Loan Portfolio Climate Impact of BNG Bank & NWB Bank

Methodological approach report 2020

Tilburg University

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1 Introduction

Since the 2015 Paris Climate Conference, the banking sector has been involved in contributing to the realization of the ambitions of the Paris Agreement. An important factor in this endeavor is to measure and disclose its carbon emissions. In this context the Dutch Platform Carbon Accounting Financials (PCAF), a collaboration between Dutch financial institutions, has launched an initiative to develop a methodology for measuring the carbon impact of the different types of asset classes within financial institutions in 2015. In the meantime it has become a global initiative[1].

A first method for carbon accounting for financial institutions was launched in November 2017. An update was published in the report Accounting GHG emissions and taking action: harmonized approach for the financial sector in the Netherlands (Platform Carbon Accounting Financials (PCAF) report 2019[2]). The methodology described in that report is the basis for the methodology approach developed and described in this report for the asset sectors of BNG Bank and NWB Bank.

BNG Bank and the 'Nederlandse Waterschapsbank' (NWB Bank), both public financial institutions, joined the PCAF initiative in 2019[3]. As a follow up, both banks reported about the greenhouse gas emissions of their loan portfolio based on the PCAF methodology[4] with some quality improvements to the methodology carried out by Het PON & Telos. In that way, both banks show their growing willingness to increase their own positive impact on society and the climate issue and have created (new) knowledge and methodologies on which others in the financial sector can build.

BNG Bank and NWB Bank are motivated to continue mapping their carbon footprint, and therefore they have asked Het PON & Telos, official partner of Tilburg University, to measure the Greenhouse Gas (GHG) emissions associated with the bank's loan portfolio in 2020 again.

This report describes the methodology used to calculate the GHG emissions of the bank's loan portfolios. This 2020 methodology approach report describes three main topics. A feasibility study regarding data improvement possibilities, the development of a new approach to map the climate footprint of drinking water utilities and an elaborated methodology description of the other sectors included in the new PCAF 2020 report for BNG Bank and NWB Bank. The aim for the feasibility study is to examine whether quality improvements on methodology approaches are possible. We mainly focused on the possibilities the microdata of the Dutch National Statistics Office (CBS) are offering. The outcome of this feasibility study is described in chapter two.

[1] https://carbonaccountingfinancials.com/
[2] https://carbonaccountingfinancials.com/regional-implementation-team/pcaf-europe
[3] https://www.carbonaccountingfinancials.com/financial-institutions-taking-action
[4] Accounting GHG emissions and taking action: harmonised approach for the financial sector in the Netherlands PCAF The Netherlands, report 2019

The second topic of this methodology approach report is to show the results of a newly developed approach to map the climate footprint of water utility companies. The new approach is shown in chapter 3, whereas the insights in developing the approach are presented in Annex A.

Chapter 3 to 10 are describing, in a detailed matter, the approaches for the other sectors on which the new PCAF 2020 report for BNG Bank and NWB Bank will be based. These chapters contain the methodology used to calculate the CO_2 equivalent footprint per client for the following sectors:

- Drinking water utilities
- Social housing associations
- Municipalities
- Other local governments
- Water authorities
- Educational institutions
- Healthcare institutions
- Other organizations

The aim of this methodology approach report is to provide more insights into the methodology behind the calculation of the emission of CO_2 equivalents, and to make the process of calculating the footprint per client more transparent.

2 Improving data quality

At the beginning of 2020, BNG Bank and NWB Bank published the CO_2 equivalent footprint of their loan portfolio according to the PCAF framework for the first time. Het PON & Telos was able to cover over 90% of the outstanding capital of both the NWB Bank and BNG Bank with a carbon footprint. In June 2020, BNG Bank and NWB Bank asked Het PON & Telos to come up with a new plan to map the 2020 carbon footprint of the banks, and to develop a strategy for further data quality improvements within the current method.

This quality improvement is one of the aims of the current assessment. One of the possibilities to improve the data quality is to use microdata collected by of the Dutch National Statistics office (CBS) on energy use instead of more abstract energy costs of sector averages. This section provides a reflection on the possibilities of using microdata to improve the data quality of the sectors education, healthcare and municipalities.

2.1 Data quality according to PCAF

The PCAF methodology distinguishes five levels of data quality (Table 2.1). For the sectors education, healthcare and municipalities a mixture of primary data and sector specific data are used. Therefore, data quality is limited between level 2 and 3. CBS Microdata might give some opportunities to improve the quality of the primary or sector specific data used per asset class.

Table 2.1 Data quality standards in PCAF

Score	Quality requirement
1	Audited GHG emissions data or actual primary energy data
2	Non-audited GHG emissions data, or other primary data
3	Average data that is peer/(sub)sector-specific
4	Proxy data on the basis of region or country
5	Estimated data with very limited support

For the calculations in the education sector, we make use of organisation specific data on energy costs and sector specific data on the energy mix: the ratio between natural gas and electricity usage. The energy mix can differ significantly between organisations such as between a primary school and a university, so having primary data on energy use will increase data quality.

For the healthcare sector separate gas and electricity costs are available for most organisations, but not for all of them. For these missing organisations only sector specific data can be used. Data quality can be improved if data on primary energy use is available for more organisations.

Energy use of municipalities is based on sector specific averages which are attributed to specific municipalities using employment figures as a proxy. Primary energy data will directly improve data quality for this sector.

2.2 CBS Microdata

Microdata of CBS provides a large number of datafiles containing registrations and results of surveys on individuals, companies, and addresses. Under specific conditions, knowledge institutions like Het PON & Telos can use this data to execute their own research. These conditions are necessary to safeguard the privacy of the companies and persons in the data. The basic rule is that data may only be extracted on an aggregated level. More information can be found on the CBS microdata webpage[5].

For BNG Bank and NWB Bank these restrictions entail that the data on energy use or calculated CO_2 equivalent emissions cannot be extracted at the level of individual clients. However, it is possible to calculate the total emissions at the level of all clients per sector and subsequently export these. This makes the calculation process more accurate, but less transparent. Another condition/restriction is that CBS can never be hold responsible for the data quality of the calculations made by using the microdata. This responsibility remains with the knowledge institute that performs the calculations.

The energy of households and companies has been provided to the CBS by the network operators. This so called connection register is not directly available in the microdata. CBS first needs to edit the data in order to align it with other datafiles. For example the data is edited to disentangle connections that service more than one building. For residential buildings the data is directly available in the microdata[6]. For companies some files can be made available on special request (see sector specific paragraphs for more information). These datafiles have been composed for the VIVET project[7].

The VIVET project[8] is a collaboration between CBS, the Ministry of Infrastructure and Water Management (Rijkswaterstaat), the Netherlands Enterprise Agency (RvO), the Netherlands Environmental Assessment Agency (PBL), and Kadaster. The main goal of this collaboration is to improve the current information and data supply for the energy transition. The aim is to acquire and disclose the necessary data in a more structured way. The inventory phase of this project has been finalized, and the multi-annual program just has started.

