metro / fiets / lopen / overige vervoerswijze Onderwerp: gemiddeld per persoon per jaar / afstand Periode: 2018 -2021 Marge: waarde Regio's: totalen / landsdelen / provincies / overig
Internal location	Werkmap\Zorg\Ruwe data
Data quality	Score 3 With sample surveys, such as the ODiN, information is collected from only part of the population. The estimated results based on the sample data are generally not equal to the actual values and therefore have margins of inaccuracy. For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland
Unit of measurement	km
Selections	Not applicable
Data transformation	In the sheet "Mobiliteit_per_persoon_persoo" some data was missing for provinces. In sheet "data gebruikt voor berekeningen" the missing values for provinces was filled with data from a larger area than provinces or the value for the Netherlands.
Data missing	For the missing values the lowest possible available geographic scale level was used. E.g.: if the data for the province of Groningen is missing, than the data for Noord-Nederland (LD) was used. If that data was not available too, the data for the whole Netherlands was used. The transformed data is in sheet: "Data gebruikt voor berekeningen".
Print screens	In folder: Werkmap\Zorg\Printscreens\20220718 mobiliteit vervoerswijzen afstand per persoon per jaar v1.png t/m v3.png

Topic	Description
Data	FTE per healthcare institution
Data files	Original files: x7conc_total_VOLLEDIG.xlsx sheet: x7conc_total_VOLLEDIG_7 DigiMV2018_20210816_concernbreed_deel2.xlsx sheet: x8conc_total_24 DigiMV2019_20210816_concernbreed_deel2.ods sheet: x9conc_total_24 DigiMV2020_prd_202111213_1200.xlsx sheet: rowdata DigiMV2021_dataset_20220715_1600.xlsx sheet: rowdata Edited datafiles: 20220707 FTE zorginstellingen 2017 gewijzigd 20-2-2023.xlsx 20220718 FTE zorginstellingen 2018 gewijzigd 20-2-2023.xlsx 20220711 FTE zorginstellingen 2019.xlsx 20220707 FTE zorginstellingen 2020.xlsx 20220729 FTE zorginstellingen 2021.xlsx
Data Source	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
Year	2017-2021 For this report data of the years 2018, 2020, and 2021 have been used.
Last update	Unknown
Date of download	Several dates in July 2022
Link to webpage	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets

Filters used to obtain the datafile	Not applicable
Internal location	Original files: Werkmap\Zorg\Ruwe data Edited files: Werkmap\Zorg\Voorbewerking data
Data quality	Score 2 Data is acquired by CIBG from individual annual reports of healthcare organizations. The source data in the annual report is audited, the composite dataset of CIBG is not.
Unit of measurement	FTE
Selections	Not applicable
Data transformation	Sum of personnel in paid employment, self-employed persons and hired staff.
Data missing	Not applicable
Print screens	In folder: Werkmap\Zorg\Printscreens\Download locatie datasets ministerie Volksgezondheid, Welzijn en Sport.png

List of the calculation sheets	Location
20220729 zorginstellingen.csv Emissiefactoren_totaaloverzicht.csv Energiedata BNG Bank.csv FTE zorginstellingen met jaartallen gewijzigd 20-2-2023.csv Jaarkilometers per persoon met jaartallen.csv Lening BNG Bank met jaartallen.csv Passiva BNG Bank.csv Voertuiginformatie algemeen met jaartallen gewijzigd 20-2-2023 BNG.csv Woonplaatsen nederland 2021.csv	Werkmap\Zorg\Brondata voor SQL
20220718 leningportefeuille zorg 2018 2020 en 2021.xlsx	Werkmap\Zorg\Ruwe data
PCAF_zorg_BNG	Werkmap\Zorg\Database en scripts voor SQL
PCAF_zorg_def_script data republiq BNG Bank 2018.sql PCAF_zorg_def_script data republiq BNG Bank 2020.sql PCAF_zorg_def_script data republiq BNG Bank 2021.sql	Werkmap\Zorg\Database en scripts voor SQL
Relatieve_emissie_BNG_zorg_2018.csv Scopestotaal_BNG_zorg_2018.csv Toerekening_BNG_zorg_2018.csv BNG 2020 CO2 voetafdruk per zorginstelling.csv BNG 2020 CO2 voetafdruk zorginstellingen scopestotaal.csv BNG 2020 CO2 voetafdruk zorginstellingen relatieve emissies.csv BNG 2021 CO2 voetafdruk per zorginstelling.csv BNG 2021 CO2 voetafdruk zorginstellingen scopestotaal.csv BNG 2021 CO2 voetafdruk zorginstellingen relatieve emissies.csv	Werkmap\Zorg\Bestanden uit SQL\BNG

8 Drinking water utilities approach

8.1 Scope 1, 2, and 3

8.1.1 Adjustments in methodology

The main part of the methodology for drinking water utilities did not change in comparison to last year. To be able to compare the results of reporting year 2022 with the results of reporting year 2021 a few changes have been made to the calculation of reporting year 2021. Therefore, the results of reporting year 2021 differ from the results in the report of last year. The following changes have been made:

1. From one drinking water utility scope 1 and 3 have been based on WTW because it was not accurate to calculate this to TTW;
2. Scope 1 of one drinking water utility is based on WTW because it was not accurate to calculate this to TTW;
3. Data for the total balance sheet of one drinking water utility has been updated according to data received from the drinking water utility itself;
4. The loan to one drinking water utility was part of two other drinking water utilities. Last year, the loan was divided equally between the two other drinking water utilities (each 50% of the loan). This year, information was received about the delivered water volumes and therefore the loan distribution has been carried out on the basis of delivered water volumes for reporting years 2021 and 2022. The percentage loan / total balance sheet used for the attribution slightly changed for reporting year 2021;
5. For one drinking water utility Dutch green electricity proved out to be grey electricity which they green by buying Dutch GVOs. In the calculation for this project this electricity has been treated as grey electricity.
6. For one drinking water utility the data for indirect GHG emissions for chemicals for the year 2020 turned out to be a factor of 1000 too small. This value has been corrected.
7. Data of one drinking water utility was missing for the year 2020. For this drinking water utility the data of the year 2021 has been used to make the GHG emissions of reporting year 2021 more complete. This addition also increased the coverage rate of this sector for reporting year 2021.

The differences between the results of the new and previous method are presented in Table 8-1. The largest difference can be seen for scope 2. This is caused by the change discussed at number 5 above.

Table 8-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)
Scope 1 direct emissions	5,921	5,076	16.6
Scope 2 indirect emissions for purchased energy	16,941	7,642	121.6
Scope 3 other indirect emissions	6,941	6,211	11.8

*The difference is calculated with the following formula: (New - Previous)/Previous*100

The methodology of the drinking water utilities has a standard calculation approach[32]. This approach can be extended with extra options to be added to the calculation. Although this methodology to calculate the GHG footprint for drinking water utilities has been published, there are still differences in the way the different drinking water utilities calculate their own GHG footprint. One could say that the standard calculation method is a golden mean, but deviates from the real GHG footprint. Scope 3, for example is incomplete and which emissions are included in the scope 1, 2 or 3 varies between the drinking water utilities. We know that there are snags in the standard calculation methodology of the drinking water utilities, but in order to match their working methods as closely as possible their so called standard calculation method is used for this report. Last year this methodology was also followed. For reporting year 2022 it was possible for some drinking water utilities to include GHG emissions due to commuting in scope 3. Where this was possible, this was included. In addition, the data on fuel type of the company cars or passengers cars and data on type of public transport was better specified than last year. This can cause small differences with the results of reporting year 2021.

The components of the standard calculation are:

Scope 1
- CH_4 and CO_2 emissions during extraction and treatment of groundwater
- Emissions due to natural gas use
- Emissions due to the use of aggregates
- Emissions caused by the vehicle fleet
- Emissions linked to the own generation of energy

Scope 2
- Indirect emissions for purchased energy

Scope 3
- (Air) Travel
- Chemicals
- Transport by third parties (suppliers)
- Transport of drinking water production residues
- Purchase of drinking water and/or semi-finished product

There are two clear differences between the standard calculation method of the drinking water utilities and the PCAF methodology. The first difference is that the drinking water utilities use the emission factors based on 'Well to Wheel' (WTW) for their calculations, whereas the PCAF methodology prescribes to use the emission factors based on 'Tank to Wheel' (TTW). For the methane emissions the drinking water utilities use 34 kg CO_2 per kg methane, while CO2emissiefactoren.nl prescribes to use 28 kg CO_2 per kg methane. The second difference is that the PCAF methodology prescribes to follow CO2emissiefactoren.nl to determine the emission factor that should be used for green energy from abroad.

[32] https://www.praktijkcodesdrinkwater.nl/opbrengst/klimaatneutraliteit/?search=klimaat

CO2emissiefactoren.nl prescribes to calculate with the emission factor for grey electricity instead of zero emissions as probably some drinking water utilities do.

In this study the purchase of drinking water and/or semi-finished product is not taken into account in scope 3. In chapter 19 the results of the drinking water utilities are presented at sector level. Taking into account the purchase of drinking water would lead to double counting at sector level because drinking water utilities purchase drinking water from each other.

Vewin has collected data from the individual drinking water utilities for a national and international benchmark based on the above mentioned standard calculation method. Vewin has send the data from this benchmark to the individual drinking water utilities with the request to share their individual data with Het PON & Telos for this report. All individual drinking water utilities has been contacted by Het PON & Telos for additional data needed to perform the calculation of the GHG footprint according to the PCAF methodology.

8.1.2 General factsheet

Topic	Description
Scopes covered	For the drinking water utilities approach scope 1, 2 and parts of scope 3 are covered.
Portfolio covered	The portfolio coverage rate for this sector is 87.7%.
Data	Data to calculate the GHG emissions for scope 1, 2 and 3 is obtained from Vewin (benchmark) and the individual drinking water utilities. Total balance sheet data is taken from the annual reports of the drinking water utilities. For one drinking water utility the annual financial report was not available. The total balance sheet data of this drinking water utility has been requested from the drinking water utility itself.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Natural gas - Global warming potential methane - Fuel oil (WTW) - Car (fuel and weight class unknown) - Train (train type unknown) - General public transport (metro, bus, tram) - Petrol - Diesel - LPG - Biodiesel - CNG - Bio-CNG - Grey energy (TTW) - Air travel <700 km - Air travel 700-2500 km - Air travel >2500 km - Bulk and goods transport - District heating (STEG)
Calculation steps	Scope 1 contains: - CH_4 and CO_2 emissions during extraction and treatment of groundwater - Emissions due to natural gas use - Emissions for the use of aggregates

	- Emissions of the vehicle fleet - Emissions linked to the generation of energy Methane emissions released during aeration were multiplied by the global warming potential for methane (28 kg CO_2-eq / kg methane; CO2emissiefactoren.nl). The amount of natural gas used for heating has been multiplied by the emission factor for natural gas. The amount of fuel oil used for emergency aggregates has been multiplied by the emission factor for fuel oil. This emission factor is only available based on 'Well to Wheel', therefore this emission factor has been used for this calculation. To calculate the GHG emissions for the vehicle fleet, the liters of used fuel have been multiplied by the correct emission factor or the driven kilometers have been multiplied by the emission factor for a car with an unknown fuel and weight class. To calculate the GHG emissions for train use, the travelled kilometers have been multiplied by the correct emission factor for a train of unknown type. Self-generated energy by the drinking water utilities has been mainly generated by solar panels and the emission factor is 0. The GHG emissions of the individual items of scope 1 have been added together to calculate total GHG emissions for scope 1. Scope 2 contains: - Indirect emissions for purchased energy CO2emissiefactoren.nl prescribes to use the emission factor for grey electricity to calculate the GHG emissions for the purchase of green electricity from abroad. The amount of electricity purchased from abroad and the amount of purchased grey electricity have been multiplied by the emission factor for grey electricity. For green energy purchased from the Netherlands zero emissions have been included. When district heating has been used, the amount of district heating has been multiplied by the emission factor for district heating (STEG). The GHG emissions of the individual items of scope 2 have been added together to calculate total GHG emissions for scope 2. Scope 3 contains: - Commuting traffic (for some drinking water utilities) - (Air) Travel - Chemicals - Transport by third parties (suppliers) - Transport of drinking water production residues For air travel the amount of kilometers have been multiplied by the correct emission factor. To calculate the GHG emissions for the use of the car, the driven kilometers have been multiplied by the emission factor for a car with an unknown fuel and weight class. To calculate the GHG emissions for train use, the travelled kilometers have been multiplied by the correct emission factor for a train of unknown type. To calculate the GHG emissions for general public transport (metro, bus, tram), the travelled kilometers have been multiplied by the correct emission factor for general public transport. The emission factors for chemicals are not described at CO2emissiefactoren.nl. Drinking water utilities obtain the emission factors for chemicals from their suppliers or from another source. We do not have insight in the chemical details of each drinking water utility. Therefore, we have used the kg CO_2 equivalent for chemicals that is in the data obtained from Vewin (benchmark). It might be possible that in some cases this also includes transport of chemicals and this might lead to double counting. The GHG emissions due to transport of chemicals and other materials by third parties have been calculated by multiplying the ton-kilometers with the emission factor for bulk and goods transport. We have used the emission factor identified by CO2emissiefactoren.nl as being the most common.

	The GHG emissions due to transport of drinking water production residues are in the data obtained from Vewin (benchmark). For the Vewin benchmark this is calculated based on 'Well to Wheel'. The GHG emissions calculated based on 'Well to Wheel' have been converted to GHG emissions based on 'Tank to Wheel' by using the same method as for the GHG emissions due to transport of chemicals and other materials. The GHG emissions of the individual items of scope 3 have been added together to calculate total GHG emissions for scope 3. From one drinking water utility we have received the total GHG emissions per scope based on 'Well to Wheel', but missed the detailed information to calculate all the individual items in scope 1, 2, and 3 based on 'Tank to Wheel'. Unfortunately, it has not been possible to make a good conversion factor based on the other drinking water utilities to convert the GHG emissions based on 'Well to Wheel' to GHG emissions based on 'Tank to Wheel'. The GHG emissions of this drinking water utility have been included in the calculation based on 'Well to Wheel' and results in an overestimation of the GHG emissions based on 'Tank to Wheel'. For the same drinking water utility detailed information has been missing for scope 2. This drinking water utility uses 100% green energy. It is most likely that this green energy originates from the Netherlands and therefore no emissions have been taken into account for scope 2 for this drinking water utility. After calculating scope 1, 2, and 3 GHG emissions, this total amount has been multiplied by the percentage of loan of the drinking water utilities in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a drinking water utility is 25%, 25% of scope 1, 2, and 3 GHG emissions of that drinking water utility has been allocated to BNG Bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million Euro.
Avoided emissions	Drinking water utilities definitely make investments that lead to avoided emissions. For example, part of their residues are used for processes that result in avoided emissions. However, the avoided emissions are not calculated in this drinking water utilities approach. Indirectly some avoided emissions are included in the calculation when a drinking water utility generates green electricity themselves because the use of this electricity does not result in GHG emissions. So indirectly part of the avoided emissions is part of scope 2 of the drinking water utilities.
Asset class specific considerations	The approach for drinking water utilities is in line with the public loan approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the drinking water utilities the total absolute GHG emissions are calculated in ton. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a GHG footprint. This results in ton CO_2-eq / mln Euro.
Limitations	In 2020, the Dutch drinking water utilities have published a methodology to calculate the GHG footprint.[33] This methodology is also based on the GHG protocol. The methodology of the drinking water utilities has a standard calculation approach. This approach can be extended with extra options to be added to the calculation. Although this methodology to calculate the GHG footprint for drinking water utilities

[33] https://www.praktijkcodesdrinkwater.nl/opbrengst/klimaatneutraliteit/?search=klimaat

	has been published, there are still differences in the way the different drinking water utilities calculate their own GHG footprint. One could say that the standard calculation method is a golden mean, but deviates from the real GHG footprint. Scope 3, for example is incomplete and which emissions are included in the scope 1, 2 or 3 varies between the drinking water utilities. We know that there are snags in the standard calculation methodology of the drinking water utilities, but in order to match their working methods as closely as possible their so called standard calculation method is used for this report. A limitation is that from one drinking water utility we have received the total GHG emissions per scope based on 'Well to Wheel', but missed the detailed information to calculate all the individual items in scope 1, 2, and 3 based on 'Tank to Wheel'. It has not been possible to make a good conversion factor based on the other drinking water utilities to convert the GHG emissions based on 'Well to Wheel' to GHG emissions based on 'Tank to Wheel'. The GHG emissions of this drinking water utility have been included in the calculation based in 'Well to Wheel' and results in an overestimation of the GHG emissions based on 'Tank to Wheel'. Another limitation is that for the drinking water utility of which we received the total GHG emissions per scope based on 'Well to Wheel' we had to assume that the purchased electricity in scope 2 was green electricity generated in the Netherlands. They use green energy, but according to the received data we cannot be completely sure that this green energy is all purchased from the Netherlands. Therefore, scope 2 might be slightly underestimated. Scope 3 contains several limitations. As mentioned earlier, the emission factors for chemicals are not described at CO2emissiefactoren.nl. Drinking water utilities obtain the emission factors for chemicals from their suppliers or from another source. We do not have insight in the chemical details of each drinking water utility. Therefore, we have used the kg CO_2 equivalent for chemicals that is in the data that we have obtained from the Vewin benchmark. It might be possible that in some cases this also includes transport of chemicals and this might lead to double counting. For transport of drinking water production residues and transport of third parties, there are several uncertainties. We might have used a different emission factor than the drinking water utilities do because there are a few options at CO2emissiefactoren.nl in the bulk and goods transport category. We have chosen the emission factor identified by CO2emissiefactoren.nl as being the most common. There can also be differences in what the drinking water utilities include in transport of third parties. Some only include transport of chemicals and others include more items. These details are unknown. One of the drinking water utilities in the loan portfolio is part of two other drinking water utilities and 2 other companies. The drinking water utility delivers a semi-finished product to two other drinking water utilities in the portfolio of BNG Bank. The GHG footprint of this drinking water utility has been included in these other drinking water utilities. The loan of the drinking water utility that delivers a semi-finished product to the other drinking water utilities has been allocated to these two drinking water utilities based of the volume of water that has been delivered to the two drinking water utilities compared to the total volume of water delivered to the 4 parties (2 drinking water utilities and 2 other companies).
Data quality estimate	The GHG emissions are calculated based on data received from the water utilities themselves, but the data is not audited. Therefore, data quality score for scope 1 and 2 is 2. The GHG emissions for scope 3 are less certain than scope 1 and 2, because traveled distances are known, but details on means of transport are sometimes missing. Therefore, data quality score is 3.

8.1.3 Factsheet per data source used

Topic	Description
Data	Data used to calculate scope 1, 2, and 3
Data folder	Data van waterleidingbedrijven
Data Source	Vewin and individual drinking water utilities
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Original data: Werkmap\Waterleidingbedrijven\Data van waterleidingbedrijven Werrkmap\Waterleidingbedrijven\Data via VEWIN The original emails can be find in: Werkmap\Waterleidingbedrijven\Ontvangen emails\Invulsheet Het PON & Telos
Data quality	Score 2 and 3 Data received from drinking water utilities, but the data is not audited.
Unit of measurement	Several
Selections	Not applicable
Data transformation	Some data had to be converted from well to wheel to tank to wheel, see calculation section in the general factsheet.
Data missing	Some detailed data was missing. See calculation section in the general factsheet.
Print Screens	Not applicable

To calculate the GHG emissions for the individual items per scope based on 'Tank to Wheel' (TTW) some extra information was requested from the drinking water utilities. In most cases this information was received by email.

Topic	Description
Data	Extra detailed information
Data folder	Extra informatie
Data Source	Individual drinking water utilities
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Original data: Werkmap\Waterleidingbedrijven\Ontvangen emails\Extra informatie
Data quality	Score 2 and 3 Data received from drinking water utilities, but the data is not audited.
Unit of measurement	Several
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	Not applicable

Topic	Description
Data	Total balance sheet
Data folder	Jaarverslagen
Data Source	Annual reports of the individual drinking water utilities
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Original data: Werkmap\Waterleidingbedrijven\Jaarverslagen
Data quality	Score 2 Data was taken from annual reports. This data is audited by an external accountant.
Unit of measurement	Several
Selections	Not applicable
Data transformation	Not applicable
Data missing	From one drinking water utility the annual report was not available . The data has been received by email and was added to the Excel file of this drinking water utility.
Print Screens	Not applicable

List of the calculation sheets	Location
20221221 Waterleidingbedrijven BNG Bank na correctie.xlsx	Werkmap\Waterleidingbedrijven\Berekeningen\ Rapportagejaar 2022
Rekensheet waterleidingbedrijven BNG met aanpassingen 2022.xlsx	Werkmap\Waterleidingbedrijven\Berekeningen\ Rapportagejaar 2021

9 Educational institutions approach

9.1 Scope 1 and 2

9.1.1 Adjustments in methodology

The methodology used for the calculations for the educational institutions did not change in comparison to last year. For the education sector the calculations have been performed by using SQL instead of Excel because the educational institutions approach contains quite a lot of calculation steps, and using SQL scripts gives better possibilities to reuse the calculation method and decrease the risk on human errors. The reporting years 2019 and 2021 were recalculated by using SQL to make sure no mistakes were made.

The differences between the results of the new and previous method are presented in Table 9-1. The difference for reporting year 2019 is larger than for reporting year 2021, because for current report in case the percentage for the distribution of costs for natural gas use and electricity use was missing on municipality level, the national average for this distribution has been used. While in the previous method for one particular educational institution the distribution of another year had been used. For this report it was decided to use the national average for the distribution when data municipality level was missing.

Table 9-1 Effect of the change in methodology on the GHG emissions

Scopes	New 2021	Previous 2021	Difference* (%)	New 2019	Previous 2019	Difference* (%)
Total scopes 1 and 2	35,148	35,391	-0.7	33,918	39,484	-13.7

*The difference is calculated with the following formula: (New - Previous)/Previous*100

9.1.2 General factsheet

Topic	Description
Scopes covered	The education sector covers scope 1 and 2. Scope 1 emissions are the direct GHG emissions. These emissions result from the use of natural gas for heating buildings, or other purposes. Scope 2 emissions include the indirect GHG emissions from consumption of purchased electricity, heat or steam. The heat and steam use per educational organization is unknown. Scope 2 therefore only includes purchased electricity.
Portfolio covered	The portfolio coverage rate for this sector is 63%.
Data	Data on the supply of energy to the education sector comes from the Dutch Central Bureau of Statistics (CBS). Data covers the supply of electricity and natural gas to businesses and other utility buildings. The supply is via public network. Data is divided by sector and region and comes from connection registers of the energy companies. It is based on actual energy consumption, and therefore reliable. Data on transaction prices for natural gas and electricity comes from the Dutch Central Bureau of Statistics (CBS). The data is obtained from energy companies by sending them surveys. Data on the addresses of the location of educational institutions, the number of pupils/students per location of the educational institutions, costs for energy per educational institution and total balance sheet per educational institution come from DUO: the Dutch Education Service of Ministry of Education, Culture and Science.

	Data on actual natural gas and electricity use per educational organization is not available. Data on the costs for energy and water are collected by the ministry of Education, Culture and Science. It is assumed that costs for water are negligible compared to costs for energy. Based on the factsheet energy data primary schools, water usage is less than 5% of the total costs of energy and water.[34] Other data on water usage by educational institutions could not be found.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Natural gas - Electricity (Unknown source)
Calculation steps	Per municipality it is known how much natural gas and electricity is delivered to the education sector per year. According to the average price for natural gas and electricity the total costs for natural gas and electricity for the education sector has been calculated per municipality. Afterwards, the percentage of costs for natural gas and electricity has been calculated relative to the total costs for natural gas, plus electricity. Percentage of costs for natural gas for the education sector per municipality (A) = costs for natural gas / total costs for natural gas + electricity Percentage of costs for electricity for education sector per municipality (B) = costs for electricity / total costs for natural gas + electricity The average price for natural gas has been calculated according to four consumption classes, provided by CBS. To calculate the price for natural gas per Nm^3, the conversion factor for natural gas of 0.03165 GJ/Nm^3 has been used (Klimaatmonitor). The average price for electricity has been calculated according to six consumption classes provided by CBS. Per educational board ('bevoegdgezag'), the total costs for energy and water has been known (DUO). As stated earlier, the costs for water were not taken into account. The total costs for energy had to be divided in costs for natural gas and costs for electricity. An educational board ('bevoegdgezag') can manage several educational institutions (BRIN-numbers) and these can be located in different municipalities. Especially primary schools have more BRIN-numbers per educational board ('bevoegdgezag'). Per BRIN-number, the municipality and students are known. If a BRIN-number has locations in multiple municipalities, the number of students has been equally divided over the locations, as the exact number of students per BRIN-number in a municipality was not known. According to this information, the percentage of students per educational board ('bevoegdgezag') per municipality has been calculated. Percentage of students per educational institution per municipality (C) = number of students per educational institution per municipality / total number of students per educational institution. The next step has been to divide the total costs for energy per educational institution to the municipalities that have locations of that institution according to the percentage of students (C). Costs per educational institution per municipality = % of students per educational institution per municipality (C) * total costs for energy of educational institution. The costs per educational institution per municipality has been divided in costs for natural gas and electricity according to % of costs for natural gas per municipality (A) and % of costs for electricity per municipality (B). After this step, the costs for natural gas and electricity per educational institution per municipality has been added up, to come to the total costs for natural gas (D) and electricity (E) per educational institution.

[34] https://duurzamepabo.nl/energie-besparen-op-school/ (factsheet energiegegevens (.pdf))

	According to the total costs for natural gas (D) and electricity (E) per educational institution the correct price per GJ for natural gas and per kWh for electricity has been chosen according to the usage of natural gas and electricity (lower price when use is higher). To convert GJ natural gas to Nm^3 the conversion factor for natural gas of 0.03165 GJ/Nm^3 has been used (Klimaatmonitor, 2020). The costs for natural gas and electricity per educational institution has been divided by the cost per Nm^3 (natural gas) and per kWh (electricity). Thereafter, the Nm^3 natural gas has been multiplied by the emission factor for natural gas (Table 14-1) and divided by 1000 to result in ton of GHG emissions for scope 1. The kWh electricity has been multiplied by the emission factor for electricity (Table 14-1) and has been divided by 1000 to result in ton of GHG emissions for scope 2. After calculating scope 1 and 2 GHG emissions, this total amount has been multiplied by the percentage of loan of the educational institutions in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of an educational institution is 25%, 25% of scope 1 and 2 GHG emissions of that educational institution has been allocated to BNG Bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR.
Avoided emissions	The total costs for energy is used to calculate total ton of GHG emissions. If a school or university generates its own electricity by for example solar panels, than the costs for energy will be lower. The reduction in GHG emissions due to for example solar panels is therefore indirectly included in the calculations if we assume that the generated electricity is reflected in the form of reduced costs on the energy bill. Unfortunately, there is no specific data available on renewable energy for educational institutions.
Asset class specific considerations	The approach for the educational institutions is in line with the 'Commercial real estate' approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the education sector the total absolute GHG emissions are calculated in ton. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in ton CO_2-eq / mln Euro.
Limitations	An important limitation is that the costs for energy and water are used as a starting point for calculating the GHG emissions. Several assumptions have been made to divide the costs for energy in costs for natural gas and electricity and then a price has been chosen to calculate costs for natural gas use in Nm^3 and electricity use in kWh. Nowadays, energy prices are under pressure in the current energy market and therefore a calculation in which price is an important factor, makes the calculation less accurate. Another limitation is that for some municipalities data on the supply of natural gas and electricity to the education sector is missing. If that was the case, the national average % of costs for natural gas per municipality and national average % of costs for electricity per municipality has been used. For some educational institutions, the exact number of students per municipality has been estimated as the number of students per 'BRIN-number' is known and some BRIN-numbers have locations in multiple municipalities. As the exact ratio on how the students are divided over these locations is not known, the students have been equally divided over the locations. These numbers have been used to calculate the total number of students per educational institution per municipality and the percentage of students per municipality per educational institution.

Data quality estimate	The GHG emissions are calculated based on costs for energy and water, energy supply to the education sector on the aggregation level of municipalities, and the number of students per educational institution. Use is made of both sectorspecific data and regional data and therefore data quality score is 4.

9.1.3 Factsheet per data source used

Topic	Description
Data	Supply of energy to the education sector
Data file	20221011 levering aardgas, elektriciteit via openbaar net; bedrijven, SBI2008, regio.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	7-10-2022
Date of download	11-10-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82538NED/table?ts=1597657120347
Filters used to obtain the datafile	Onderwerp: Geleverd aardgas, geleverde elektriciteit Perioden: 2018-2020-2021 Regio's: Gemeenten per provincie Bedrijfstakken/branches: Bedrijfstakken 1e digit (SBI 2008), P Onderwijs
Internal location	Original data: Werkmap\Onderwijs\Ruwe data
Data quality	Score 4 Highly reliable data, because of the registration manner. Different control and correction methods are used, which can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net. The supply of energy is to the whole education sector per municipality and it is unknown to which type of education (primary school, etc.) Therefore, the data quality score is 4 because it is a combination of sectorspecific data and region data.
Unit of measurement	Natural gas: 1000 Nm^3 Electricity: 1000 kWh
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\ 20221011 levering aardgas, elektriciteit via openbaar net; bedrijven, SBI2008, regio v1.PNG 20221011 levering aardgas, elektriciteit via openbaar net; bedrijven, SBI2008, regio v2.PNG 20221011 levering aardgas, elektriciteit via openbaar net; bedrijven, SBI2008, regio v3.PNG 20221011 levering aardgas, elektriciteit via openbaar net; bedrijven, SBI2008, regio v4.PNG

Topic	Description
Data	Transaction prices for natural gas and electricity
Data file	20220901 ruwe data aardgas en elektriciteitsprijs.xlsx
Data Source	CBS Statline
Year	2018-2020-2021
Last update	30-06-2022
Date of download	1-9-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81309NED/table?ts=1599143752393
Filters used to obtain the datafile	Belastingen: Inclusief btw en belastingen Onderwerp: Aardgasprijs verbruiksklassen niet-huishoudens/ elektriciteitsprijs verbruiksklassen niet-huishoudens Perioden: 2018-2020-2021 Prijscomponenten: Transactieprijs
Internal location	Original data: Werkmap\Onderwijs\Ruwe data
Data quality	Score 2 The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/aardgas-en-elektriciteit-gemiddelde-prijzen-van-eindverbruikers. The data is obtained from energy companies via surveys
Unit of measurement	Natural gas: Euro per GJ Electricity: Euro per kWh
Selections	Transaction prices natural gas Euro per GJ: 4 usage classes 1 till 10 TJ 10 till 100 TJ 100 till 1000 TJ 1000 TJ and more Transaction prices electricity Euro per kWh: 6 usage classes 20 till 500 MWh 500 till 2000 MWh 2000 till 20000 MWh 20000 till 70000 MWh 70000 till 150000 MWh 150000 MWh and more
Data transformation	For the minimum and maximum usage per class the total price has been calculated (Euro per GJ). This has been used to choose the correct price per educational institution. If the organization uses less electricity or natural gas the price per GJ is higher. The average price for natural gas over the 4 usage classes and average price for electricity over the 6 usage classes has been used to calculate the percentage of costs for natural gas and electricity per municipality.
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\20220901 aardgas en elektriciteitsprijs.png

Topic	Description
Data	Energy-content of natural gas
Data file	Energie-inhoud aardgas (onderwaarde_in GJ_m3)
Data Source	Klimaatmonitor
Year	2021
Last update	Unknown
Date of download	21-9-2022
Link to webpage	https://klimaatmonitor.databank.nl/Jive
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Onderwijs\Ruwe data
Data quality	Score 1 Official statistic. https://www.infomil.nl/onderwerpen/duurzaamheid-energie/energiebesparing/vragen-antwoorden/overige-vragen/omrekening-verbruik/
Unit of measurement	GJ/Nm^3
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	In folder: Werkmap\Onderwijs\Printscreens\20220921 energie inhoud aardgas 2021.png