Apart from data on energy use some files in the microdata are of interest to calculate the CO_2 equivalent emissions of companies. The most important file is the General Company Register (Algemeen Bedrijvenregister, ABR). This file contains general information on companies like the number of employees and company locations. Unfortunately, company locations are not given on exact addresses, but only with ZIP-codes. This limits the possibilities to link ABR data with the datafiles on energy use. Alternatively exact addresses

[5] https://www.cbs.nl/en-gb/our-services/customised-services-microdata/microdata-conducting-your-own-research
[6] This file is used to calculate the CO_2 emissions of mortgage portfolio of Dutch commercial banks (Meijers, 2020).
[7] https://www.cbs.nl/nl-nl/achtergrond/2019/14/vivet-betere-informatievoorziening-energietransitie
[8] https://www.cbs.nl/nl-nl/corporate/2019/41/aan-de-slag-met-eenduidige-data-voor-energietransitie

of clients can be uploaded to the microdata environment in project specific files[9]. These files can also contain financial data about the clients.

2.2.1 Education sector

Data on energy use of the education sector is contained in the data file 'Energieverbruik onderwijsvastgoed 2018'. It is used to calculate the sector average energy supply for the VIVET project (see Sipma, 2018 and https://dashboards.cbs.nl/v2/energieverbruik_vastgoed_funderend_onderwijs/). The data file contains data on natural gas and electricity use of school buildings for primary and secondary education in 2018. The primary entity is the building identified by the (encrypted) address. In case an energy connection services multiple buildings the number of buildings is provided and it is possible to have the addresses of these other buildings linked to the identification code. The (encrypted) addresses in this datafile are extracted from data of Dienst Uitvoering Onderwijs (DUO). This data is also used to get financial data for the PCAF calculations, so the addresses in both files should match.

The major deficiency of the education datafile is that it is limited to primary and secondary education. The clients of BNG Bank & NWB Bank are mainly organisations in higher education. Furthermore the datafile only contains data for the year 2018. So there are no possibilities for longitudinal research at the moment. Nonetheless, this might change in the near future due to the VIVET project described earlier.

2.2.2 Healthcare sector

Energy use data of the healthcare sector is available in the file 'Energieverbruik zorgvastgoed VWS 2018'. This data is also used to calculate average energy coefficients for this sector (Sipma, 2018 and https://dashboards.cbs.nl/v2/energieverbruik_zorgvastgoed/). In that data file, the data for 2017 on natural gas and electricity use of all subsectors that are part of the banks healthcare sector are present. Only data from small organisations may be lacking. In the Microdata, this data can be linked to addresses of clients in the same way as for the education sector. Address data in the file is taken from Zorgkaart Nederland (www.zorgkaartnederland.nl). This deviates slightly from the data that was used for the PCAF calculations, which come from DigiMV register (www.jaarverantwoordingzorg.nl).

These microdata developments in the healthcare sector are promising, and might be interesting to use for PCAF purposes in the near future. Although, there are a few deficiencies, similar to those for the education sector. At the moment, only 2017 data is available. Therefore there are no possibilities for longitudinal research at the moment. Another main deficiency is that the process of acquiring the CO_2 equivalent emissions from the energy use database, will get less transparent. Because CBS Microdata prescribes that analysis should be done within the secure microdata environment, before they can be exported. No client level data can be extracted.

[9] This data will remain in a specific project environment and is only accessible by the researchers with access to the project. Data that directly identifies individual companies (like KvK codes and addresses) will be encrypted to a unique identification code. The identification code can be used to link the files to microdata files containing e.g. energy use.

2.2.3 Municipalities

CBS doesn't have a specific datafile for municipalities. However, there is a data file on the energy use of all office buildings in The Netherlands. This datafile contains data on the energy use of about 23,000 offices in 2016 (Kremer, 2016). This is a selection of all registered offices (about 90,000). The main selection criterion is that the office building contains only one accommodation (verblijfsobject). It is unsure whether this is the case for municipal office buildings.

Data on the addresses of offices specifically used by municipalities is not available in the microdata. Therefore this data needs to come from other sources. Extracting data on buildings used by municipalities requires to define clear selection boundaries since municipalities can own and/or use a wide range of buildings, including schools, sport facilities, and offices. According to PCAF, emissions in scope 1 and 2 need to be limited to the municipalities own offices or operations.

For location (addresses) data of municipalities two sources can be considered: chamber of commerce (KvK) or Kadaster. The chamber of commerce data contains main and branch locations of official company addresses. Kadaster provides data on locations owned by municipalities. Advantage of the chamber of commerce data is that it is directly linked to the financial entity of the municipality. Also addresses are included when the municipality rents the office. However, it is possible that municipalities are using offices that are not registered as official addresses at the chamber of commerce. For the Kadaster data, a selection needs to be made to exclude buildings that are owned, but not used by the municipality. The Kadaster data will not include offices rented by the municipality.

Since the datafile on energy use is not longitudinal, and quite outdated, CBS Microdata does not seem the best option for energy use at the moment. Especially given the fact that it is hardly possible to connect the right addresses to the database. However, it is recommended to keep a close eye on the development within the Microdata, because the climate agreement and the VIVET project might help to make this information more accessible in the near future.

2.3 Conclusions

Although the microdata of CBS contains primary energy use data of organisations, the scopes are considered to be limited as a basis for the PCAF calculations.

For the education sector only primary and secondary education organisations are included in the data, while BNG Bank and NWB Bank finances mainly higher education institutions.

For municipalities there are limitations to link buildings used by the municipalities with the energy use reported in the office dataset. The healthcare sector is the only sector where the microdata can be directly used in the PCAF calculations. However, only 2017 data is available.

At this moment one of the main problems with the Microdata is the time coverage of the data. Preferably two recent years should be included in the PCAF calculations. All the datafiles contain only energy use data of one year and the data is also quite outdated, especially for the offices, which data is of the year 2016.

At this moment, the use of microdata for calculation of CO_2 equivalent emissions for PCAF does not seem of added value. However, it is advisable to follow the developments of the VIVET project. Because within this project, more data on the energy transition per sector and organisation might become available.

2.4 Literature and data sources

CBS (2019). Documentatierapport bestand Energieverbruik zorgvastgoed VWS 2018.

CBS (2020). Documentatierapport bestand VIVET Energieverbruik onderwijsvastgoed 2018.

Kremer, A. (2016). Energie intensiteiten kantoren. Den Haag, CBS.

Meijers, R. (2020). Inzicht in de CO_2-uitstoot van particuliere hypotheekportefeuilles. Den Haag, Centraal Bureau voor de Statistiek. Retreived from https://www.cbs.nl/nl-nl/longread/diversen/2020/inzicht-in-co2-uitstoot-van-particuliere-hypotheekportefeuilles on 21-6-2020.

Sipma, J.M., & Niessink, R.J.M. (2018). Energielabels en het daadwerkelijk energiegebruik van scholen en tehuizen in de zorg. Amsterdam, ECN.

Sipma, J.M. (2019). Nieuwe benchmarkmethodiek energiegebruik kantoren: op basis van het werkelijke gas- en elektriciteitsverbruik van 13.000 kantoren, beïnvloed door grootte, bouwjaar, energielabel, locatie, verbruiksjaar en de bezettingsgraad. Amsterdam, TNO.