Topic	Description
Data	Registration numbers of schools and universities
Data file	Original files: 02-adressen-besturen_mbo.xlsx 03-bevoegde-gezagen-hbo-en-wo.xlsx 03-bevoegde-gezagen-vo.xlsx 03-schoolbesturen-basisonderwijs_.xlsx 10-besturen-sbo-so-en-vso.xlsx Edited files: 02-adressen-besturen_mbo kolommen geselecteerd voor SQL.xlsx 03-bevoegde-gezagen-hbo-en-wo kolommen geselecteerd voor SQL.xlsx 03-bevoegde-gezagen-vo kolommen geselecteerd voor SQL.xlsx 03-schoolbesturen-basisonderwijs_kolommen geselecteerd voor SQL.xlsx 10-besturen-sbo-so-en-vso kolommen geselecteerd voor SQL.xlsx
Data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	2018-2020-2021
Last update	1-6-2022
Date of download	13-6-2022
Link to webpage	***Primary schools*** https://duo.nl/open_onderwijsdata/primair-onderwijs/scholen-en-adressen/schoolbesturen-basisonderwijs.jsp ***Secondary schools*** https://duo.nl/open_onderwijsdata/voortgezet-onderwijs/adressen/besturen.jsp ***Special primary and secondary schools*** https://duo.nl/open_onderwijsdata/primair-onderwijs/scholen-en-adressen/schoolbesturen-sbo-vso.jsp ***Secondary vocational education*** https://duo.nl/open_onderwijsdata/middelbaar-beroepsonderwijs/adressen/adressen-mbo-besturen.jsp ***Higher professional education and universities***

	https://duo.nl/open_onderwijsdata/hoger-onderwijs/adressen/besturen-hogescholen-universiteiten.jsp
Filters used to obtain the datafile	Not applicable
Internal location	Original files: Werkmap\Onderwijs\Ruwe data\Data 2021\Bevoegd gezag Edited files: Werkmap\Onderwijs\Ruwe data\Data 2021\Bevoegd gezag\Voorbewerking data Data of the years 2020 and 2018 can be find in the folders: 2018: Werkmap\Onderwijs\Ruwe data\Data 2018\Bevoegd gezag 2020: Werkmap\Onderwijs\Ruwe data\Data 2020\Bevoegd gezag
Data quality	Not applicable
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\Bevoegd gezag nr

Topic	Description
Data	Addresses of schools and universities
Data file	Original files: 01-adressen-instellingen_mbo.xlsx 01-instellingen-hbo-en-wo.xlsx 02-alle-schoolvestigingen-basisonderwijs.xlsx 02-alle-vestigingen-vo.xlsx 09-alle-vestigingen-speciaal-basisonderwijs.xlsx Edited files: 01-adressen-instellingen_mbo kolommen geselecteerd voor SQL.xlsx 01-instellingen-hbo-en-wo kolommen geselecteerd voor SQL.xlsx 02-alle-schoolvestigingen-basisonderwijs kolommen geselecteerd voor SQL.xlsx 02-alle-vestigingen-vo kolommen geselecteerd voor SQL.xlsx 09-alle-vestigingen-speciaal-basisonderwijs kolommen geselecteerd voor SQL.xlsx
Data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	2018-2020-2021
Last update	1-6-2022
Date of download	13-6-2022
Link to webpage	***Primary schools*** https://duo.nl/open_onderwijsdata/primair-onderwijs/scholen-en-adressen/schoolvestigingen-basisonderwijs.jsp ***Secondary schools*** https://duo.nl/open_onderwijsdata/voortgezet-onderwijs/adressen/vestigingen.jsp ***Special primary and secondary schools*** https://duo.nl/open_onderwijsdata/primair-onderwijs/scholen-en-adressen/hoofd-nevenvestigingen-sbo-vso.jsp ***Secondary vocational education*** https://duo.nl/open_onderwijsdata/middelbaar-beroepsonderwijs/adressen/adressen-instellingen-mbo.jsp ***Higher professional education and universities*** https://duo.nl/open_onderwijsdata/hoger-onderwijs/adressen/hogescholen-en-universiteiten.jsp
Filters used to obtain the datafile	Not applicable
Internal location	Original files: Werkmap\Onderwijs\Ruwe data\Data 2021\Brin nummers

	Edited files: Werkmap\Onderwijs\Ruwe data\Data 2021\Brin nummers\Voorbewerking data Data of the years 2020 and 2018 can be find in the folders: 2018: Werkmap\Onderwijs\Ruwe data\Data 2018\Brin nummers 2020: Werkmap\Onderwijs\Ruwe data\Data 2020\Brin nummers
Data quality	Not applicable
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\Brin nr

Topic	Description
Data	Number of pupils or students per educational institution
Data file	Original files: 01a-ingeschrevenen-hbo-2021.csv 01a-ingeschrevenen-wo-2021.xlsx 01-leerlingen-po-soort-po-cluster-leeftijd-2021-2022.csv 01-leerlingen-vo-per-vestiging-naar-onderwijstype-2021.xlsx 01-studenten-per-instelling-bestuur-plaats-gemeente-provincie-type-mbo-2017-2021.xlsx Edited files: 01a-ingeschrevenen-hbo-2021 aanpassingen voor gebruik SQL.csv 01a-ingeschrevenen-wo-2021 aanpassingen voor gebruik SQL.xlsx 01-leerlingen-po-soort-po-cluster-leeftijd-2021-2022 kolommen geselecteerd voor SQL.csv 01-leerlingen-vo-per-vestiging-naar-onderwijstype-2021 kolommen geselecteerd voor SQL.xlsx 01-studenten-per-instelling-bestuur-plaats-gemeente-provincie-type-mbo-2017-2021-kolommen geselecteerd voor SQL.xlsx
Data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	2018-2020-2021
Last update	Primary schools 11-2-2022, secondary schools 22-12-2021, secondary vocational education 23-2-2022, higher professional education 15-3-2022, universities 15-3-2022
Date of download	13-6-2022 (secondary vocational education on 22-6-2022)
Link to webpage	***Primary schools*** https://duo.nl/open_onderwijsdata/primair-onderwijs/aantal-leerlingen/leerlingen-onderwijssoort-cluster-leeftijd.jsp ***Secondary schools*** https://duo.nl/open_onderwijsdata/voortgezet-onderwijs/aantal-leerlingen/aantal-leerlingen.jsp ***Secondary vocational education*** https://duo.nl/open_onderwijsdata/middelbaar-beroepsonderwijs/aantal-studenten/aantal-studenten-mbo-per-instelling.jsp ***Higher professional education*** https://duo.nl/open_onderwijsdata/hoger-onderwijs/aantal-studenten/studenten-hbo.jsp ***Universities*** https://duo.nl/open_onderwijsdata/hoger-onderwijs/aantal-studenten/studenten-wo.jsp
Filters used to obtain the datafile	Not applicable

Internal location	Original files: Werkmap\Onderwijs\Ruwe data\Data 2021\Aantal leerlingen Edited files: Werkmap\Onderwijs\Ruwe data\Data 2021\Aantal leerlingen\Voorbewerking data Data of the years 2020 and 2018 can be find in the folders: 2018: Werkmap\Onderwijs\Ruwe data\Data 2018\Aantal leerlingen 2020: Werkmap\Onderwijs\Ruwe data\Data 2020\Aantal leerlingen
Data quality	Score 2 Registration data
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Some universities and higher professional education schools had as value '<5'. These are replaced with the number 5.
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\Aantal leerlingen

Topic	Description
Data	Energy and water costs per educational institution
Data files	Original files: 20200825 Kopie van 14-lasten-2018.xlsx 20210921 14-lasten-2016-2020.xlsx 2021 onderwijs portefeuilles.xlsx & diversen jaarverslagen Edited file: Lasten totaal 2018 2020 2021.xlsx
Data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	2018-2020-2021
Last update	19-10-2022
Date of download	20-10-2022
Link to webpage	https://duo.nl/open_onderwijsdata/databestanden/onderwijs-algemeen/financiele-cijfers/verantwoording-xbrl.jsp
Filters used to obtain the data file	Not applicable
Internal location	Original files: 2018: Werkmap\Onderwijs\Ruwe data\ Data 2018 2020: Werkmap\Onderwijs\Ruwe data\ Data 2020 2021: Werkmap\Onderwijs\Ruwe data\Data 2021\Lasten Werkmap\Onderwijs\Ruwe data\Data 2021\Jaarverslagen energie\BNG Edited file: Werkmap\Onderwijs\Ruwe data\Data 2021\Lasten
Data quality	Score 2 Schoolboards send the data to DUO. The numbers are not checked by accountants or by DUO/the Ministry of Education, Culture and Science.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	DUO did not publish data on energy and water costs on time (data expected in December 2022). To calculate the GHG emissions for the education sector, energy costs have been extracted from annual reports of the educational institutions. If the annual report of the year 2021 was not yet available, the energy costs of the previous year have been used. In the file: 2021 onderwijs portefeuilles.xlsx it is shown that for eleven educational institutions data from the previous years have been used.
Print Screens	Not applicable

Topic	Description
Data	Total balance sheet per educational institution
Data files	Original files: 20200819 Kopie van 01-balans-2014-2018.xlsx 20210921 01-balans-2020.xlsx Pdf bestanden van de 5 onderwijstypen Edited file: Passiva totaal 2018 2020 2021.xlsx
Data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	2018-2020-2021
Last update	19-10-2022
Date of download	20-10-2022
Link to webpage	https://duo.nl/open_onderwijsdata/databestanden/onderwijs-algemeen/financiele-cijfers/verantwoording-xbrl.jsp
Filters used to obtain the datafile	Not applicable
Internal location	Original files: 2018: Werkmap\Onderwijs\Ruwe data\Data 2018 2020: Werkmap\Onderwijs\Ruwe data\Data 2020 2021: Werkmap\Onderwijs\Ruwe data\Data 2021\Passiva Edited file: Werkmap\Onderwijs\Ruwe data\Data 2021\Passiva
Data quality	Score 2 Schoolboards send the data to DUO. The numbers are not checked by accountants or by DUO/the Ministry of Education, Culture and Science.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print Screens	In folder: Werkmap\Onderwijs\Printscreens\20221020 passiva onderwijs.PNG

List of the calculation sheets	Location
Aantal_leerlingen_bo_onderwijs.csv Aantal_leerlingen_hbo_onderwijs.csv Aantal_leerlingen_mbo_onderwijs.csv Aantal_leerlingen_vo_onderwijs.csv Aantal_leerlingen_wo_onderwijs.csv Aardgas_elektra_prijs_onderwijs.csv Bg_bo_onderwijs.csv Bg_hbo_wo_onderwijs.csv Bg_mbo_onderwijs.csv Bg_sbo_onderwijs.csv Bg_vo_onderwijs.csv Brin_hbo_wo_onderwijs.csv Brin_mbo_onderwijs.csv Brin_sbo_onderwijs.csv Brin_vo_onderwijs.csv Elektra_aardgas_onderwijs.csv Emissiefactoren_totaaloverzicht.csv Lasten_onderwijs.csv	Werkmap\Onderwijs\Brondata voor SQL

leningportefeuilleBNG_onderwijs.csv passiva_onderwijs 25102022.csv	
PCAF_onderwijs BNG	Werkmap\Onderwijs\Scripts en database SQL
PCAF onderwijs BNG Bank 2018.sql PCAF onderwijs BNG Bank 2020.sql PCAF onderwijs BNG Bank 2020.sql	Werkmap\Onderwijs\Scripts en database SQL
20221019_BNG relatieve emissie bo 2018.csv 20221019_BNG relatieve emissie vo 2018.csv 20221019_BNG relatieve emissie mbo 2018.csv 20221019_BNG relatieve emissie hbo 2018.csv 20221019_BNG relatieve emissie wo 2018.csv 20221019_BNG relatieve emissie per onderwijstype 2018.csv 20221019_BNG scopes bo 2018.csv 20221019_BNG scopes vo 2018.csv 20221019_BNG scopes mbo 2018.csv 20221019_BNG scopes hbo 2018.csv 20221019_BNG scopes wo 2018.csv 20221019_BNG toerekening scopes onderwijs 2018.csv 20221019_BNG totaal scopes onderwijs 2018.csv 20221019_BNG tussenstap onderwijstype 2018.csv	Werkmap\Onderwijs\Data verkregen uit SQL\BNG\2018
20221019_BNG relatief bo 2020.csv 20221019_BNG relatief vo 2020.csv 20221019_BNG relatief mbo 2020.csv 20221019_BNG relatief hbo 2020.csv 20221019_BNG relatief wo 2020.csv 20221019_BNG relatief per onderwijstype 2020.csv 20221019_BNG relatieve emissies onderwijs 2020.csv 20221019_BNG scopes bo 2020.csv 20221019_BNG scopes vo 2020.csv 20221019_BNG scopes mbo 2020.csv 20221019_BNG scopes hbo 2020.csv 20221019_BNG scopes wo 2020.csv 20221019_BNG toerekening scopes onderwijs 2020.csv 20221019_BNG totaal scopes onderwijs 2020.csv 20221019_BNG tussenstap onderwijstype 2020.csv	Werkmap\Onderwijs\Data verkregen uit SQL\BNG\2020
20221019_BNG relatieve emissie bo 2021.csv 20221019_BNG relatieve emissie vo 2021.csv 20221019_BNG relatieve emissie mbo 2021.csv 20221019_BNG relatieve emissie hbo 2021.csv 20221019_BNG relatieve emissie wo 2021.csv 20221019_BNG relatieve emissie per onderwijstype 2021.csv 20221019_BNG relatieve emissies onderwijs 2020.csv 20221019_BNG scopes bo 2021.csv 20221019_BNG scopes vo 2021.csv 20221019_BNG scopes mbo 2021.csv 20221019_BNG scopes hbo 2021.csv 20221019_BNG scopes wo 2021.csv 20221019_BNG toerekening scopes onderwijs 2021.csv 20221019_BNG totaal scopes onderwijs 2021.csv 20221019_BNG tussenstap onderwijstype 2021.csv	Werkmap\Onderwijs\Data verkregen uit SQL\BNG\2021

10 Joint regulation approach

10.1 Scopes

10.1.1 Adjustments in methodology

The sector joint regulation is added to this report for the first time.

10.1.2 General factsheet

Topic	Description
Scopes covered	For the sector joint regulation scope 1 and 2 are covered. Scope 1 covers natural gas use for heating buildings and company vehicles that run on fossil fuels. Scope 2 covers consumption of purchased electricity and heat. Electric company vehicles are also part of scope 2. Scope 3 is not covered because data to calculate scope 3 was not available.
Portfolio covered	The coverage rate for the joint regulation sector is 36%.
Data	Data to calculate scope 1 and 2 is received from the joint regulation themselves.
Grid emission factors	Chapter 14 contains more information on emission factors. The following emission factors from Table 14-1 are used: - Electric car; - Electricity, Grey energy; - District heating (STEG).
Calculation steps	The travel kilometers by company vehicles have been multiplied by the correct emission factor to result in kg GHG emissions. The used warmth has been multiplied by the correct emission factor to result in kg GHG emissions. The used electricity has been multiplied by the correct emission factor to result in kg GHG emissions. The kg GHG emissions has been divided by 1000 to result in ton GHG emissions. The GHG emissions of the individual items of scope 1 have been added together to calculate total GHG emissions for scope 1. The same has been done for scope 2. After calculating scope 1 and 2 GHG emissions, this total amount has been multiplied by the percentage of loan of the joint regulations in the total balance sheet. When for example the percentage of the outstanding loan at the NWB Bank in the total balance sheet of a joint regulation is 25%, 25% of scope 1 and 2 GHG emissions of that joint regulation has been allocated to the NWB bank. The absolute GHG emissions and relative emissions are reported per scope. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million Euro.
Avoided emissions	Avoided emissions for the joint regulations are unknown.
Asset class specific considerations	The approach for the joint regulation is in line with the public loan approach in the PCAF methodology.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the sector joint regulations the total absolute GHG emissions are calculated in ton.

	The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in ton CO_2-eq / mln Euro.
Limitations	Data to calculate scope 3 are not available.
Data quality estimate	The GHG are calculated based on data received from the joint regulations themselves, but the data is not audited. Therefore, data quality score is 2.

10.1.3 Factsheet per data source used

Topic	Description
Data	Electricity consumption
Data file	Elektriciteitsverbruik 2021.pdf Eneco 20210904_F4727105.pdf
Data Source	Joint regulations
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\GR\Data
Data quality	Score 2 Data is received from the joint regulations themselves
Unit of measurement	kWh
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Warmth usage
Data file	Warmtelevering 2021.pdf
Data Source	Joint regulations
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\GR\Data
Data quality	Score 2 Data is received from the joint regulations themselves
Unit of measurement	GJ
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Use of company cars
Data file	Dienstauto's gereden km etc.
Data Source	Joint regulation
Year	2021
Last update	Not applicable
Date of download	Not applicable
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\GR\Ontvangen emails
Data quality	Score 2 Data is received from the joint regulations themselves
Unit of measurement	kilometers
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Total balance sheet
Data file	Jaarverslag-2021.pdf
Data Source	Joint regulations
Year	2021
Last update	Not applicable
Date of download	4-10-2022
Link to webpage	Not applicable for privacy reasons
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\GR\Data
Data quality	Score 2 Data comes from the joint regulations themselves and is verified by an accountant.
Unit of measurement	Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	In folder: Werkmap\GR\Data\Printscreens\downloadlocatie jaarverslag.png

List of the calculation sheets	Location
20221221 Berekening CO2 voetafdruk GR BNG Bank aangepaste versie.xlsx	Werkmap\GR\Berekening GR

11 Other organizations approach

11.1 Scopes

11.1.1 Adjustments in methodology

The methodology used for the calculations for the other organizations did not change in comparison to last year.

11.1.2 General factsheet

Topic	Description
Scopes covered	For mobility and other, scope 1, 2, and 3 emissions are included in current report. The results are not presented per scope, but only as a total amount of GHG emissions because data at the level of the 3 scopes is not available. Scope 1 emissions are the direct GHG emissions of the different companies. These emissions result from the use of gas for heating buildings, manufacturing of different types of products, and when present the vehicle fleet. Scope 2 emissions include the indirect GHG emissions from consumption of purchased electricity, heat, or steam. Not every company has a clear documentation of the scope 2 emissions. Scope 3 emissions are other indirect emissions such as the extraction and production of purchased materials and fuels, outsourced activities, waste disposal etc. Documentation of scope 3 emissions is often missing.
Portfolio covered	Data is collected by hand, for a selection of the organizations in the loan portfolio. Unfortunately, for a number of organizations, data availability is inadequate. This means the portfolio coverage rate for this sector is 86% for mobility and 19% for others.
Data	Due to a wide variety in the type of companies, the data that has been used comes mostly from the annual reports of the companies. Relatively big companies often use these reports to report their annual emissions. Most companies, however, do not report on their GHG emissions. When data on all three scopes are missing, emissions data based on the standard industrial classifications (SBI in Dutch) has been used.
Grid emission factors	No emission factors used.
Calculation steps	Some companies report their own GHG emissions, mostly in kilotons. We have converted these emission outcomes from kilotons to kilograms in order to make further calculations. GHG emissions for companies that don't report about their emissions in the annual report, are obtained via CBS Statline by looking at GHG emissions based on the Standard Industrial Classifications (SBI). Every company is classified via SBI codes. For each SBI code a measure for total GHG emission is available. De total GHG emission for a particular SBI code have been divided by the total net revenue for that SBI. This results in the average GHG emissions in kilograms per net revenue in millions per SBI code. The next step is to look at the total net revenue of the companies that do not report about their emissions. The average GHG emissions per net revenue has been multiplied by the total net revenue of each company. This results in the total GHG emissions based on SBI codes. After calculating the GHG emissions, this total amount has been multiplied by the percentage of loan of the projects in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a project is 25%, 25% of the GHG emissions of that project has been allocated to BNG Bank.

	The absolute GHG emissions and relative emissions are reported. To calculate the relative emissions, the absolute GHG emissions have been divided by the loans covered with a GHG footprint to calculate the relative emissions in ton CO_2-eq per million EUR.
Avoided emissions	Some big companies report on the use of solar panels or other ways to generate its own energy. For these companies the avoided emissions are already included in their self-reported GHG emissions by subtracting the avoided emissions from the total reported emissions. For other companies there was no documentation of these avoided emissions and could therefore not be taken into account.
Asset class specific considerations	The approach for other organizations is in line with project finance approach in the PCAF methodology. The companies in this sector are (partly) owned by municipalities or other regional authorities. This could lead to double counting. This is not taken into account in the calculations for this report.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, GHG emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate scopes and the sum of the scopes of all individual organizations have to be aggregated.
Absolute vs. relative emissions	For the other organizations, the absolute GHG emissions are presented in tons. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans with a carbon footprint. This results in tons CO_2-eq / mln Euro.
Limitations	The data availability is highly dependent on the disclosure of information of individual companies. Especially relatively smaller companies do not disclose information on GHG emissions. For relatively large companies it is also not always documented how GHG emissions are calculated. It is unknown whether they have used the emission factors based on 'Tank to Wheel' or 'Well to Wheel' and whether they have subtracted their avoided emissions from the total GHG emissions. Therefore, the used GHG emissions for annual reports might be calculated by using a different method than used for current report.
Data quality estimate	The GHG emissions for 20% of the other organizations are based on GHG emissions published in their annual reports which are audited. For 80% of the other organizations, the GHG emissions are based on emission factors for the sector per unit of revenue. Therefore, data quality score is 4. See option 3a in Table 5-10 on page 83 of the Financed Emissions, The global GHG accounting & reporting standard Part A.[35]

11.1.3 Factsheet per data source used

Topic	Description
Data	Net revenue per SBI code
Data file	20222709 – netto omzet per SBI.csv
Data Source	CBS
Year	2020
Last update	17-3-2022
Date of download	27-9-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81837NED/table
Filters used to obtain the datafile	Totaal, ex. Financiële sector, vastgoed Bedrijfstakken 1e digit Netto omzet

[35] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

	2020
Internal location	Werkmap\Projecten\Data
Data quality	Score 2 Data is acquired on the basis of actual tax forms from Dutch companies and organizations. The data is therefore of high quality. More information about the accuracy and checks and controls can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/statistiek-financien-van-ondernemingen
Unit of measurement	Million Euro
Selections	All types of organizations on 1 digit of the SBI; net revenue in millions for 2020.
Data transformation	Not applicable
Data missing	Not applicable
Print screens	In folder: Werkmap\Projecten\Printscreens\20222709 netto omzet per SBI.png

Topic	Description
Data	GHG emissions to the air by the Dutch economy
Data file	20222709 – emissies broeikasgas-equivalent per SBI.csv
Data Source	CBS
Year	2020
Last update	3-12-2021
Date of download	27-9-2022
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83300NED/table?ts=1634067425549
Filters used to obtain the datafile	Broeikasgassen (klimaatverandering) Broeikasgas-equivalent Economische activiteiten (SBI 2008): A-U, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S
Internal location	Werkmap\Projecten\Data
Data quality	Score 4 The research method used to obtain the data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/milieurekeningen Data is based on environmental accounts. Important sources for the environmental accounts are environmental statistics, such as emission registrations, energy statistics (Dutch energy balance) and a macro economic system used by CBS. It is data on the basis of country and therefore data quality score is 4.
Unit of measurement	GHG emissions: mln kg
Selections	All types of organizations on 1 digit of the SBI; greenhouse gas equivalent in millions for 2020.
Data transformation	Not applicable
Data missing	Not applicable
Print screens	In folder: Werkmap\Projecten\Printscreens\20222709 emissies broeikasgas-equivalent.png

Topic	Description
Data	Annual reports of organizations containing net revenue and/or GHG emissions
Data file	Multiple files in Werkmap\Projecten\Jaarverslagen
Data Source	Webpage of the organization or company.info
Year	2020 and 2021
Last update	Not applicable
Date of download	Between 13-7-2022 and 29-9-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Projecten\Jaarverslagen
Data quality	Score 2 It's primary data provided by the organizations
Unit of measurement	Net revenue: mln euro GHG emissions: Kton
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

List of the calculation sheets	Location
Projecten 2022 overzicht BNG.xlsx	Werkmap\Projecten
Annual reports	Werkmap\Projecten\Jaarverslagen

12 Avoided emissions from wind farms

BNG Bank finances several renewable energy projects like wind farms. These projects lead to avoided emissions. By adding chapter 12 to this report some of the avoided emissions financed by BNG Bank are quantified showing the positive contribution of BNG Banks's lending activities to prevent climate change. Avoided emissions have to be quantified and reported separately from the actual emissions. The PCAF methodology also prescribes to be conservative in calculating the avoided emissions to limit the chance of overstating the avoided emissions.

The methodology used to calculate the avoided emissions of wind farms is described in the general factsheet.

12.1.1 General factsheet

Topic	Description
Scopes covered	Not applicable
Portfolio covered	51% of all financed wind farms are included in the calculation.
Data	Data on theoretical production, actual energy production in 2021, estimated lifespan, and total balance sheet has been obtained from BNG bank (the bank's own account manager). Data on the number of wind turbines per project and type of wind turbines has been obtained from BNG Bank or the website of the wind farms. Data on GHG emissions due to production, maintenance, and decommissioning comes from the wind turbine manufacturer itself, or if this information was not available from scientific literature.
Grid emission factors	The emission factor is based on the grey 'Well to Wheel' (WTW) energy mix of the Netherlands of 0.556 kg CO_2 / kWh.
Calculation steps	For the wind farms, first, the GHG emissions due to production, maintenance, and decommissioning has been calculated. For each type of wind turbine the GHG emissions in grams per kWh for production, maintenance, and decommissioning has been established. The theoretical annual capacity (P90) per wind turbine has been multiplied by the estimated lifespan of a wind farm. The total production has been multiplied by the GHG emissions in grams per kWh for production, maintenance, and decommissioning. This value has been multiplied by the number of turbines at the wind farm and divided by the estimated lifespan to calculate the GHG emissions for production, maintenance, and decommissioning for one year. The actual energy production in the year 2021 has been multiplied by the emission factor 0.556 kg CO_2 / kWh. This resulted in the gross emissions avoided. The GHG emissions for production, maintenance, and decommissioning calculated per year has been subtracted from the gross emissions to result in the net avoided emissions per year. After calculating the net avoided emissions, this total amount has been multiplied by the percentage of loan of the wind farms in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a wind farm is 25%, 25% of the net avoided emissions of that wind farm has been allocated to BNG Bank. To calculate the relative emissions, the net avoided emissions have been divided by the loans of which the net avoided emissions could be calculated to calculate the net avoided emissions in ton CO_2-eq per million EUR.

Avoided emissions	Not applicable
Asset class specific considerations	For the calculation of avoided emissions of wind farms asset class Project finance has been followed.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet of the individual wind farms is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate avoided emissions per wind farm have to be aggregated.
Absolute vs. relative emissions	The avoided emissions are calculated in ton CO_2-eq. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans to wind farms for which the avoided emissions were calculated. This results in ton avoided CO_2-eq / mln Euro.
Limitations	For some wind turbines the GHG emissions in grams per kWh for production, maintenance, and decommissioning has been unknown. In that case data from scientific literature was used to decide which value was best to use. The decision to use a certain number was made by at least two researchers from Het PON & Telos. Some financed wind farms were not or not yet fully operational in 2021. Wind farms that were not operational in 2021 were not taken into account. Wind farms that were not yet fully operational were taken into account for the months in which energy was produced.
Data quality estimate	The GHG emissions are calculated based on data received from the wind farms themselves, but the data is not audited. Information about wind turbines are mainly obtained from the suppliers. Therefore data quality score is 2.

12.1.2 Factsheet per data source used

Topic	Description
Data	Energy production, total balance sheet, number and type of wind turbines
Data file	Email with name: Data windparken tbv berekenen vermeden emissies BNG
Data Source	Accountmanagers of the bank
Year	2021
Last update	Not applicable
Email received	Data windparken tbv berekenen vermeden emissies BNG: 14-7-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- zonneparken\Windparken\Mails
Data quality	Score 2 Data is not audited, but data comes from the wind farms themselves.
Unit of measurement	Energy production: kWh Total balance sheet: Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Theoretical production (P90) and lifespan
Data file	Email with name: Data windparken tbv berekenen vermeden emissies BNG
Data Source	Accountmanagers of the bank
Year	2021
Last update	Not applicable
Email received	Data windparken tbv berekenen vermeden emissies BNG: 14-7-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- zonneparken\Windparken\Mails
Data quality	Score 2 Data is not audited, but data comes from the wind farms themselves.
Unit of measurement	Theoretical production (P90): MWh Lifespan: years
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	CO2 emissions due to production, maintenance, and decommissioning
Data file	Bonou_2016_Applied_Energy_LCAonshoreoffshore.pdf (Table 4 onshore D3) swt 4.0 130 siemens.pdf (page 9) ENERCON_Sustainability_Report_2019_Rev000.pdf (page 31) Vestas LCA of Electricity Production from an onshore V136-4.2MW Wind Plant.pdf (page 77, table 12)
Data Source	Scientific article: Bonou et al., 2016 Siemens Enercon Vestas
Year	Bonou et al., 2016 Siemens: unknown Enercon: 2019 Vestas ; 2022
Last update	Not applicable
Date of download	Bonou et al., 2016: 24-9-2021 Siemens: 24-9-2021 Enercon: 30-9-2021 Vestas; 20-7-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- en zonneparken\Achtergrondgegevens
Data quality	Score between 2 and 3. Some information is wind turbine specific (score 2) and some information is not (score 3).
Unit of measurement	g CO_2 / kWh
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable

Print screens	Not applicable

List of the calculation sheets	Location
Vermeden emissies windparken 2022 BNG Bank.xlsx	Werkmap\Wind- zonneparken\Windparken
financiering windparken BNG 2022.xlsx	Werkmap\Wind- zonneparken\Windparken

13 Avoided emissions from solar parks

BNG Bank finances several renewable energy projects like solar parks. These projects lead to avoided emissions. By adding chapter 13 to this report some of the avoided emissions financed by BNG Bank are quantified showing the positive contribution of BNG Banks's lending activities to prevent climate change. Avoided emissions have to be quantified and reported separately from the actual emissions. The PCAF methodology also prescribes to be conservative in calculating the avoided emissions to limit the chance of overstating the avoided emissions.

The methodology used to calculate the avoided emissions of solar parks is described in the general factsheet.

13.1.1 General factsheet

Topic	Description
Scopes covered	Not applicable
Portfolio covered	43% of all financed solar parks are included in the calculation.
Data	Data on theoretical production, actual energy production in 2021, estimated lifespan, and total balance sheet has been obtained from BNG bank (the bank's own account manager). Data on the number of solar panels per project and type of solar panels has been obtained from BNG Bank. Data on GHG emissions due to production, maintenance, and decommissioning comes from scientific literature, since no data from the solar panel manufacturers was available.
Grid emission factors	The emission factor is based on the grey 'Well to Wheel' (WTW) energy mix of the Netherlands of 0.556 kg CO_2 / kWh.
Calculation steps	For the solar parks, first, the GHG emissions due to production, maintenance, and decommissioning has been calculated. For each type of solar panel the GHG emissions in grams per kWh for production, maintenance, and decommissioning has been established. The theoretical annual capacity per solar panel was calculated by multiplying the Watt-peak per solar panel, as obtained from BNG Bank, by 0.85. This factor has been found in de scientific literature for calculating the total output on average of solar panels in The Netherlands. The theoretical annual capacity per solar panel has been multiplied by the estimated lifespan of each solar panel. The total production has been multiplied by the GHG emissions in grams per kWh for production, maintenance, and decommissioning. This value has been multiplied by the number of solar panels at the solar farm and divided by the estimated lifespan to calculate the GHG emissions for production, maintenance, and decommissioning for one year. The actual energy production in the year 2021 has been multiplied by the emission factor 0.556 kg CO_2 / kWh. This results in the gross emissions avoided. The GHG emissions for production, maintenance, and decommissioning calculated per year has been subtracted from the gross emissions to result in the net avoided emissions per year. After calculating the net avoided emissions, this total amount has been multiplied by the percentage of loan of the solar parks in the total balance sheet. When for example the percentage of the outstanding loan at BNG Bank in the total balance sheet of a solar park is 25%, 25% of the net avoided emissions of that solar park has been allocated to BNG Bank.