3 Drinking water utilities approach (new)

3.1 General factsheet

Topic	Outcome
Scopes Covered	Energy and process related emissions (scope 1 and 2). This is in line with the project finance asset class approach in the Dutch harmonized approach report 2019. Scope 1 and scope 2 should be included. Scope 3 if relevant and available. Scope 1: Emissions from stationary combustion sources based on fuel consumption (fuel oil, Gas/diesel oil, lpg, natural gas & petroleum). Scope 1: Methane emissions from degassing of groundwater Scope 2: electricity use
Portfolio Coverage	Data is collected for 10 drinking water utilities. This means the portfolio coverage ratio will be close to 100%.
Data	The data used in this approach are from multiple sources. Most data are from National Institute for Public Health and the Environment (RIVM), via emission registration[10]. Data about the emissions from stationary combustion sources based on fuel consumption (fuel oil, Gas/diesel oil, lpg, natural gas & petroleum) are provided by emission registration[11]. The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about the drinking water sector specific emissions . Data about the emissions from methane emissions from degassing of groundwater are provided by emission registration[12]. The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about the drinking water sector specific emissions . Data on electricity use is provided by Vewin, in their annual report (2019). Data on m^3 drinking water produced per utility per year are from Vewin, provided in their annual report (2019). Data on water origin, and total balance sheet per drinking water utility are derived from individual company annual reports. In a few cases missing data was extracted from annual reports. If that is the case, it is shown in the calculations sheets and the annual reports are included in the data folders.
Emission factors used	No emission factors were needed in this particular approach. The CO_2 equivalent of the emissions of methane are calculated by multiplying with the global warming potential of methane of 28 kg CO_2-eq / kg CH_4 (Greenhouse Gas Protocol, 2016).
Calculation steps	**Scope 1** The total GHG-emission of the drinking water utilities sector is available, and because the 10 drinking water utilities make up the whole sector, the clean water production volumes can be used as a weighing factor to distribute the sector emissions. The CO_2 equivalent of the emissions of methane are calculated by multiplying with the global warming potential of methane of 28 kg CO_2-eq / kg CH_4 (Greenhouse Gas Protocol, 2016).

[10] http://emissieregistratie.nl/erpubliek/bumper.nl.aspx
[11] http://emissieregistratie.nl/erpubliek/bumper.nl.aspx
[12] http://emissieregistratie.nl/erpubliek/bumper.nl.aspx

Topic	Outcome
	Methane emissions from the degassing of groundwater are emitted during the process of winning groundwater. Therefore, they are part of scope 1. These emissions do not occur when water is won from surface water. Groundwater makes up for about 65% of all the water won in the Netherlands. The other emissions come from fuel consumption, such as natural gas and diesel/petroleum. The emission intensity for groundwater and surface water are calculated by dividing the emissions by m^3 drinking water produced. These emission intensity are than used to calculate the emissions of individual drinking water companies. **Scope 2** Scope 2 emissions are the indirect emissions of the drinking water utilities. These include the emissions of electricity use. The process of collection, purification and distribution of drinking water uses a lot of electricity. In 2018, the average electricity use for production and distribution was 0.51 kWh/m^3 drinking water (Vewin, 2020). This would mean that the whole sector uses 611 million kWh per year, which would be accompanied with a huge CO2 equivalent footprint. However, Vewin reports that all the energy used by drinking water utilities is renewable. The renewable energy is derived from own solar panels, and/or they purchase renewable energy from example windmill parks elsewhere in Europe. Based on tank to wheel (TTW) emission factors, this would mean that there are no emissions for electricity use, and that scope 2 emissions would therefore be non-existing[13].
Avoided emissions	Avoided emissions are expected to be minimal given the nature and primary task of the drinking water utilities. Avoided emissions are the emissions that the financed project emits less than would have been emitted in the absence of the project. Unfortunately, there is no data available on avoided emissions at the moment. Hopefully, this will change in the future.
Asset class specific considerations	In order to enable the drinking water utilities to calculate their carbon footprint in a uniform way, the Watercycle Research Institute has developed a new method tailored for this sector (Snip & Oesterholt, 2019). It describes all the activities included in the process of winning ground and surface water, and turning it in to drinking water for the end-consumers (households and companies). The method is described elaborately, and based on the GHG-protocol (Word Resources Institute, 2015), on which the PCAF methodology is based as well (PCAF, 2019). Unfortunately, the publication on how to measure carbon footprints for drinking water utilities has not led to any publication on actual CO_2 equivalents per utility yet. Het PON & Telos will follow the developments at Vewin and the Watercycle Research institute closely. Different asset class specific considerations came up in the development of the approach for this sector. For more information on these considerations, please refer to Annex A.
Attribution	The footprint of the drinking water companies are calculated based on the emissions of individual organizations. The individual emissions of an organization are multiplied by the proportional share of the loan in the balance sheet. In the end, all individual emissions of drinking water utilities are aggregated, using the following formula: $$\sum CO_2eq \times \frac{Outstanding\ loan}{Total\ balance\ sheet}$$
Limitations	Irrespective of the proposed methodology, the best way to assess the drinking water utilities carbon footprint is to follow a similar kind of approach as Arcadis (2020) is following and executing for the Water Authorities. In the case of the water utilities, it is possible to take a survey at every drinking water utility, in order to acquire the right data. This survey can be based on the framework developed by the Watercycle Research Institute (2019). Het PON & Telos would advise to look into the options of developing a study in this direction to make this methodology stronger in the future.

[13] Wind power, solar power, water power and biomass al have a TTW emission factor of 0 kg CO2/kWh

<table>
<tr><th>Topic</th><th>Outcome</th></tr>
<tr><td></td><td>Scope 3 emissions are not generally available for drinking water companies.</td></tr>
<tr><td>Data quality estimate</td><td>The following data scoring is used to score and improve data quality of the Drinking water utilities.

<table>
<tr><th>Score</th><th>Description</th></tr>
<tr><td>Score 1</td><td>Actual energy consumption, converted to CO_2 eq-emissions using verified emissions factors specific to the type of energy consumed</td></tr>
<tr><td>Score 2</td><td>Actual energy consumption, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 3</td><td>Estimated energy consumption based on energy performance/energy label and floor area per type of social house in a country, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 4</td><td>Estimated energy consumption per type of social house in a country and floor area, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 5</td><td>Average energy consumption per social house in a country, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
</table>

The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about national emissions, municipal emissions, and sector and company specific emissions (when available). This data is based on scientific models, and therefore very reliable. The data quality estimate for this method is 2.</td></tr>
</table>

3.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	Total drinking water production
Data File	Kerngegevens2018-NL-web
data Source	Vewin
Year	2018
Download date	20-10-2020
Link to webpage	https://www.vewin.nl/publicaties/Paginas/default.aspx
Internal location	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
unit of measurement	Million m^3
Data quality	Score 1: audited data drinking water utility, data collected by TNS NIPO. For more information see the report.
Selections	Page 4
Data transformations	No specific transformations.