	To calculate the relative emissions, the net avoided emissions have been divided by the loans of which the net avoided emissions could be calculated to calculate the net avoided emissions in ton CO_2-eq per million EUR.
Avoided emissions	Not applicable
Asset class specific considerations	For the calculation of avoided emissions from solar parks asset class Project finance is followed.
Attribution	To calculate the GHG footprint following the PCAF principles, a general approach has been developed. First, emissions of the different entities in the sector are calculated. Subsequently the Bank loan ratio of the total balance sheet of the individual solar parks is used to determine which part of the emissions the Bank is accountable for. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan\ volume}}{\boldsymbol{Total\ balance\ sheet\ (equity + debt)}}$$ In the end, the separate avoided emissions per solar park have to be aggregated.
Absolute vs. relative emissions	The avoided emissions are calculated in ton CO_2-eq. The relative emissions are calculated by dividing the absolute GHG emissions by the amount of loans to solar parks for which the avoided emissions were calculated. This results in ton avoided CO_2-eq / mln Euro.
Limitations	For all solar panels the GHG emissions in grams per kWh for production, maintenance, and decommissioning were unknown. Therefore, data from scientific literature was used to decide which value was best to use. The decision to use a certain number was made by at least two researchers from Het PON & Telos.
Data quality estimate	The GHG emissions are calculated based on data received from the solar parks themselves, but the data is not audited. Information about solar panels is mainly not solar panel specific. Therefore data quality score is 3.

13.1.2 Factsheet per data source used

Topic	Description
Data	Energy production, total balance sheet, number and type of solar panels
Data file	Email with name: Data zonneparken tbv berekenen vermeden emissies zonnepark_1 Data zonneparken tbv berekenen vermeden emissies zonnepark_2
Data Source	Accountmanagers of the bank
Year	2021
Last update	Not applicable
Email received	Data zonneparken tbv berekenen vermeden emissies zonnepark_1: 22-9-2022 Data zonneparken tbv berekenen vermeden emissies zonnepark_2: 22-9-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- zonneparken\Zonneparken\Mails
Data quality	Score 2 Data is not audited, but data comes from the solar parks themselves.
Unit of measurement	Energy production: kWh Total balance sheet: Euro
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Theoretical production and lifespan
Data file	Email with name: Data zonneparken tbv berekenen vermeden emissies zonnepark_1 Data zonneparken tbv berekenen vermeden emissies zonnepark_2
Data Source	Accountmanagers of the bank
Year	2021
Last update	Not applicable
Email received	Data zonneparken tbv berekenen vermeden emissies zonnepark_1: 22-9-2022 Data zonneparken tbv berekenen vermeden emissies zonnepark_2: 22-9-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- zonneparken\Zonneparken\Mails
Data quality	Score 2 Data is not audited, but data comes from the solar parks themselves.
Unit of measurement	Theoretical production: Wp Lifespan: years
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Lifespan
Data file	Economic lifespan of solar panels.pdf
Data Source	Scientific article: Sodhi et al., 2022
Year	2022
Last update	Not applicable
Date of download	17-10-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- en zonneparken\Zonneparken\Achtergrondgegevens
Data quality	Score 3 Information is not solar panel specific.
Unit of measurement	years
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	CO2 emissions due to production, maintenance, and decommissioning
Data file	Life Cylce Analysis PV solar National Renewable Energy Laboratory.pdf (page 1)
Data Source	National Renwable Energy Laboratory (NREL)
Year	2012
Last update	Not applicable
Date of download	17-10-2022
Link to webpage	Not applicable

Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- en zonneparken\Zonneparken\Achtergrondgegevens
Data quality	Score 3 Information is not solar panel specific.
Unit of measurement	g CO_2 / kWh
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

Topic	Description
Data	Conversion factor Wp to kWh
Data file	
Data Source	Zonnepanelenkennis
Year	2022
Last update	Not applicable
Date of download	20-10-2022
Link to webpage	Not applicable
Filters used to obtain the datafile	Not applicable
Internal location	Werkmap\Wind- en zonneparken\Zonneparken\Achtergrondgegevens
Data quality	Not applicable
Unit of measurement	Not applicable
Selections	Not applicable
Data transformation	Not applicable
Data missing	Not applicable
Print screens	Not applicable

List of the calculation sheets	Location
Vermeden emissies zonneparken 2022.xlsx	Werkmap\Wind- zonneparken\Zonneparken
financiering zonneparken BNG 2022.xlsx	Werkmap\Wind- zonneparken\Zonneparken

14 Emission factors

For the calculation of the carbon footprint of the bank loan portfolio and clients from BNG Bank, emission factors have been used to calculate emissions to ton GHG emissions. The selection of the correct emission factors is crucial. For this publication the emission factors from CO2emissiefactoren.nl have been used. This list of emission factors is developed by the Dutch National Government, SKAO, Stimular, Connekt, and Milieu Centraal.[36] This list is frequently updated and contains information about the applied system boundaries and gives a list of widely accepted and uniform emission factors.

PCAF has chosen to use the grid emission factors related to direct emissions, expressed under column 'Tank to Wheel' (TTW) value on CO2emissiefactoren.nl. This emission factor only includes the emission from the use of the energy carrier and not the production of the energy carrier.

An emission factor can change over time. The factors can change due to changes in methodology on scientific insights or due to changes in the context of the emission factor. This latter is the case for example for the emission factor for electricity from an unknown source. This emission factor is calculated on the basis of the national energy production mix (e.g. the mutual relationship between coal, nuclear, and renewable energy sources). This factor changes every year due to changes in the national energy mix.

Changes in CO_2 emission factors can be of influence on the development in GHG emissions. Therefore, when calculating GHG emissions, for a correct comparison, the footprint of previous years may need to be recalculated.
At CO2emissiefactoren.nl an advise is given whether the revised emission factor should be used retroactively and also from which date onwards. For example it is recommended to use the emission factor for electricity from an unknown source revised in 2020 retroactively from January 2018.

In this report, when emission data is longitudinally presented, we follow three basic principles to determine what emission factor to use:

1. Changes in emission factors over time due to changes in the national energy mix: use the emission factor in accordance to the data year. E.g. data from 2021 means using the emission factor of 2021.

[36] In March 2014, the Green Deal CO_2 equivalent emission factors was signed by the Dutch national government, SKAO, Stimular, Connekt and Milieu Centraal. Due to an increasing social attention for CO_2 emission factors, more and more tools are created to make a comparison or calculate a footprint. However, confusion arises when companies and organizations use different figures. Creating a uniform list is a solution to this and that is why the Green Deal was created.

The aim of the Green Deal is to arrive at a single, widely supported and scientifically substantiated list of CO_2 emission factors, based on generally accepted principles. The list concerns CO_2 data of energy carriers, passenger transport, goods transport and refrigerants. The primary target group consists of companies and organizations that use CO_2 equivalent emission data or calculation tools in their communications or reports. This shifts the discussion about the accuracy of the figures to what really matters: reducing GHG emissions.

2 Changes in emission factors over time due to technological development: use the emission factor in accordance to the data year. E.g. data from 2021 means using the emission factor of 2021.
3 Changes in emission factors over time due to new methodology or scientific insights: use the most recent emission factor. E.g. data from 2021 means using the emission factor of 2022.

An overview of the emission factors used per year is presented in Table 14-1. In general, for every calculation and approach, emission factors were chosen in accordance to the data year. However, one exception was made for the social housing sector. For unknown electricity it is advised by CO2emissiefactoren.nl to use the emission factor of 0.405 kg CO_2 equivalent per kWh from January 2018 because of a method change for the average power mix. To have no differences between years due to a change in the emission factor the emission factor of the year 2018 was used for reporting year 2019, while the energy consumption data was from the year 2017.

Table 14-1 Emission factors used per data year

Source	Emission factor (kg CO_2 eq/unit) (TTW)					If emission factor has changed over the years, which one should be used?
	2017	**2018**	**2019**	**2020**	**2021**	
Petrol (E95) (NL)	2.233	2.233	2.233	2.141	2.141	Advised by CO2emissiefactoren to use these values (see CO2emissiefactoren 2021)
Diesel (NL)	2.514	2.514	2.514	2.474	2.474	Advised by CO2emissiefactoren to use these values (see CO2emissiefactoren 2021)
LPG (NL)	1.61	1.61	1.61	1.61	1.631	Use the emission factor in accordance to the data year
Bio-diesel (HVO)					0.038	Values before 2021 were indicative. Advised by CO2emissiefactoren to use values of the year 2021
CNG	2.234	2.234	2.234	2.234	2.284	Use the emission factor in accordance to the data year
Bio-CNG					0.137	Values before 2021 were indicative. Advised by CO2emissiefactorento use values of the year 2021
Fuel oil	3.185 (WTW)	3.185 (WTW)	3.185 (WTW)	3.185 (WTW)	3.185 (WTW)	Use the emission factor in accordance to the data year
Natural gas (Nm^3)	1.791	1.791	1.791	1.785	1.785	Use the emission factor in accordance to the data year
Grey energy	0.464	0.572	0.572	0.476 (TTW) 0.556 (WTW)	0.476 (TTW) 0.556 (WTW)	Use the emission factor in accordance to the data year
Electricity from unknown sources (kWh)	~~0.301~~	~~0.361~~	~~0.361~~	0.405	0.405	Use the most recent emission factor. Advised by CO2emissiefactoren to use values of the year 2020 and 2021 also for the years 2018 and 2019.
Passenger transport by car, unknown fuel & weight (vehicle km)	0.181	0.181	0.181	0.163	0.163	Use the emission factor in accordance to the data year
Electric Car (grey energy)	0	0	0	0	0	
Public transport in general (traveled kms; type of transport unknown)	0.025	0.025	0.025	0.025	0.011	Use the emission factor in accordance to the data year
Public transport in general (traveled kms; Bus, Tram, Metro average)	-	-	-	-	0.052	Use the emission factor in accordance to the data year. For year 2018 and 2020 we also used this emission factor.
Public transport by train (traveled kms; unknown train type)	0.005	0.005	0.005	0.005	0.002	Use the emission factor in accordance to the data year
Public transport by bus (traveled kms; type unknown)	0.113 TTW	0.113 TTW	0.113 TTW	0.113 TTW	0.103 WTW	Use the emission factor in accordance to the data year CO2emissiefactoren reports that for the year 2021 the division

						into WTW and TTW is not available
Public transport by tram (traveled kms)	0	0	0	0	0	
Public transport by metro (traveled kms)	0	0	0	0	0	
Air travel <700 km	0.278	0.278	0.278	0.278	0.278	
Air travel 700-2500 km	0.187	0.187	0.187	0.187	0.187	
Air travel >2500 km	0.137	0.137	0.137	0.137	0.137	
Bulk goods, Truck, unit with semi-trailer heavy	0.064	0.064	0.064	0.064	0.067	Use the emission factor in accordance to the data year
District heating (STEG)	32.53	32.53	32.53	32.53	32.53	
Methane					28 WTW	Value for methane only published by CO2emissiefactoren for the year 2021, this value is also applicable for earlier years
Source	LINK[37]	*LINK*[38]	*LINK*[39]	*LINK*[40]	*LINK*[41]	

[37] https://www.co2emissiefactoren.nl/wijzigingen-overzicht/ 2017 Lijst CO2-emissefactoren
[38] https://www.co2emissiefactoren.nl/wijzigingen-overzicht/ 2018 Lijst CO2-emissefactoren
[39] https://www.co2emissiefactoren.nl/wijzigingen-overzicht/ 2019 Lijst CO2-emissefactoren
[40] https://www.co2emissiefactoren.nl/wijzingingen-overzicht/ 2020 Lijst CO2-emissiefactoren
[41] https://www.co2emissiefactoren.nl/wijzingingen-overzicht/ 2021 lijst CO2-emissiefactoren

15 Introduction Results

In the chapters 15 up to 27 the results of the GHG emission calculations are presented. These chapters contain the GHG emissions of reporting years 2019, 2021, and 2022. In chapter 27 an overview is given of the development of the loan portfolio, coverage rate, and GHG emissions over the last two reporting years (2021 and 2022) and the reference year (2019). For the calculation of GHG emissions of reporting year 2022, the most recent available data has been used. The most recent data can be either from 2020 or 2021.

When the results show an increase or decrease in GHG emissions between reporting years, these changes can be caused by various factors. It can be due to changes in clients, changes in the outstanding loan volume, changes in the total balance sheet of the clients, changes in the ratio outstanding loan volume / total balance sheet, and also by changes in absolute GHG emissions by the clients due to several possible factors, like energy savings, investments in renewable energy, and weather conditions etc. Within this study, there is no insight into the specific changes that might have taken place at the clients.

15.1 BNG Bank loan portfolio

BNG Bank's loan portfolio consists of different market segments. These segments cover multiple sectors or sub-sectors. An overview of these sectors is given in Table 15-1.
In reporting year 2019 some clients were in the group 'remaining', while in the reporting years 2021 and 2022 there was no group 'remaining'. Instead, clients from the group 'remaining' were subdivided in other sectors. Table 15-1 shows that the share of the 'remaining' group in the total loan portfolio is very small.

Table 15-1 Overview of BNG Bank loan portfolio for reporting years 2019, 2021, and 2022[42]

Market segment	Sector	Loan portfolio (million EUR)			Percentage of all loans		
		2022	2021	2019	2022	2021	2019
Social housing	Social housing associations	43,336	41,791	38,739	49.7	48.6	47.5
	Others	67	71	9	0.1	0.1	0.0
Public sector	Municipalities	27,272	27,402	26,033	31.3	31.9	31.9
	Provinces	337	357	137	0.4	0.4	0.2
	Water authorities	204	193	233	0.2	0.2	0.3
	Joint Regulations	1,935	2,066	2,014	2.2	2.4	2.5
	Others	1,344	1,371	1,290	1.5	1.6	1.6
Healthcare	Healthcare	6,860	7,130	6,973	7.9	8.3	8.5
Education	PO	69	38	17	0.1	0.0	0.0
	VO	192	177	146	0.2	0.2	0.2
	MBO	152	165	217	0.2	0.2	0.3
	HBO	50	62	92	0.1	0.1	0.1

[42] Reference dates for reporting years 2019, 2021, and 2022 are 31-12-2018, 31-12-2020, and 31-12-2021, respectively.

	WO	273	299	210	0.3	0.3	0.3
	Others	257	265	272	0.3	0.3	0.3
Networks	Drinking water utilities	677	686	811	0.8	0.8	1.0
	Others	731	471	435	0.8	0.5	0.5
Mobility	Mobility	1,229	1,398	1,512	1.4	1.6	1.9
Energy	Energy	836	662	541	1.0	0.8	0.7
Environment	Environment	745	792	759	0.9	0.9	0.9
Financial institutions	Financial institutions	226	235	157	0.3	0.3	0.2
Others		320	351	120	0.4	0.4	0.1
Remaining				911			1.1
Total		**87,112**	**85,982**	**81,628**	**100**	**100**	**100**

As can be seen in Table 15-1, the social housing associations and municipalities are the largest sectors in BNG Bank's loan portfolio. The total loan portfolio increased by 1,130 million Euro in 2022.

15.2 Data quality per sector

As mentioned before, an important element of carbon accounting is the quality of data on emissions attributed to loans and investments. The data quality score gives insight into how accurate the calculated GHG emissions are. Different asset classes present unique challenges and opportunities with respect to emission data.

Because the data source and calculation method can differ between scopes and items within a scope, several data quality scores are given to the different scopes of a sector. In the general factsheets, the choice for the data quality score has already been explained, but in this paragraph an overview of the data quality is given in Table 15-2. The percentage of total GHG emissions emitted by the different categories is also shown in Table 15-2.

Even though the calculation method has not always changed in comparison to last year, it is still possible that the data quality score has changed. This is because the data quality has been reassessed for current report. For the reassessment of data quality, the report Financed Emissions, The global GHG accounting & reporting standard Part A was used.[43] When in doubt about a score, the higher score has been chosen not to overestimate the data quality.
For the education sector and drinking water utilities the data source and calculation method did not change but due to the reassessment of data quality the data quality decreased for some or for all scopes, which has resulted in a higher score. For provinces the data source did not change, but due to the reassessment of data quality the data quality decreased for all scopes, which has resulted in a higher score.
For the sectors social housing, healthcare, and municipalities the data source improved, but the data quality score did not reduce, also due to the reassessment of data quality. For

[43] https://carbonaccountingfinancials.com/standard. PCAF(2022). Financed Emissions, The global GHG accounting & reporting standard Part A.

the water authorities, the GHG emissions of the sewage treatment plant were added to the methodology. Because these emissions are based on a model, this particular part of scope 1 has a higher score for data quality than the other parts of scope 1, which means the data quality is lower.

Table 15-2 Data quality scores per sector per scope

Sector and scope	Data quality score	Explanation	Percentage of total GHG emissions reporting year 2022
Social housing sector scopes 1 and 2	2	The GHG emissions are calculated based on primary data on actual building energy consumption. The data quality score 2 applies to the overall sector. At the level of individual social housing associations, the data quality score would be 3, because it is not known which houses belong to which social housing association.	22.3
Municipalities scopes 1 natural gas use and 2 electricity use	4	The GHG emissions are calculated based on energy supply to the public administration and government services sector at the aggregation level of municipalities. This is not only energy supply to the municipalities, but also other governmental authorities. Therefore, data is used on the basis of region and data quality score is 4.	9.3
Municipalities scope 1 company vehicles	5	The GHG emissions are calculated based on average vehicle information. Vehicle make, model, and type are unknown and distance traveled is based on local or regional statistical data. Therefore, data quality score is 5.	0.2
Municipalities scope 3	4	The GHG emissions are calculated based on economic activity. The expenses made in the categories 3.1, 3.2, 3.5, and 3.8 were multiplied by a value for kg CO_2-eq / Euro. The value for kg CO_2-eq / Euro has been calculated based on proxy data on the basis of country. Therefore, the data quality is score 4.	54.2
Provinces scopes 1 natural gas use and 2 electricity use	4	The GHG emissions are calculated based on energy supply to the public administration and government services sector at the aggregation level of a whole province. This is not only energy supply to the province organization, but also other governmental authorities. Therefore, data is used on the basis of region and data quality score is 4.	0.0
Provinces scope 1 company vehicles	5	The GHG emissions are calculated based on average vehicle information. Vehicle make, model, and type are unknown and distance traveled is based on local or regional statistical data. Therefore, data quality score is 5.	0.0
Provinces scope 3	4	The GHG emissions are calculated based on economic activity. The expenses made in the categories 3.1, 3.2, 3.5, and 3.8 were multiplied by a value for kg CO_2-eq / Euro. The value for kg CO_2-eq / Euro has been calculated based on proxy data on the basis of country. Therefore, data quality score is 4.	0.4
Water authorities scope 1 **without** GHG emissions from the sewage treatment plant, scope 2, and scope 3	2	The GHG emissions are calculated based on data received from the water authorities themselves, but the data is not audited. Therefore, data quality score is 2.	0.2
Water authorities scope 1 for GHG emissions from the sewage treatment plant	3	The GHG emissions of methane and nitrous oxide from sewage treatment plants have been determined based on an IPCC model. This does not take into	0.6

		account the individual situations of the sewage treatment plants. But, data is sectorspecific. Therefore, data quality score is 3.	
Healthcare sector scopes 1 and 2	3	The GHG emissions are based as much as possible on Actual building energy consumption. However, due to privacy reasons it is not allowed to provide energy consumption data for individual buildings. It is allowed to provide these for cluster of buildings (10 to 15 buildings). Where possible, clusters consisted only of buildings of the same owner. If this was not possible, buildings of different owners have been clustered. For the buildings with missing consumption data an estimation for gas and electricity has been assigned on the basis of the building period and surface class. Because the actual building energy consumption had to be clustered and in some cases for the buildings with missing data an estimation has been made the data quality score is 3.	9.0
Healthcare sector scope 3 (commuting)	5	The GHG emissions are calculated based on average vehicle information. Vehicle make, model, and type are unknown and distance traveled is based on local or regional statistical data. Therefore, data quality score is 5.	1.2
Drinking water utilities scopes 1 and 2	2	The GHG emissions are calculated based on data received from the drinking water utilities themselves, but the data is not audited. Therefore, data quality score is 2.	0.8
Drinking water utilities scope 3	3	The GHG emissions for scope 3 are less certain than scope 1 and 2, because traveled distances are known, but details on means of transport are sometimes missing. Therefore, data quality score is 3.	0.2
Education sector scopes 1 and 2	4	The GHG emissions are calculated based on costs for energy and water, energy supply to the education sector on the aggregation level of municipalities, and the number of students per educational institution. Use is made of both sectorspecific data as data on the basis of region. Therefore, data quality score is 4.	1.0
Joint regulations scopes 1 and 2	2	The GHG emissions are calculated based on data received from the joint regulations themselves, but the data is not audited. Therefore, data quality score is 2.	0.0
Other organizations	4	The GHG emissions for 20% of the other organizations are based on GHG emissions published in their annual reports which are audited. For 80% of the other organizations, the GHG emissions are based on emission factors for the sector per unit of revenue. Therefore, data quality score is 4.	0.7
Wind farms	2	The GHG emissions are calculated based on data received from the wind farms themselves, but the data is not audited. Information about wind turbines are mainly obtained from the suppliers. Therefore, data quality score is 2.	
Solar parks	3	The GHG emissions are calculated based on data received from the solar parks themselves, but the data is not audited. Information about solar panels is mainly not solar panel specific. Therefore, data quality score is 3.	

16 Results Social housing sector

The social housing sector is the largest sector within the loan portfolio of BNG Bank. The sector has a share of 49.7% within the bank's loan portfolio.

16.1 Coverage

It has been possible to calculate the GHG footprint for 98.4% of the loan portfolio within the social housing sector. Between reporting year 2021 and 2022, the outstanding loan volume has increased by 1.541 million Euro. In reporting year 2021, the coverage rate was 98.2% and has increased by 0.2%. For reporting years 2019, 2021 and 2022, the loan portfolio and coverage rate are shown in Tables 16-1, 16-2, and 16-3.

Table 16-1 Loan portfolio and coverage rate for the social housing sector reporting year 2022

Social housing sector	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Social housing associations	43,336	99.8%	49.7%	98.5%
Others	67	0.2%	0.1%	0.0%
Total	**43,403**	**100%**	**49.8%**	**98.4%**

Table 16-2 Loan portfolio and coverage rate for the social housing sector reporting year 2021

Social housing sector	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Social housing associations	41,791	99.8%	48.6%	98.7%
Others	71	0.2%	0.1%	0.0%
Total	**41,862**	**100%**	**48.7%**	**98.5%**

Table 16-3 Loan portfolio and coverage rate for the social housing sector reporting year 2019

Social housing sector	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Social housing associations	38,739	99.9%	47.5	98.9%
Others	9	0.1%	0.0	0.0%
Total	**38,748**	**100%**	**47.5**	**98.8%**

16.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to the social housing sector for the reporting years 2019, 2021, and 2022 are shown in Table 16-4.

Table 16-4 Absolute and relative GHG emissions for the social housing sector for reporting years 2019, 2021, and 2022

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Natural gas use	Scope 1	350,232	362,637	427,086	62.1	63.2	64.3	8.2	8.8	11.2
Electricity use	Scope 2	200,925	195,410	220,563	35.6	34.0	33.2	4.7	4.7	5.8
District heating	Scope 2	12,785	16,187	16,569	2.3	2.8	2.5	0.3	0.4	0.4
Total		**563,942**	**574,234**	**664,218**	**100**	**100**	**100**	**13.2**	**13.9**	**17.3**

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for scope 1 natural gas use and scope 2 use of district heating. For scope 2 electricity use the absolute GHG emissions have increased. The total absolute GHG emissions have decreased by 10,292 ton. This decrease is mainly caused by a decrease in scope 1 natural gas use, which has decreased by 12,405 ton. The part of the loans covered with a GHG footprint has increased from 41,231 to 42,782 million Euro. The percentage of outstanding loan volume / total balance sheet has increased in comparison to reporting year 2021 (from 10.9% to 11.4%). Due to an increase in the part of the loans covered with a GHG footprint and a decrease in the absolute GHG emissions the relative GHG emissions have decreased by 0.7 ton / million Euro. In conclusion, the absolute and relative GHG emissions for the social housing sector have decreased between reporting year 2021 and 2022.

In 2050, all houses in possession of a social housing association need to be CO_2 neutral. Social housing associations are working hard to better insulate homes to save energy. This can be seen in de reduction of Scope 1. Social housing associations also have to aim to increase the number of houses without a gas connection. To make that possible, alternative heat sources are needed, such as district heating. Between reporting year 2021 and 2022, the GHG emissions have not increased for district heating, so it seems that scope 1 natural gas use has not decreased due to more use of district heating. The GHG emissions for scope 2 electricity use have not decreased in comparison to last year. Probably the focus is more on the reduction of natural gas use. To make progress in making homes more sustainable and decrease the GHG emissions of social housing associations, they have to cooperate with other social housing associations and municipalities.

17 Results public sector: municipalities

With a share of 31% of the total loan portfolio of BNG Bank the municipalities are the second largest sector within the total loan portfolio of BNG Bank.

17.1 Coverage

It has been possible to provide all municipalities with a GHG footprint. Between reporting year 2021 and 2022, the outstanding loan volume has decreased by 130 million Euro. For reporting years 2019, 2021, and 2022 the loan portfolio and coverage rate are shown in Tables 17-1, 17-2, and 17-3.

Table 17-1 Loan portfolio and coverage rate for the municipalities for reporting year 2022

Municipalities	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Municipalities	27,230	99.8%	31.2%	100%
Others	42	0.2%	0.1%	0%
Total	**27,272**	**100%**	**31.3%**	**99.9%**

Table 17-2 Loan portfolio and coverage rate for the municipalities for reporting year 2021

Municipalities	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Municipalities	27,359	99.8%	31.8%	100%
Others	43	0.2%	0.1%	0%
Total	**27,402**	**100%**	**31.9%**	**99.8%**

Table 17-3 Loan portfolio and coverage rate for the municipalities for reporting year 2019

Municipalities	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Municipalities	25,973	99.8%	31.8%	100%
Others	60	0.2%	0.1%	0%
Total	**26,033**	**100.0%**	**31.9%**	**99.8%**

17.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to Dutch municipalities for reporting years 2019, 2021, and 2022 are shown in Table 17-4.

Table 17-4 Absolute and relative GHG emissions for municipalities for reporting years 2019, 2020, and 2021

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Natural gas use	Scope 1	59,153	56,401	77,571	3.7	3.4	4.5	2.2	2.1	3.0
Fossil fuel use (cars)	Scope 1	4,219	6,500	6,433	0.3	0.4	0.4	0.2	0.2	0.2
Electricity use	Scope 2	175,621	184,478	209,900	10.9	11.0	12.2	6.4	6.7	8.1
Purchased goods and services	Scope 3	1,371,885	1,432,112	1,432,018	85.2	85.3	83.0	50.4	52.3	55.1
Total all scopes		**1,610,878**	**1,679,491**	**1725,922**	**100**	**100**	**100**	**59.2**	**61.4**	**66.5**
Total scopes 1 and 2*		**238,993**	**247,379**	**293,904**	**14.9**	**14.8**	**17.1**	**8.8**	**9.0**	**11.3**

*Scope 1 and 2 are part of BNG Bank's climate action plan

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for scopes 1 fossil fuel use (cars), scope 2, and scope 3. In total the absolute GHG emissions have decreased by 68,613 ton. This decrease is mainly caused by a decrease for scope 3 by 60,227 ton. For the calculation of scope 3 the emissions to air by the Dutch economy are used (CBS Statline). The emissions to air are classified into the Dutch hierarchical classification of economic activities used by CBS ('Standaard bedrijfsindeling'). For reporting years 2022 and 2021, the emissions to air in the year 2020 and 2019 have been used, respectively. Between 2019 and 2020 the GHG emissions due to economic activity have decreased due to the COVID-19 crisis.[44] Therefore, the emissions to air have decreased and the kg CO_2-eq/Euro that have been used in the calculation (see section 4.2.2, Table 4-4) were lower than in the previous years and resulted in a decrease for scope 3. Although the expenses of the municipalities in the categories 3.1, 3.2, 3.5, and 3.8 increased for reporting year 2022 in comparison to reporting year 2021, the GHG emissions decreased because the expenses were multiplied by a lower value for kg CO_2-eq/Euro. It seems, therefore, that the reduction in GHG emissions is more a result of the calculation method than a real reduction of GHG emissions due to a change in behavior by municipalities.
The part of the loans covered with a GHG footprint has decreased from 27,359 to 27,230 million Euro. The percentage of outstanding loan volume/ total balance sheet has decreased in comparison to reporting year 2021 (from 29.7% to 28.7%). This reduction has a share in the decrease of the absolute GHG emissions. The relative GHG emissions decreased by 2.2 ton / million Euro. In conclusion, based on the used calculation method the absolute and relative GHG emissions for the municipalities have decreased between

[44] https://www.cbs.nl/nl-nl/nieuws/2020/50/lagere-co2-uitstoot-in-het-derde-kwartaal-2020

reporting year 2021 and 2022. However, because the largest decrease was seen in scope 3 and data quality for scope 3 is poor (score 4), we should be somewhat cautious about drawing conclusions based on these data.

18 Results public sector: provinces

The Dutch provinces have a small share within the bank's loan portfolio with 0.4% of the total loan portfolio of BNG Bank in reporting year 2022.

18.1 Coverage

It has been possible to provide all provinces with a GHG footprint. Therefore, the coverage rate of this sector is 100%. Between reporting year 2021 and 2022, the outstanding loan volume has decreased by 20 million Euro. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate are shown in Table 18-1 .

Table 18-1 Loan portfolio and coverage rate for the provinces for reporting years 2019, 2021, and 2022

Provinces	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
2022	337	100%	0.4%	100%
2021	357	100%	0.4%	100%
2019	137	100%	0.2%	100%

18.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to Dutch provinces for reporting years 2019, 2021, and 2022 are shown in Table 18-2.

Table 18-2 Absolute and relative GHG emissions for the provinces for reporting years 2019, 2021, and 2022

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	2021	2019	2022	2021	2019	2022	2021	2019
Natural gas use	Scope 1	138	152	93	1.3	1.3	1.7	0.4	0.4	0.7
Fossil fuel use (cars)	Scope 1	44	33	13	0.4	0.3	0.2	0.1	0.1	0.1
Electricity use	Scope 2	583	708	345	5.5	6.3	6.3	1.7	2.0	2.5
Purchased goods and services	Scope 3	9,809	10,400	4,998	92.8	92.1	91.7	29.1	29.1	36.5
Total all scopes		**10,573**	**11,292**	**5,449**	**100**	**100**	**100**	**31.4**	**31.6**	**39.8**
Total scopes 1 and 2		**765**	**893**	**451**	**7.2**	**7.9**	**8.2**	**2.2**	**2.5**	**3.3**

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for all scopes except for Scope 1 fossil fuel use (cars). In total the absolute GHG emissions have decreased by 719 ton. This decrease is mainly caused by a decrease in scope 3 by 591 ton.

For calculating province scope 3 the same method was used as for scope 3 municipalities. It is therefore possible that the decrease in scope 3 is more a result of the calculation method than a real reduction of GHG emissions due to a change in behavior by the provinces.
The percentage of outstanding loan volume / total balance sheet has decreased in comparison to reporting year 2020 (from 9.3% to 8.3%). The part of the loans covered with a GHG footprint has decreased from 357 to 337 million Euro. The decrease in the part of the loans covered with a GHG footprint and a lower percentage of outstanding loan volume / total balance sheet have a share in the decrease of the absolute GHG emissions. The total relative GHG emissions have decreased by 0.2 ton per million Euro. In conclusion, based on the used calculation method the absolute and relative GHG emissions for the provinces have decreased between reporting year 2021 and 2022. However, because the largest decrease was seen in scope 3 and data quality for scope 3 is poor (score 4), we should be somewhat cautious about drawing conclusions based on these data.

19 Results public sector: water authorities

The water authorities have a small share within the bank's loan portfolio with 0.2% of the total loan portfolio of BNG Bank in reporting year 2022.

19.1 Coverage

For the water authorities it has been possible to provide 100% of the loan portfolio with a GHG footprint. The outstanding loan volume fluctuates over the years. Between reporting year 2021 and 2022 the outstanding loan volume has increased by 11 million Euro. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate are shown in Table 19-1 .

Table 19-1 Loan portfolio and coverage rate for the water authorities for reporting years 2019, 2021, and 2022

Water authorities	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
2022	204	100%	0.2%	100%
2021	193	100%	0.2%	100%
2019	233	100%	0.3%	100%

19.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to water authorities for the reporting years 2019, 2021, and 2022 are shown in Table 19-2.