TOPIC	DESCRIPTION
DATA	Total drinking water production
DATA FILE	Kerngegevens drinkwater 2019
DATA SOURCE	Vewin
YEAR	2019
DOWNLOAD DATE	20-10-2020
LINK TO WEBPAGE	https://www.vewin.nl/publicaties/Paginas/default.aspx
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
UNIT OF MEASUREMENT	Million m^3
DATA QUALITY	Score 1: audited data drinking water utility, data collected by TNS NIPO. For more information see the report.
SELECTIONS	Page 4
DATA TRANSFORMATIONS	No specific transformations.

TOPIC	DESCRIPTION
DATA	Groundwater, surface water balance
DATA FILE	Multiple data files

Source	Downloaded on
Volgens eigen website: 7 van de 44 miljard liter komt uit oppervlaktewater. Bron: https://waterbedrijfgroningen.nl/over-ons/facts-figures/	19-10-2020
Drinkwaterproductie komt volledig uit grondwater. bron: https://www.vewin.nl/sector-in-beeld/Paginas/default.aspx	19-10-2020
Grondwater: 5.022 m3; Duinwater: 1.008 m3; Inkoop drinkwater 17.057 m3; Inkoop voorgezuiverd water (WRK, oppervlaktewater): 60.177 m3; Gewonnen oppervlaktewater (PSA): 28.045 m3. Bron: PWN jaarverslag 2019, pag. 132 pwn.nl/jaarverslag-2019	19-10-2020
Uw drinkwater komt uit twee bronnen. Ongeveer twee derde van ons drinkwater halen we uit het Lekkanaal bij Nieuwegein. Dit water zuiveren we daarna op een natuurlijke manier verder. Dat doen we in de Amsterdamse Waterleidingduinen. Daarna gaat het naar onze zuivering in Leiduin bij Heemstede.De rest van het drinkwater komt uit de Bethunepolder. Dit water zuiveren we eerst op een natuurlijke manier in de Waterleidingplas. Daarna gaat het naar onze zuivering in Weesperkarspel (Amsterdam Zuid-Oost). bron: https://www.waternet.nl/service-en-contact/drinkwater/waar-komt-ons-drinkwater-vandaan/	19-10-2020
De originele bron van ons water, een grote voorraad zoet water in de duinen, wordt sinds 1976 aangevuld met rivierwater uit de Afgedamde Maas. Bron: corporate brochure Dunea, pag. 7 dunea.nl/over-dunea	19-10-2020
al het water komt uit grond- en oevergrondwaterbronnen. Minder dan 5% uit oevergrondwater. Exacte percentage is niet bekend, maar ook niet relevant voor deze berekening. Vandaar afgerond op 100% grondwater. Bron: Jaarverslag Vitens 2019 vitensjaarverslag.nl https://www.drinkwaterplatform.nl/waar-komt-ons-kraanwater-vandaa	19-10-2020
Al het water komt uit grond- en oevergrondwaterbronnen. Het grootste deel komt uit oevergrondwater, maar exacte percentage is niet bekend, maar ook niet relevant voor deze	12-08-2020

	berekening. Vandaar afgerond op 100% grondwater. Bron: Jaarverslag Oasen 2019 oasen.nl/over-oasen/jaarverslagen	
	bekend is dat 80% van het water uit oppervlakte water komt (Maas) bron: https://www.evides.nl/drinkwater/hoe-wordt-mijn-drinkwater-gemaakt. De verhouding tussen grondwater en infiltratiewater is onbekend. Maar dit maakt geen verschil voor de berekening	19-10-2020
	Drinkwaterproductie komt volledig uit grondwater. bron: https://www.vewin.nl/sector-in-beeld/Paginas/default.aspx	19-10-2020
	Het meeste drinkwater in Limburg (75%) wordt gemaakt van grondwater. Voor het overige kwart wordt water uit de Maas, ook wel oppervlaktewater genoemd, gebruikt. (https://www.wml.nl/alles-over-water)	19-10-2020
DATA SOURCE	Multiple	
YEAR	Most recent	
DOWNLOAD DATE	19-10-2020	
LINK TO WEBPAGE	See “datafile”	
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data	
UNIT OF MEASUREMENT	%	
DATA QUALITY	Unknown, based on individual information per drinking water utility	
SELECTIONS	-	
DATA TRANSFORMATIONS	No specific transformations.	

TOPIC	DESCRIPTION
DATA	Methane and carbon emissions, from degassing and fuel use
DATA FILE	ERemissie-export202010-19145304
DATA SOURCE	RIVM, Emissieregistratie
YEAR	2018
DOWNLOAD DATE	19-10-2020
LINK TO WEBPAGE	http://emissieregistratie.nl/erpubliek/erpub/export/bron.aspx
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
UNIT OF MEASUREMENT	kg
DATA QUALITY	The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about national emissions, municipal emissions, and sector and company specific emissions (when available). This data is based on scientific models, and therefore very reliable. The data quality estimate for this method is 2.
SELECTIONS	Tab: ERemissie-export202010-19145304
DATA TRANSFORMATIONS	No specific transformations.

TOPIC	DESCRIPTION
DATA	Methane and carbon emissions, from degassing and fuel use
DATA FILE	ERemissie-export202010-19145304
DATA SOURCE	RIVM, Emissieregistratie
YEAR	2017
DOWNLOAD DATE	19-10-2020
LINK TO WEBPAGE	http://emissieregistratie.nl/erpubliek/erpub/export/bron.aspx

INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
UNIT OF MEASUREMENT	kg
DATA QUALITY	The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about national emissions, municipal emissions, and sector and company specific emissions (when available). This data is based on scientific models, and therefore very reliable. The data quality estimate for this method is 2.
SELECTIONS	Tab: ERemissie-export202010-19145304
DATA TRANSFORMATIONS	No specific transformations.

TOPIC	DESCRIPTION
DATA	Global warming potential methane
DATA FILE	Global-Warming-Potential-Values (Feb 16 2016)_1(1)
DATA SOURCE	Greenhouse gas protocol
YEAR	May 2015
DOWNLOAD DATE	19-10-2020
LINK TO WEBPAGE	https://ghgprotocol.org/calculation-tools
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
UNIT OF MEASUREMENT	Kg CO_2-eq /kg CH_4
DATA QUALITY	Widely accepted standard for carbon accounting (following GHG-protocol)
SELECTIONS	-
DATA TRANSFORMATIONS	No specific transformations.

TOPIC	DESCRIPTION
DATA	Total balance sheet per drinking water utility
DATA FILE	Multiple data files

Source	Page	Downloaded on
WATERBEDRIJFGRONINGEN_Jaarverslag_2018_NL	67	20-10-2020
wmd-water-jaarverslag-2018-z4zxday3y9ea	74	20-10-2020
PWNNOORDHOLLAND_Geconsolideerd_2018	60	20-10-2020
		20-10-2020
DUNEA_Jaarverslag_2018_NL	45	20-10-2020
VITENS_Jaarverslag_2018_NL	119	20-10-2020
OASEN_Jaarverslag_2018_NL	20	20-10-2020
EVIDES_Jaarverslag_2018_NL	34	20-10-2020
BRABANTWATER_Geconsolideerd_2018	27	20-10-2020
WML_Jaarverslag_2018_NL	17	20-10-2020

DATA SOURCE	Multiple
YEAR	2018 & 2017
DOWNLOAD DATE	20-10-2020
LINK TO WEBPAGE	-
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen\Data
UNIT OF MEASUREMENT	X1,000 EUR
DATA QUALITY	Score 1: audited data per drinking water utility
SELECTIONS	-
DATA TRANSFORMATIONS	No specific transformations.