Table 19-2 Absolute and relative GHG emissions for the water authorities for reporting years 2019, 2021, and 2022

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Direct CO_2 emissions										
Water treatment management	Scope 1									
Natural gas use		67	64	111	0.3	0.3	0.3	0.3	0.3	0.5
Other fuels		0	48	50	0.0	0.2	0.1	0.0	0.2	0.2
Water systems	Scope 1									
Natural gas use		28	31	30	0.1	0.1	0.1	0.1	0.2	0.1
Other fuels		21	21	111	0.1	0.1	0.3	0.1	0.1	0.5
Other	Scope 1									
Natural gas use		53	62	50	0.3	0.2	0.1	0.3	0.3	0.2
Other fuels		0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Own mobility, transport and maintenance	Scope 1	189	216	502	1.0	0.9	1.3	0.9	1.1	2.2
GHG sewage treatment plant	Scope 1	14,336	14,922	22,881	75.0	60.2	58.0	70.3	77.2	98.1
Indirect CO_2 emissions										
Water treatment management^	Scope 2									
Electricity		1,999	5,678	12,291	10.5	22.9	31.2	9.8	29.4	52.7
Warmth		64	59	70	0.3	0.2	0.2	0.3	0.3	0.3
Water systems^	Scope 2									
Electricity		694	1,669		3.6	6.7		3.4	8.6	
Warmth		0	0		0.0	0.0		0.0	0.0	
Other^	Scope 2									
Electricity		76	188		0.4	0.8		0.4	1.0	
Warmth		3	3		0.0	0.0		0.0	0.0	
Own mobility, transport and maintenance*	Scope 2	4	2		0.0	0.0		0.0	0.0	
Commuting	Scope 3	115	161	484	0.6	0.6	1.2	0.6	0.8	2.1
Outsourced transport, and maintenance	Scope 3	666	874	1,377	3.5	3.5	3.5	3.3	4.5	5.9
Materials and raw materials	Scope 3	802	810	1,462	4.2	3.3	3.7	3.9	4.2	6.3
Total al scopes		**19,117**	**24,807**	**39,419**	**100**	**100**	**100**	**93.8**	**128.4**	**169.0**
Total scopes 1 and 2		**17,534**	**22,963**	**36,096**	**91.6**	**92.6**	**91.6**	**85.9**	**118.7**	**154.8**

^For reporting year 2019 the indirect CO_2 emissions for water treatment management , water systems, and other are reported as one value under Water treatment management electricity and warmth.

*Own mobility, transport, and maintenance was not in the data of reporting year 2019.

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for all scopes except for scope 1 natural gas use for the water treatment management and scope 2 own mobility, transport and maintenance. Overall this has resulted in a decrease in the absolute GHG emissions by 5,690 ton. The percentage of outstanding loan volume / total balance sheet has slightly decreased in comparison to reporting year 2021 (from 3.5% to 3.3%). The part of the loans covered with a GHG footprint has increased from 193 to 204 million Euro. The total relative GHG emissions have decreased by 34.6 ton per million Euro. This has mainly been due to a reduction of the absolute GHG emissions for electricity (scope 2). Overall a decrease in absolute and relative GHG emissions has been seen.
The water authorities are making good progress in all three scopes. In the 'Klimaatmonitor Waterschappen' (Arcadis, 2022) it is shown that water authorities are making progress in solar energy generation and the production of green gas.[45] Although energy efficiency measures are taken by the water authorities, it is expected that energy consumption will further increase in the future.[46] The new added GHG emissions from the sewage treatment plants contain methane and nitrous oxide emissions and these emissions are determined with an IPCC model. Water authorities take actions to reduce methane and nitrous oxide emissions. However, these reductions are not yet evident through the model-based determination. It is expected that the GHG emissions of purchased electricity will decrease because more water authorities are willing to purchase electricity from renewable sources in the Netherlands. Also more water authorities have plans to make their mobility more sustainable.

[45] Klimaatmonitor Waterschappen, verslagjaar 2021, Arcadis Nederland B.V.
[46] Klimaatmonitor Waterschappen, verslagjaar 2021, Arcadis Nederland B.V.

20 Results healthcare sector

The healthcare sector has a small share within the bank's loan portfolio with 7.9% of the total loan portfolio of BNG Bank in reporting year 2022.

20.1 Coverage

As shown in Table 20-1, 86.9% of the organizations in the healthcare sector has been provided with a GHG footprint. The healthcare sector loan portfolio has decreased by 270 million Euro between reporting year 2021 and 2022. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate are shown in Table 20-1 .

Table 20-1 Loan portfolio and coverage rate for the healthcare sector for reporting years 2019, 2021, and 2022

Healthcare sector	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
2022	6,860	100%	7.9%	86.9%
2021	7,130	100%	8.3%	86.3%
2019	6,973	100%	8.5%	87.4%

20.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to healthcare organizations for reporting years 2019, 2020, and 2021 are shown in Table 20-2.

Table 20-2 Absolute and relative GHG emissions for the healthcare sector for reporting years 2019, 2021, and 2022

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Natural gas use	Scope 1	150,167	163,256	200,218	58.0	58.1	58.1	25.2	26.5	32.8
Electricity use	Scope 2	78,367	84,289	90,504	30.2	30.0	26.3	13.1	13.7	14.8
Commuting (car, bus, tram, metro, train)	Scope 3	30,595	33,311	53,733	11.8	11.9	15.6	5.1	5.4	8.8
Total all scopes		**259,129**	**280,856**	**344,455**	**100**	**100**	**100**	**43.5**	**45.6**	**56.5**
Total scopes 1 and 2*		**228,534**	**247,545**	**290,722**	**88.2**	**88.1**	**84.4**	**38.3**	**40.2**	**47.6**

**Scope 1 and 2 are part of BNG Bank's climate action plan

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for all scopes. In total the absolute GHG emissions have decreased by 21,727 ton. The largest decrease was seen for scope 1 by 13,089 ton. The part of the loans covered with a GHG footprint has decreased from 6.151 to 5,962 million Euro. The percentage of outstanding loan volume / total balance sheet has slightly decreased in comparison to reporting year

2021 (from 13.8% to 13.0%). The decrease in outstanding loan volume and percentage of outstanding loan volume / total balance sheet have a share in the decrease of the absolute GHG emissions. The total relative GHG emissions have decreased by 2.2 ton per million Euro. This shows that the decrease in outstanding loan volume cannot be the only reason for the reduction in absolute GHG emissions. In conclusion, the absolute and relative GHG emissions for the healthcare sector have decreased between reporting year 2021 and 2022.

In recent years, the efficiency of healthcare institutions has been under pressure, on the one hand because of the increased demand for care due to the ageing population and on the other hand because of cuts by the government, health insurers, care offices and municipalities. When making real estate more sustainable, healthcare institutions face higher construction costs. Banks can at least help by making financing sustainable real estate attractive.

21 Results drinking water utilities

The drinking water utilities have a small share within the bank's loan portfolio with 0.8% of the total loan portfolio of BNG Bank in reporting year 2022.

21.1 Coverage

As shown in Table 21-1, 87.7% of the drinking water utilities has been provided with a GHG footprint. Between reporting year 2020 and 2021 the calculation method for the drinking water utilities has changed and the coverage rate for reporting year 2019 cannot be recalculated. Therefore, the coverage rate for reporting year 2019 is missing in Table 21-1 and cannot be compared with the coverage rate of reporting years 2021 and 2022.
The loans to the drinking water utilities have decreased by 9 million Euro between reporting year 2021 and 2022. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate are shown in Table 21-1 .

Table 21-1 Loan portfolio and coverage rate for the drinking water utilities for reporting years 2019, 2021, and 2022

Drinking water utilities	Loan portfolio (million EUR)	Percentage of network sector	Percentage of all loans	Coverage rate of loan portfolio (%)
2022	677	48.0%	0.8%	87.7%
2021	686	59.3%	0.8%	88.0%
2019	811	65.1%	1.0%	

21.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to drinking water utilities for reporting years 2021 and 2022 are shown in Table 21-2.

Table 21-2 Absolute and relative GHG emissions for the drinking water utilities for reporting years 2021 and 2022

Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
	2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Scope 1	5,913	5,921		22.5	19.9		10.0	9.8	
Scope 2	14,562	16,941		55.4	56.8		24.5	28.1	
Scope 3	5,824	6,941		22.1	23.3		9.8	11.5	
Total all scopes	**26,300**	**29,803**		**100**	**100**		**44.3**	**49.4**	
Total scopes 1 and 2	**20,475**	**22,862**		**77.9**	**76.7**		**34.5**	**37.9**	

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for scope 2 and 3 and have slightly increased for scope 1. In total the absolute GHG emissions have decreased by 3,503 ton. The largest decrease was seen for scope 2 by 2,379 ton. The

part of the loans covered with a GHG footprint has decreased from 603 to 593 million Euro. The percentage of outstanding loan volume / total balance sheet has increased in comparison to reporting year 2021 (from 9.6% to 10.2%). The total relative GHG emissions have decreased by 5.1 ton per million Euro. In conclusion, the absolute and relative GHG emissions have decreased between reporting year 2021 and 2022. Some drinking water utilities have replaced green energy from a foreign country by Dutch green energy and this decreased scope 2.

22 Results educational institutions

The education sector has a share of 1.2% within the bank's loan portfolio reporting year 2022. This sector consists of several subsectors, representing different levels of education. The subsector 'Others' in the education sector is not provided with a GHG footprint. These organizations are mainly holdings or real estate companies in the education sector.

22.1 Coverage

The education loan portfolio has decreased by 12 million Euro between reporting year 2021 and 2022. Within the education sector, coverage rate of total loan portfolio is 62.7% for reporting year 2022. The coverage rate has decreased in comparison to last year, mainly due to an increase in the number of clients in the segment of primary schools (PO) for which no GHG footprint could be calculated. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate of the relevant subsectors are shown in Tables 22-1, 22-2, and 22-3.

Table 22-1 Loan portfolio and coverage rate for the educational institutions for reporting year 2022

Educational institutions	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Primary school (PO)	69	6.9%	0.1%	26.8%
Secondary Education (VO)	192	19.4%	0.2%	70.8%
Intermediate Vocational Education (MBO)	152	15.3%	0.2%	96.8%
Higher Vocational Education (HBO)	50	5.1%	0.1%	100.0%
Scientific education (WO)	273	27.5%	0.3%	99.3%
Other	257	25.9%	0.3%	0.0%
Total	**993**	**100%**	**1.2%**	**62.7%**

Table 22-2 Loan portfolio and coverage rate for the educational institutions for reporting year 2021

Educational institutions	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
PO	38	3.7%	0.0%	52.9%
VO	177	17.6%	0.2%	67.3%
MBO	165	16.5%	0.2%	96.3%
HBO	62	6.1%	0.1%	100.0%
WO	299	29.7%	0.3%	99.2%
Other	265	26.4%	0.3%	0.0%
Total	**1,005**	**100%**	**1.2%**	**65.3%**

Table 22-3 Loan portfolio and coverage rate for the educational institutions for reporting year 2019

Educational institutions	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
PO	17	1.8%	0.0%	100%
VO	146	15.3%	0.2%	65.3%
MBO	217	22.7%	0.3%	99.3%
HBO	92	9.6%	0.1%	99.7%
WO	210	22.0%	0.3%	98.8%
Other	272	28.5%	0.3%	0.0%
Total	**954**	**100%**	**1.2%**	**65.7%**

22.2 GHG emissions

The GHG footprint of the outstanding BNG Bank loans to the education sector for reporting years 2019, 2021, and 2022 is shown in Table 22-4.

Table 22-4 Absolute and relative GHG emissions for the educational institutions for reporting years 2019, 2021, and 2022

Source of emissions	Scope	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
PO										
Natural gas use	Scope 1	991	1,486	920	3.8	4.2	2.7	1.6	2.3	1.5
Electricity use	Scope 2	1,000	2,150	1,969	3.8	6.1	5.8	1.6	3.3	3.1
VO										
Natural gas use	Scope 1	2,912	3,180	3,668	11.1	9.0	10.8	4.7	4.8	5.9
Electricity use	Scope 2	2,615	3,278	3,421	10.0	9.3	10.1	4.2	5.0	5.5
MBO										
Natural gas use	Scope 1	2,388	2,743	3,455	9.1	7.8	10.2	3.8	4.2	5.5
Electricity use	Scope 2	2,670	3,685	4,769	10.2	10.5	14.1	4.3	5.6	7.6
HBO										
Natural gas use	Scope 1	945	1,371	1,778	3.6	3.9	5.2	1.5	2.1	2.8
Electricity use	Scope 2	844	1,313	2,008	3.2	3.7	5.9	1.4	2.0	3.2
WO										
Natural gas use	Scope 1	4,970	6,315	5,007	19.0	18.0	14.8	8.0	9.6	8.0
Electricity use	Scope 2	6,872	9,627	6,923	26.2	27.4	20.4	11.0	14.7	11.0
Total		**26,207**	**35,148**	**33,918**	**100**	**100**	**100**	**42.1**	**53.6**	**54.1**

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased for all subsectors and scopes. For the educational institutions the total absolute GHG emissions have decreased by 8,941 ton. The decrease in the total absolute GHG emissions is mainly due to a decrease in scope 1 for PS, scope 2 for MBO, and scope 1 and 2 for WO. The part of the loans covered with a GHG footprint has decreased from 656 to 623 million Euro. The percentage of outstanding loan volume / total balance sheet has decreased in comparison to reporting year 2021 (from 10.6% to 9.5%). The decrease in outstanding loan volume and percentage of outstanding loan volume / total balance sheet have a share in the decrease of the absolute GHG emissions. The total relative GHG emissions have decreased by 11.5

ton per million Euro. This shows that the decrease in outstanding loan volume cannot be the only reason for the reduction in absolute GHG emissions. In conclusion, the absolute and relative GHG emissions have decreased for the educational institutions between reporting year 2021 and 2022. In education, there is an increasing focus on healthy indoor climate and low energy consumption. Educational institutions have to take measures to save energy and have to invest in renewable energy.

23 Joint Regulations

This chapter covers loans to joint regulations. The joint regulations have a small share within the bank's loan portfolio with 2.2% of the total loan portfolio of BNG Bank in reporting year 2022.

23.1 Coverage

As shown in Table 23-1, 35.6% of the joint regulations have been provided with a GHG footprint. For the joint regulations there is only data for reporting year 2022, so no comparison with a previous year can be made.
For reporting year 2022, the loan portfolio and coverage rate are shown in Table 23-1 .

Table 23-1 Loan portfolio and coverage rate for the joint regulations for reporting year 2022

Joint Regulations	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
2022	1,935	100%	2.2%	35.6%

23.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to joint regulations for reporting year 2022 is shown in Table 23-2.

Table 23-2 Absolute and relative GHG emissions for the joint regulations for reporting year 2022

Scope	GHG emissions (ton/year)	GHG emissions (%)	Relative GHG emissions (ton CO_2/million EUR)
	2022	**2022**	**2022**
Scope 1	0	0	0
Scope 2	17.3	100	0.03
Total	**17.3**	**100**	**0.03**

The part of the loans covered with a GHG footprint is 689 million Euro. The percentage of outstanding loan volume / total balance sheet is 47.0%. The total relative GHG emissions is extremely low with 0.03 ton per million Euro.

24 Mobility, energy, environment, and other organizations

This chapter covers loans to organizations and projects in the mobility, environment, energy, and other sectors. In opposite of many other sectors, there is no public database available with information about these organizations. Therefore, for a selection of the organizations in the loan portfolio, data is collected from annual reports of these organizations.

24.1 Coverage

The 5 market segments have a share of 4.0% within the bank's loan portfolio of reporting year 2022. Due to the variety in organizations within this sector, it is a challenge to find adequate data in order to map the GHG footprint of this sector. It was possible to calculate the GHG footprint for 33.3% of the loan portfolio within the sectors. For reporting years 2019, 2021, and 2022, the loan portfolio and coverage rate are shown in Tables 24-1, 24-2, and 24-3.