3.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	berekeningen waterleidingbedrijven 2017	
LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen	
COLUMN-NAME	DESCRIPTION	UNIT
Name	Name of drinking water utility	-
KvK	Company registration number (1/2)	-
KvK	Company registration number (2/2)	
Ton CO2 per jaar (grondwater)	Total ton CO_2 equivalent emission per drinking water utility as a result of groundwater use	Ton
Ton CO2 per jaar (oppervlaktewater)	Total ton CO_2 equivalent emission per drinking water utility as a result of surfacewater use	Ton
Totaal passiva	Total balance sheet	X1,000 EUR

TOPIC	DESCRIPTION	
DATA FILE	berekeningen waterleidingbedrijven 2018	
LOCATION	O:\205305 PCAF 2020\Werkmap\Waterbedrijven\Berekeningen	
COLUMN-NAME	DESCRIPTION	UNIT
Name	Name of drinking water utility	-
KvK	Company registration number (1/2)	-
KvK	Company registration number (2/2)	
Ton CO2 per jaar (grondwater)	Total ton CO_2 equivalent emission per drinking water utility as a result of groundwater use	Ton
Ton CO2 per jaar (oppervlaktewater)	Total ton CO_2 equivalent emission per drinking water utility as a result of surfacewater use	Ton
Totaal passiva	Total balance sheet	X1,000 EUR

The attributed data to the bank can be found in the bank specific folder in this location:
O:\205305 PCAF 2020\Werkmap\Waterbedrijven\NWB Bank
O:\205305 PCAF 2020\Werkmap\Waterbedrijven\BNG Bank

4 Social housing associations approach

4.1 General factsheet

Topic	Outcome
Scopes Covered	Energy use of financed buildings (scope 1 and 2). This is in line with the commercial real estate and mortgages approach in the PCAF methodology. There are plans within the PCAF Platform to explore the possibilities of adding scope 3 to this approach, but these are not finalized yet, and therefore not been taken into account in this study. Scope 1: Natural gas use Scope 2: electricity use and district heating
Portfolio Coverage	Data is collected for over 300 social housing associations. This means the portfolio coverage ratio will be close to 100%.
Data	The data used in this approach are from multiple sources. Most data are from The Human Environment and Transport Inspectorate (ILenT): National Authority of Social Housing Associations, Aedes, and the Dutch Nationals Statistics Office (CBS). Data on energy labels, dwellings per association and municipality, and types of dwellings are coming from The National Authority of Social Housing Associations, and are on the level of individual social housing associations. These data are based on audited registration data, provided by the social housing associations themselves, and therefore very reliable. Data on average floor space per dwelling are based on registration data from the Dutch National Statistics office (CBS). This data is based on the "Basisregistratie Adressen en Gebouwen" (BAG), which consists of all buildings in the Netherlands. It is therefore very reliable. This data is on the aggregation level of municipalities. Data on the number of residents per households are based on registration data from the Dutch National Statistics office (CBS). The whole Dutch population is in this sample. This data is on the aggregation level of municipalities. The data on natural gas use is based on connection registers of energy network companies, collected by the Dutch National Statistics office (CBS). It is based on actual energy consumption, and therefore very reliable. This data is aggregated by the type of dwelling, energy label and average floor space. The data on electricity use is based on connection registers of energy network companies, collected by the Dutch National Statistics office (CBS). It is based on actual energy consumption, and therefore very reliable. This data is aggregated by the type of dwelling, number of residents in households and average floor space. The data on district heating is based on connection registers of energy network companies, collected by the Dutch National Statistics office (CBS). It is based on actual energy consumption, and therefore very reliable. This data is aggregated by the type of dwelling, number of residents in households and average floor space. In a few cases missing data was extracted from annual reports. If that is the case, it is shown in the calculations sheets and the annual reports are included in the data folders.
Emission factors used	The consumed natural gas, district heating, and electricity on household level can be converted to CO_2 equivalent emissions using grid emission factors. Within the Netherlands, www.co2emissiefactoren.nl gives a list of widely accepted and uniform grid emission factors.

Topic	Outcome
	PCAF has chosen to use the grid emission factor related to direct emissions, expressed under column TTW value on *www.co2emissiefactoren.nl*. The emission factor for district heating depends strongly on the source of heating. When the source of heat is unknown, the emission factor for STEG (Combined cycle power plant) should be used. When the origin of the consumed electricity is unknown, the emission factor for electricity from undefined energy source should be used. The factor for electricity is updated regularly to reflect changes in the Dutch electricity mix. In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
Calculation steps	**Scope 1: Natural gas** The exact 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, multiple calculation factors were used. CO_2 equivalent emissions caused by natural gas use have been estimated by the energy-labels of the rental units, the type of rental unit, the geographic location, and the floor surface of the rental unit. Unfortunately, no data is available about the car fleet of the housing associations, therefore this is not taken into account in scope 1. **Scope 2: District heating** No exact district heating statistics per social housing association are known. To make a reliable estimation, multiple calculation factors were used. CO_2 equivalent emissions caused by district heating per social housing association have been estimated by the energy-labels of the rental units, the type of rental unit, the geographic location, the floor surface of the rental unit, and the percentage of district heating houses per municipality. It can be expected that social housing associations have a higher than average percentage of district heating. However, there is no data available on that matter. So this has not been taken into account. **Scope 2: Electricity use** The exact use of electricity per social housing association is unknown. Estimations have been made using multiple calculation factors. CO_2 equivalent emissions caused by electricity use per social housing association have been estimated by the type of rental unit, the floor surface of the rental unit, the estimated number of residents per rental unit, electricity use per type of rental unit, floor surface, and number of residents. These estimations are done with locally specific data (per municipality).
Avoided emissions	Avoided emissions are most relevant for project finance, because than there is a direct link between the involvement of the financial institution and a reduction in GHG emissions. However, social housing associations receive balance sheet financing by the bank. The PCAF harmonised approach states in the approach for commercial real estate class "Real estate finance that is climate-positive, that is, a property generating more energy than it consumes, could be viewed as avoided emissions. In the approach for mortgages, it states that "mortgage on a house that is climate-positive, i.e., generating more energy than it consumes, could be seen as avoided emissions. For now, there is no data available about climate-positive houses or property that generates more energy than it consumes owned by social housing associations. So, considering the guidelines in the PCAF harmonized approach, and the lack of data, it was decided not to take avoided emissions into consideration.
Asset class specific considerations	Actual consumption data, made anonymous, but specific for every social housing association is preferred. The actual energy consumption will be more accurate than working with the average energy consumption per energy label, dwelling type, floor space, number of inhabitants, and municipality. CBS and Aedes are working on this data, but for now this data is only available for 2018, and only for heat, not electricity. Developments on this data will be monitored. There is no data available on the energy use of the social housing associations themselves (own organization, headquarters e.g.). This is unfortunate, but on the other hand only a

<table>
<tr><th>Topic</th><th>Outcome</th></tr>
<tr><td></td><td>minor problem, because this will be negligible compared to the total CO_2 equivalent footprint of a social housing association.

Due to data availability, only independent dwellings have been taken into account for the calculation of the total CO_2 equivalent footprint. This is about 85.3% of all the property of the social housing associations. Besides, 7% of the property consists of parking spaces (which do generally not use any energy). The remaining property consists of care-units (6%) or commercial real estate (1.4%). Unfortunately, there is not enough data available to make reliable assumption about this part of the possession.</td></tr>
<tr><td>Attribution</td><td>As a basic attribution principle, the lender accounts for a portion of the GHG emissions of the financed company determined by the ratio between the lender's exposure and the enterprise value of the company (in this asset class total balance sheet of the company). For this, the actual outstanding exposure is used. This means adjusting the numerator of the attribution factor annually (end-of-year exposure), resulting in the attribution to decline to 0 at the end of the lifetime of the loan (when it is fully repaid).

$$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$</td></tr>
<tr><td>Limitations</td><td>As stated before in the 'Asset class specific considerations', data availability should be improved on several cases. Developments will be intensively monitored, and hopefully there is more data available in the coming years.

At this moment, another limitation is that scope 3 is not considered in this asset class. There are plans within the PCAF platform to broaden the approach and include scope 3 for social housing associations in the harmonised approach. This is however not finalized yet. Het PON & Telos has a positive attitude towards adding scope 3 to the social housing associations approach in future research.</td></tr>
<tr><td>Data quality estimate</td><td>Data quality estimate: 2.5

<table><tr><th>Score</th><th>Description</th></tr><tr><td>Score 1</td><td>Actual energy consumption, converted to CO_2 eq-emissions using verified emissions factors specific to the type of energy consumed</td></tr><tr><td>Score 2</td><td>Actual energy consumption, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr><tr><td>Score 3</td><td>Estimated energy consumption based on energy performance/energy label and floor area per type of social house in a country, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr><tr><td>Score 4</td><td>Estimated energy consumption per type of social house in a country and floor area, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr><tr><td>Score 5</td><td>Average energy consumption per social house in a country, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source</td></tr></table>
The CO_2 equivalent emissions per housing unit are ideally calculated using energy consumption data per client account. When this is not available, other methods were used. This of course will increase the need to use estimations, and the uncertainty level of the calculations.

The method in this study uses energy labels, number of residents, and floor area per type of social house, converted to CO_2 equivalent emissions using emission factors for energy from undefined fuel source (except for gas use, were the energy source is natural gas). This is in compliance with data quality level 3. However, instead of country level averages, municipal averages were used. This makes the calculation more precise, because of the geographical differences in the Netherlands in energy use.</td></tr>
</table>

Topic	Outcome
	In addition, we were able to subtract an estimate of energy used within district heating. Therefore, the natural gas use estimate is even more precise. Given the considerations above, the data quality score is estimated at 2.5. It is not as precise as data quality level 2, but it is better than data quality level 3.

4.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	General data on social housing associations
Data File	dVI2018 Hoofdstuk1
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2018
Download date	22-09-2020
Link to webpage	https://data.overheid.nl/dataset/verantwoordingsinformatie-woningcorporaties-dvi2018-hfd1
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable.
Data quality	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/documenten/brieven/2019/10/17/datakwaliteit-dpi2018-en-dvi2018
Selections	No specific selections.
Data transformations	No specific transformations.

Topic	DESCRIPTION
Data	Number of dwellings per social housing association and municipality
Data File	dVI2018 Hoofdstuk 2
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2018
Download date	22-09-2020
Link to webpage	https://data.overheid.nl/dataset/verantwoordingsinformatie-woningcorporaties-dvi2018-hfd2
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Number of dwellings
Data quality	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/documenten/brieven/2019/10/17/datakwaliteit-dpi2018-en-dvi2018
Selections	No specific selections.
Data transformations	No specific transformations.

Topic	DESCRIPTION
Data	General data on social housing associations
Data File	dvI2017hoofdstuk1
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2017
Download date	23-09-2020
Link to webpage	https://data.overheid.nl/dataset/e08ca47c-6c83-4530-bbd3-6f6ceb03eae1
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable.
Data quality	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/onderwerpen/actuele-informatie/overzicht-berichten-aw/actuele-informatie-aw/tips-voor-een-betere-datakwaliteit-dvi-en-dpi
Selections	No specific selections.
Data transformations	No specific transformations.

Topic	DESCRIPTION
Data	Number of dwellings per social housing association and municipality
Data File	dvi2017hoofdstuk2
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2017
Download date	23-09-2020
Link to webpage	https://data.overheid.nl/dataset/53b4cc9f-5331-4ed3-898a-bfbc4b1ddea0
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable.
Data quality	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/onderwerpen/actuele-informatie/overzicht-berichten-aw/actuele-informatie-aw/tips-voor-een-betere-datakwaliteit-dvi-en-dpi
Selections	No specific selections.
Data transformations	No specific transformations.

<table>
<tr><th>TOPIC</th><th>DESCRIPTION</th></tr>
<tr><td>DATA</td><td>Number of dwellings per social housing association and energy label</td></tr>
<tr><td>DATA FILE</td><td>dPI2019 H2</td></tr>
<tr><td>DATA SOURCE</td><td>Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties</td></tr>
<tr><td>YEAR</td><td>2019</td></tr>
<tr><td>DOWNLOAD DATE</td><td>22-09-2020</td></tr>
<tr><td>LINK TO WEBPAGE</td><td>https://data.overheid.nl/dataset/prognose-informatie-woningcorporaties-dpi2019-hfd2</td></tr>
<tr><td>INTERNAL LOCATION</td><td>O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data</td></tr>
<tr><td>UNIT OF MEASUREMENT</td><td>Energy index (score)</td></tr>
<tr><td>DATA QUALITY</td><td>Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://servicedesk.sbr-wonen.nl/support/solutions/articles/75000026685-kwaliteit-van-de-aangeleverde-gegevens-dpi2019</td></tr>
<tr><td>SELECTIONS</td><td>No specific selections.</td></tr>
<tr><td>DATA TRANSFORMATIONS</td><td>Transformation of Energy-index to Energy-label:
<table>
<tr><td>Energy Index <= 0,6</td><td>AAA</td></tr>
<tr><td>0,6 < Energy Index <= 0,8</td><td>AA</td></tr>
<tr><td>0,8 < Energy Index <= 1,2</td><td>A</td></tr>
<tr><td>1,2 < Energy Index <= 1,4</td><td>B</td></tr>
<tr><td>1,4 < Energy Index <= 1,8</td><td>C</td></tr>
<tr><td>1,8 < Energy Index <= 2,1</td><td>D</td></tr>
<tr><td>2,1 < Energy Index <= 2,4</td><td>E</td></tr>
<tr><td>2,4 < Energy Index <= 2,7</td><td>F</td></tr>
<tr><td>Energy index > 2,7</td><td>G</td></tr>
<tr><td>Energy Index unknown</td><td>O</td></tr>
</table></td></tr>
</table>