Table 24-1 Loan portfolio and coverage rate for the organizations and projects for reporting year 2022

Others	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Energy	836	24.9%	1.0%	0.0%
Environment	745	22.2%	0.9%	0.0%
Mobility	1,229	36.6%	1.4%	86.1%
Others	320	9.5%	0.4%	19.0%
Financial institutions	226	6.7%	0.3%	0.0%
Total	**3,356**	**100%**	**4.0%**	**33.3%**

Table 24-2 Loan portfolio and coverage rate for the organizations and projects for reporting year 2021

Others	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Energy	662	19.3%	0.8%	0.0%
Environment	792	23.0%	0.9%	0.0%
Mobility	1,398	40.7%	1.6%	87.5%
Others	351	10.2%	0.4%	18.0%
Financial institutions	235	6.8%	0.3%	0.0%
Total	**3,438**	**100%**	**4.0%**	**37.4%**

Table 24-3 Loan portfolio and coverage rate for the organizations and projects for reporting year 2019

Others	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans	Coverage rate of loan portfolio (%)
Energy	541	17.5%	0.7%	0.0%
Environment	759	24.6%	0.9%	0.0%
Mobility	1,512	48.9%	1.9%	58.5%
Others	120	3.9%	0.1%	0.0%
Financial institutions	157	5.1%	0.2%	0.0%
Total	**3,089**	**100%**	**3.8%**	**28.7%**

24.2 GHG emissions

The results of the GHG footprint of the outstanding BNG Bank loans to the 5 mentioned sectors for reporting years 2021 and 2022 are shown in Table 24-4. Due to the general character of the analysis it is not possible to express the GHG emissions for scope 1, 2 and 3 separately. Table 24-4 shows the total of all scopes combined.

Table 24-4 Absolute and relative GHG emissions for the organizations and projects for reporting years 2019, 2021, and 2022

Source of emissions	Scope*	GHG emissions (ton/year)			GHG emissions (%)			Relative GHG emissions (ton CO_2/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Energy	All scopes	-	-	-	-	-	-	-	-	-
Environment	All scopes	-	-	-	-	-	-	-	-	-
Mobility	All scopes	16,894	23,471	14,017	98.8	98.9	100	16.0	19.2	15.8
Others	All scopes	206	264	-	1.2	1.1	-	3.4	4.2	-
Financial institutions	All scopes	-	-	-	-	-	-	-	-	-
Total		**17,100**	**23,735**	**14,017**	**100**	**100**	**100**	**15.3**	**18.5**	**15.8**

*For the calculation of coverage rate in BNG Bank's climate action plan these scopes are treated as scopes 1 and 2

Between reporting year 2021 and 2022 the absolute GHG emissions have decreased by 6,635 ton. The part of the loans covered with a GHG footprint has decreased from 1,286 to 1,119 million Euro. The percentage of outstanding loan volume / total balance sheet has decreased in comparison to reporting year 2021 (from 4.3% to 3.9%). The decrease in the part of the loans covered with a GHG footprint and the percentage of outstanding loan volume / total balance sheet have a share in the decrease of the absolute GHG emissions. The relative GHG emissions have decreased by 3.2 ton per million Euro. This shows that the decrease in in the part of the loans covered with a GHG footprint cannot be the only reason for the reduction in absolute GHG emissions. In conclusion, the absolute and relative GHG emissions for mobility, energy, environment, and other organizations decreased between reporting year 2021 and 2022.

25 Avoided GHG emissions by wind farms

Within the sector energy (mentioned in chapter 24) BNG Bank finances projects that produce renewable energy. Some of these projects are wind farms (onshore and offshore). For this report the avoided emissions of five wind farms have been calculated.

25.1 Coverage

Avoided emissions have been calculated for 51% of the financed wind farms. This means, 49% of the financed wind farms are not included in the calculation for reporting year 2022 (Avoided emissions not calculated in Table 25-1). The wind farms loan portfolio has increased by 145 million Euro between reporting year 2021 and 2022. For reporting years 2021 and 2022, the loan portfolio and coverage rate are shown in Table 25-1 and 25-2.

Table 25-1 Loan portfolio and coverage rate for the wind farms for reporting year 2022

Wind farms	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans
Avoided emissions calculated	165	51%	0.2%
Avoided emissions **not** calculated	158	49%	0.0%
Total	**323**	**100%**	**0.2%**

Table 25-2 Loan portfolio and coverage rate for the wind farms for reporting year 2021

Wind farms	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans
Avoided emissions calculated	140	79%	0.2%
Avoided emissions **not** calculated	38	21%	0.0%
Total	**178**	**100%**	**0.2%**

25.2 Avoided GHG emissions

The results of the avoided GHG emissions are shown in Table 25-3.

Table 25-3 The absolute and relative avoided GHG emissions of the wind farms for reporting years 2021 and 2022

Wind farms	Avoided GHG emissions (ton/year)		Percentage calculated avoided GHG emissions versus total absolute GHG emissions		Relative avoided GHG emissions (ton/million EUR)	
	2022	**2021**	**2022**	**2021**	**2022**	**2021**
Avoided emissions	88,826	91,260	3.5	3.4	539	651

Although the avoided emissions of more wind farms and more wind turbines have been included in the calculation of reporting year 2022 in comparison to reporting year 2021, the

total absolute avoided emissions have decreased. This is caused by a lower actual production of energy in the year 2021 than in the year 2020.

26 Avoided GHG emissions by solar parks

Within the sector energy (mentioned in chapter 24) BNG Bank finances projects that produce renewable energy. Some of these projects are solar parks. For this report the avoided emissions of three solar parks have been calculated.

26.1 Coverage

Avoided emissions have been calculated for 43% of the financed solar parks. This means, 57% of the financed solar parks are not included in the calculation for reporting year 2022 (Avoided emissions not calculated in Table 26-1). For reporting year 2022, the loan portfolio and coverage rate are shown in Table 26-1.

Table 26-1 Loan portfolio and coverage rate for the solar parks for reporting year 2022

Wind farms	Loan portfolio (million EUR)	Percentage of sector	Percentage of all loans
Avoided emissions calculated	129	43.4%	0.1%
Avoided emissions **not** calculated	168	56.6%	0.2%
Total	**297**	**100%**	**0.3%**

26.2 Avoided GHG emissions

The results of the avoided GHG emissions are shown in Table 26-2.

Table 26-2 The absolute and relative avoided GHG emissions of the solar parks for reporting year 2022

Wind farms	Avoided GHG emissions (ton/year)	Percentage calculated avoided GHG emissions versus total absolute GHG emissions	Relative avoided GHG emissions (ton/million EUR)
	2022	**2022**	**2022**
Avoided emissions	59,962	2.4	464

The total avoided GHG emissions from the solar parks included in the calculations is 59,962 ton emissions per year. This is 2.4% of the total GHG emissions of the bank's loan portfolio.

27 Total GHG emissions for reporting years 2019, 2021, and 2022

27.1 Coverage of the GHG emission assessment

In summary, Table 27-1 shows the overview of outstanding loan volume per sector and subsectors and the coverage rate for the reporting years 2019, 2021, and 2022.

Table 27-1 Total outstanding loan volume of BNG Bank and part covered in the GHG assessment for reporting years 2019, 2021, and 2022[47]

Market segment	Sector	Loan portfolio (million EUR)			Loan portfolio Covered with GHG footprint (%)		
		2022	**2021^**	**2019**	**2022**	**2021**	**2019**
Social housing	Social housing associations*	43,336	41,791	38,739	98.5	98.7	98.9
	Others	67	71	9	0.0	0.0	0.0
Public sector	Municipalities*	27,272	27,402	26,033	99.9	99.8	99.8
	Provinces	337	357	137	100.0	100.0	100.0
	Water authorities	204	193	233	100.0	100.0	100.0
	Joint regulations	1,935	2,066	2,014	35.6	0.0	0.0
	Others	1,344	1,371	1,290	0.0	0.0	0.0
Healthcare	Healthcare*	6,860	7,130	6,973	86.9	86.3	87.4
Education*	PO	69	38	17	26.8	52.9	100.0
	VO	192	177	146	70.8	67.3	65.3
	MBO	152	165	217	96.8	96.3	99.3
	HBO	50	62	92	100.0	100.0	99.7
	WO	273	299	210	99.3	99.2	98.8
	Others	257	265	272	0.0	0.0	0.0
Networks	Drinking water utilities	677	686	811	87.7	88.0	0.0
	Others	731	471	435	0.0	0.0	0.0
Mobility	Mobility	1,229	1,398	1,512	86.1	87.5	58.5
Energy	Energy	836	662	541	0.0	0.0	0.0
Environment	Environment	745	792	759	0.0	0.0	0.0
Financial institutions	Financial institutions	226	235	157	0.0	0.0	0.0
Others		320	351	120	19.0	18.0	0.0
Remaining				911			0.0
Total		**87,112**	**85,982**	**81,628**	**91.3**	**90.5**	**88.5**

* In the climate action plan, BNG Bank focuses on the GHG emissions of scope 1 and 2 of 4 sectors, namely social housing associations, municipalities, healthcare institutions, and educational institutions.
The coverage rate for these scopes (1 and 2) by these four sectors is 95% for reporting year 2022.
^In current report, data of reporting year 2020 is not included. The decisions has been made to calculate 3 years. The reference year (reporting year 2019) an the two most recent years which are reporting years 2021 and 2022 for current report.

[47] Reference date for reporting year: 2022 is 31-12-2021; reference date for reporting year 2021 is 31-12-2020, and reference date for reporting year 2019 is 31-12-2018.

For the reporting year 2022, the GHG emission estimates cover 91.3% of BNG Bank loans portfolio. The coverage percentage increased by 0.8% in comparison to reporting year 2021. The coverage rate has increased by adding the joint regulations and due to the change in data source of energy consumption for the healthcare sector. The latter has also increased the recalculated coverage rate for reporting years 2021 and 2019. Although the coverage rate for reporting year 2022 is 91.3%, not all sectors in table 27-1 include scope 3 in the GHG footprint and if scope 3 is included, this scope is not complete. In conclusion, the coverage rate of 91.3% means that from the clients that are part of this 91.3% only a part of their total GHG emissions have been included in the results of this report.

27.2 GHG emissions of BNG Bank loan portfolio

The results of the GHG footprint of the total outstanding BNG Bank loans for reporting years 2019, 2021, and 2022 are shown in Table 27-2.

Table 27-2 Absolute and relative GHG emissions for reporting years 2019, 2021, and 2022

Market segment	Sector ^	Part covered with GHG footprint (million EUR)			GHG emissions (ton CO_2-eq)			Relative GHG emissions (ton CO_2-eq/million EUR)		
		2022	**2021**	**2019**	**2022**	**2021**	**2019**	**2022**	**2021**	**2019**
Social housing	Social housing associations	42,782	41,231	38,302	563,942	574,234	664,218	13.2	13.9	17.3
Public sector	Municipalities	27,230	27,359	25,973	1,610,878	1,679,491	1,725,922	59.2	61.4	66.5
	Provinces	337	357	137	10,573	11,292	5,449	31.4	31.6	39.8
	Water authorities	204	193	233	19,117	24,807	39,419	93.8	128.4	169.0
	Joint Regulations	689	0	0	17	-	-	0.03	-	-
Healthcare	Healthcare	5,962	6,151	6,096	259,129	280,856	344,455	43.5	45.6	56.5
Education	Education	623	656	627	26,207	35,148	33,918	42.1	53.6	54.1
Networks	Drinking water utilities	593	603	0	26,300	29,803	-	44.3	49.4	-
Mobility	Mobility	1,058	1,223	885	16,894	23,471	14,017	16.0	19.2	15.8
Others	Others	61	63	0	206	264	-	3.4	4.2	-
Total scopes 1, 2, and 3	**All sectors**	**79,539**	**77,836**	**72,253**	**2,533,263**	**2,659,366**	**2,827,398**	**31.8**	**34.2**	**39.1**
Total scopes 1 and 2	**All sectors**	**79,539**	**77,836**	**72,253**	**1,113,567**	**1,174,759**	**1,333,326**	**14.0**	**15.1**	**18.5**
Total scopes 1 and 2*	**Social housing Municipalities Healthcare Education***	**76,597**	**75,397**	**70,998**	**1,057,676**	**1,104,306**	**1,282,762**	**13.8**	**14.6**	**18.1**

^ Avoided emissions need to be reported separately from actual emissions, therefore the avoided emissions that have been calculated for this report are not included in this table, but are presented separately in chapter 25 and 26.

*The totals for scope 1 and 2 are reported for the sectors in total, but also for the sectors social housing, municipalities, healthcare, and education together.

As can be seen in Table 27-2, BNG Bank's loan portfolio for reporting year 2022 has a total emission of 2,533 kiloton CO_2 equivalent. In comparison to reporting year 2021 the total emissions have decreased by 126 kiloton (-4.7%). The reduction was mainly due to a reduction of GHG emissions for the municipalities (-69 kiloton CO_2 equivalent) and for the healthcare sector (-22 kiloton CO_2 equivalent). For the healthcare sector the reduction was largest for scope 1 (-13 kiloton CO_2 equivalent) and for municipalities the reduction was largest for scope 3 (-60 kiloton CO_2 equivalent). Unfortunately, data quality of scope 3 for municipalities is poor (score 4), therefore we should be somewhat cautious about drawing conclusions based on these data.

The loan portfolio covered by the GHG footprint calculation has grown from 72 to 80 billion Euro in four years. During these four years, the three largest sectors (social housing sector, municipalities, and healthcare sector) have shown a reduction in the GHG emissions by 301 kiloton.

As a result of an increased loan portfolio covered by the GHG footprint calculation and a reduction in the absolute GHG emissions, the relative emissions of all sectors (ton CO_2-eq/million Euro) have decreased from 39.1 ton per million Euro for reporting year 2019 to 31.8 ton per million Euro for reporting year 2022. The relative emissions of all sectors (ton CO_2-eq/million Euro) have decreased from 34.2 ton per million Euro for reporting year 2021 to 31.8 ton per million Euro for reporting year 2022 (-7.0%). Per million Euro, the municipalities and water authorities have the highest GHG emissions. During the last four years, the water authorities have shown a large decrease in the relative emissions.

The absolute and relative decrease of GHG emissions of BNG's loan portfolio is positive. Many factors play a role in explaining why this development is taking place. It can be due to changes at the side of the bank, such as changes in clients, changes in the outstanding loan volumes, changes in the total balance sheet of the clients, and changes in the ratio outstanding loan volume / total balance sheet.
However, the goal is to reduce GHG emissions through actions that are taken or investments that are done by the clients. If a decrease is seen at client level, this can be a result of the fact that more and more investments are made to make real estate more sustainable. Attention for energy savings grows and there are also more investments made in renewable energy. These developments can be seen all around us. Across all sectors, more and more actions are taken to achieve the climate agreement target of 49% reduction in GHG emissions in 2030 compared to 1990. These actions are partly reflected in this report. However, some actions are taken by the clients, but are not yet visible in the results of this report because of these changes are not represented in the used data source. For example, the actions that are taken to make mobility more sustainable at municipalities and provinces is not visible yet.

Several other external factors can influence the GHG emissions, such as the weather, the current energy crisis due to the war between Ukraine and Russia, and the COVID-19 crisis. The effect of the energy crisis is probably small in current report, because most recent used data is from the year 2021.

The winter of 2019/2020 was the second warmest since recording began.[48] The winter of 2020/2021 was also a mild winter. Mild winters often result in lower natural gas use and may affect scope 1 in current report.
Higher energy prices due to the energy crisis may accelerate the generation of renewable energy and actions to save energy. We may see the effect in the coming years.
The worldwide COVID-19 crisis started in the beginning of 2020 and was still present in the year 2021. Also in the year 2021, various measures were taken to control this crisis. This COVID-19 crisis still influenced the results of reporting year 2022. In the year 2022, the influence of the COVID-19 crisis will probably be less than in the year 2021 and it is possible that next year some GHG emissions may increase again.

Nevertheless, the absolute and relative decrease of GHG emissions that is seen in the result of this report is a positive development. By longitudinal monitoring of the GHG footprint of the bank's loan portfolio, the results will show whether the reduction is temporary or a long term positive development.

[48] https://www.knmi.nl/nederland-nu/klimatologie/maand-en-seizoensoverzichten/2020/winter

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About Het PON & Telos

Improving social decision-making

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With a multidisciplinary and creative team of nearly 30 research consultants, we work mainly for local and regional authorities in the Netherlands, but also for corporate bodies, banks, care and welfare institutions, funds, and social organizations. We work closely with civic organizations and other knowledge institutions and are an official partner of Tilburg University. We use our knowledge and insights to advise initiators, policy-makers and managers. This enables them to make informed choices and give a positive impulse to the society of tomorrow.

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