Topic	DESCRIPTION
Data	Number of dwellings per social housing association and energy label
Data File	dPi2018 H2_0
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2018
Download date	23-09-2020
Link to webpage	https://data.overheid.nl/dataset/prognose-informatie-woningcorporaties-dpi2018-hfd2
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable.
Data quality	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/documenten/brieven/2019/10/17/datakwaliteit-dpi2018-en-dvi2018
Selections	No specific selections.
Data transformations	Transformation of Energy-index to Energy-label:

Energy Index <= 0,6	AAA
0,6 < Energy Index <= 0,8	AA
0,8 < Energy Index <= 1,2	A
1,2 < Energy Index <= 1,4	B
1,4 < Energy Index <= 1,8	C
1,8 < Energy Index <= 2,1	D
2,1 < Energy Index <= 2,4	E
2,4 < Energy Index <= 2,7	F
Energy index > 2,7	G
Energy Index unknown	O

Topic	DESCRIPTION
Data	Overview of municipalities in The Netherlands
Data File	Gebieden_in_Nederland_2018_23092020_150634
data Source	CBS, Statline
Year	2018
Download date	23-09-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83859NED/table?ts=1600866375104
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable
Data quality	Not applicable
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Overview of municipalities in The Netherlands
Data File	Gebieden_in_Nederland_2019_24092020_104714
data Source	CBS, Statline
Year	2019
Download date	24-09-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84378NED/table?ts=1600937218667
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Not applicable
Data quality	Not applicable
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Types of dwellings per social housing association
Data File	Type - woningcorporaties
data Source	Aades Datacentrum; dVi (de Verantwoordingsinformatie)
Year	2017 & 2018
Download date	22-09-2020
Link to webpage	https://aedesdatacentrum.nl/jive
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Number of dwellings
Data quality	Based on dVI 2018: Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/documenten/brieven/2019/10/17/datakwaliteit-dpi2018-en-dvi2018 Possible transformations by Aedes are unknown
Selections	No specific selections.
Data transformations	When data is missing, data of the previous year is used to complete the dataset.

Topic	DESCRIPTION
Data	Average floor space per type of dwelling and municipality
Data File	82550NED_UntypedDataSet_22092020_173216
data Source	CBS, Statline
Year	2018 & 2019
Download date	22-09-2020
Link to webpage	https://opendata.cbs.nl/statline/portal.html?_la=nl&_catalog=CBS&tableId=82550NED&_theme=269
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	m^2
Data quality	Data quality score: 1. Based on audited registration data of all buildings registered in BAG (Basisregistratie Adressen en Gebouwen). Municipalities are in charge of collecting these data. Kadaster and the Ministry of Infrastructure and Water Management perform a triennial audit.
Selections	No specific selections.
Data transformations	When it is unknown in which municipality a social housing association has possession, the Dutch national average is used. (only the case for 43 out of 2,208,254 dwellings)

Topic	DESCRIPTION
Data	Average natural gas use per square meter, type of dwelling, energy label and average floor space.
Data File	83878NED_UntypedDataSet_22092020_174721
data Source	CBS, Statline
Year	2017 & 2018
Download date	22-09-2020
Link to webpage	https://opendata.cbs.nl/statline/portal.html?_la=nl&_catalog=CBS&tableId=83878NED&_theme=123
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	m^3/m^2
Data quality	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/energiekentallen-woningen
Selections	No specific selections.
Data transformations	Data have been recalculated to match the types of dwellings used in the social housing association database. Weighing is based on CBS research (see table ”Maatwerk-Woningkenmerken-tijdreeks”).

Topic	DESCRIPTION
Data	Number of dwellings per type of dwelling in The Netherlands
Data File	Maatwerk-Woningkenmerken-tijdreeks
data Source	CBS, Maatwerktabel
Year	2016
Download date	23-09-2020
Link to webpage	https://www.cbs.nl/nl-nl/maatwerk/2016/14/woningkenmerken-tijdreeks
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Number of dwellings
Data quality	Data quality score: 2. Based on WoON questionaire (woon onderzoek Nederland). This is a sample survey. This means that the data are based on reliable estimates, with a 95% confidence interval. More information: http://www.cbs.nl/nl-NL/menu/themas/bouwen-wonen/methoden/dataverzameling/korte-onderzoeksbeschrijvingen/woningonderzoek-nederland-art.htm
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Percentage of dwellings connected to district heating per municipality
Data File	Aandeel stadsverwarming - Gemeenten
data Source	Klimaatmonitor; CBS, Statline
Year	2018 & 2019
Download date	22-09-2020
Link to webpage	https://klimaatmonitor.databank.nl/Jive Energiegebruik > Gebouwde omgeving (fysieke eenheden) > Woningen > Stadsverwarming > Aandeel stadsverwarming
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Percentage
Data quality	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/energiekentallen-woningen Possible calculation steps by klimaatmonitor unknown.
Selections	No specific selections.
Data transformations	No specific transformations

Topic	Description
Data	Energy-content of natural gas
Data File	Energie-inhoud aardgas (onderwaarde_in GJ_m3) 2020
data Source	Klimaatmonitor
Year	2017 - 2020
Download date	23-09-2020
Link to webpage	https://klimaatmonitor.databank.nl/Jive
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	GJ/m3
Data quality	Official statistic. https://www.infomil.nl/onderwerpen/duurzaamheid-energie/energiebesparing/vragen-antwoorden/overige-vragen/omrekening-verbruik/
Selections	No specific selections.
Data transformations	No specific transformations

Topic	Description
Data	Emission factors In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
Data File	20201002 emissiefactoren
data Source	CO2emissiefactoren
Year	2017-2020
Download date	23-09-2020
Link to webpage	https://www.co2emissiefactoren.nl/wijzigingen-overzicht/
Internal location	O:\205305 PCAF 2020\Werkmap\Emissiefactoren
unit of measurement	kg/GJ, kg/Nm3 & kg/kWh
Data quality	High. These emission factors are the official factors recommended by the Dutch government and PCAF harmonized approach.
Selections	No specific selections.
Data transformations	No specific transformations

Topic	Description
Data	Total number of households per municipality
Data File	71486ned_UntypedDataSet_24092020_110918
data Source	CBS, Statline
Year	2018 & 2019
Download date	24-09-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71486ned/table?ts=1600938470000
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Number of households
Data quality	Data quality score: 1. Based on audited registration data of all Dutch citizens. More information: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/huishoudensstatistiek
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Total number citizens living in households per municipality
Data File	71488ned_UntypedDataSet_24092020_111932
data Source	CBS, Statline
Year	2018 & 2019
Download date	24-09-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71488ned/table?ts=1600939064596
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	Number of citizens living in households
Data quality	Data quality score: 1. Based on audited registration data of all Dutch citizens. More information: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/huishoudensstatistiek
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Average electricity use per inhabitant, type of dwelling, number of residents in households and average floor space
Data File	83882NED_UntypedDataSet_24092020_112809
data Source	CBS, Statline
Year	2017 & 2018
Download date	24-09-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83882NED/table?ts=1600939531543
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	kWh per inhabitant
Data quality	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/energiekentallen-woningen
Selections	No specific selections.
Data transformations	Data have been recalculated to match the types of dwellings used in the social housing association database. Weighing is based on CBS research (see table ”Maatwerk-Woningkenmerken-tijdreeks”).

Topic	DESCRIPTION
Data	Total balance sheet per housing association 2018
Data File	dVi2018 Hoofdstuk 3
data Source	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
Year	2018
Download date	23-10-2020
Link to webpage	https://data.overheid.nl/dataset/92662164-b8e1-4e39-ae08-e94d1103c8a3
Internal location	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
unit of measurement	EUR

DATA QUALITY	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/documenten/brieven/2019/10/17/datakwaliteit-dpi2018-en-dvi2018
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	Data transmitted to file: O:\205305 PCAF 2020\Werkmap\Woningcorporaties\balanstotaal 2017-2018

TOPIC	DESCRIPTION
DATA	Total balance sheet per housing association 2017
DATA FILE	dvi2017h3
DATA SOURCE	Inspectie Leefomgeving en Transport (ilent); Autoriteit Woningcorporaties
YEAR	2017
DOWNLOAD DATE	23-10-2020
LINK TO WEBPAGE	https://data.overheid.nl/dataset/47d9b7f2-820d-4637-9b08-69232f6c2eb9
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
UNIT OF MEASUREMENT	EUR
DATA QUALITY	Score 1: audited data per social housing association specific. There were some issues about the data quality found by the WSW (waarborgfonds sociale woningbouw), which can be found here: https://www.ilent.nl/onderwerpen/actuele-informatie/overzicht-berichten-aw/actuele-informatie-aw/tips-voor-een-betere-datakwaliteit-dvi-en-dpi
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	Data transmitted to file: O:\205305 PCAF 2020\Werkmap\Woningcorporaties\balanstotaal 2017-2018

4.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	Gasverbruik woningen 2019, tab: eindberekening	
LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties	
COLUMN-NAME	DESCRIPTION	UNIT
KvK	Company registration number (1/2)	-
L_nummer	Company registration number (2/2)	-
Ton CO2 per jaar (Aardgas)	Total kg CO_2 equivalent emission per social housing association as a result of natural gas use	Ton
Ton CO2 per jaar (Stadsverwarming)	Total kg CO_2 equivalent emission per social housing association as a result of district heating	Ton

TOPIC	DESCRIPTION	
DATA FILE	Gasverbruik woningen 2018, tab: eindberekening	
LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties	
COLUMN-NAME	DESCRIPTION	UNIT
Row Labels	Company registration number (1/2)	-
L_nummer	Company registration number (2/2)	-
Ton CO2 per jaar (Aardgas)	Total kg CO_2 equivalent emission per social housing association as a result of natural gas use	Ton
Ton CO2 per jaar (Stadsverwarming)	Total kg CO_2 equivalent emission per social housing association as a result of district heating	Ton

TOPIC	DESCRIPTION	
DATA FILE	Elektriciteitsverbruik woningen 2019, tab: eindberekening	
LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties	
COLUMN-NAME	DESCRIPTION	UNIT
KvK	Company registration number (1/2)	-
L_nummer	Company registration number (2/2)	-
Ton CO2 per jaar (Elektriciteit)	Total kg CO_2 equivalent emission per social housing association as a result of electricity use	Ton

TOPIC	DESCRIPTION	
DATA FILE	Elektriciteitsverbruik woningen 2018, tab: eindberekening	
LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties	
COLUMN-NAME	DESCRIPTION	UNIT
KvK	Company registration number (1/2)	-
L_nummer	Company registration number (2/2)	-
Ton CO2 per jaar (Elektriciteit)	Total kg CO_2 equivalent emission per social housing association as a result of electricity use	Ton

The attributed data to the bank can be found in the bank specific folder in this location:
O:\205305 PCAF 2020\Werkmap\Woningcorporaties\NWB Bank
O:\205305 PCAF 2020\Werkmap\Woningcorporaties\BNG Bank

5 Municipalities approach

5.1 Scope 1 & 2

5.1.1 General factsheet

Topic	Outcome
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. This is in line with the public loan approach in the PCAF methodology. Scope 1 emissions are the direct GHG emissions of the organization. For the 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 however not known per municipality, so some estimations had to be made using multiple calculation factors to achieve the best result possible. Scope 2 emissions include the indirect GHG emissions from consumption of purchased electricity, heat or steam. Because the heat and steam use per municipality is unknown, scope 2 will be focused on the use of purchased electricity. As exact figures per municipality are not known, estimations had to be made using multiple calculation factors to result in as exact data as possible.
Portfolio Coverage	Data is collected for all 355 municipalities in The Netherlands. This means the portfolio coverage ratio for this sector will be 100%.
Data	For scope 1 natural gas use and scope 2 electricity use, data of the years 2018 and 2019 were used for the calculations. Data of the year 2019 was the most recent data available. For scope 1 fossil fuel use by company vehicles, data of the years 2017 and 2018 were used for the calculations. Data of the year 2018 about the number of company vehicles and kilometers was the most recent data available. The data used in this approach are from multiple sources. Data about FTE per size of municipality comes from A&O fonds gemeenten. A&O is an organization for all Dutch municipalities. A&O provides practical tools, knowledge, and subsidies for municipalities. This data is on the aggregation level of municipality size classes. Data about the inhabitants per municipality comes from the Dutch National Statistics office (CBS). This data is on the aggregation level of municipalities. It contains the population per municipality on January 1 of each year. It is based on the population register of a municipality and therefore highly reliable data. Data about the number of jobs (FTE) per COROP (NUTS3) area comes from Lisa. Lisa is the national information system for jobs in the Netherlands and has a database with data of all locations where paid work is done. This data is on the aggregation level of COROP (NUTS3) area. A COROP area is regional area within the Netherlands. In total, the Netherlands has 40 COROP areas[14]. A COROP area has a central location surrounded by a service area. This area can contain multiple municipalities, but is usually smaller than a province. Data about the supply of energy to the sector public administration and government services comes from the Dutch National Statistics office (CBS). Data is about the supply of electricity and natural gas to businesses and other utility buildings. The data is based on connection register of the energy network and therefore very reliable. Data is divided by sector and region. Data about the number of company vehicles in the Netherlands comes from the Dutch National Statistics office (CBS). Data is about the number of company vehicles owned by companies per sector. The data originally comes from motor vehicle registration (RDW) and therefore reliable. Data about the number of kilometers driven with a vehicle per year comes from the Dutch National Statistics office (CBS). Data is about the average kilometers per year of a passenger

[14] https://www.cbs.nl/nl-nl/dossier/nederland-regionaal/gemeente/gemeenten-en-regionale-indelingen/landelijk-dekkende-indelingen

Topic	Outcome
	vehicle with a Dutch registration. The original data comes from the online kilometer registration (OKR) of the RDW.
Emission factors used	Emission factors for natural gas, electricity, and for a company vehicle are used. In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
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) per COROP (NUTS3) area. This includes municipalities but also other governments. To calculate scope 1 and 2 for municipalities several calculation steps were necessary. It is known for the COROP area how many employees in FTE are working for the total sector public administration and government services. For municipalities it can also be calculated how many employees in FTE are working for municipalities. According to the percentage of the number of employees in FTE working in the municipalities per COROP area in comparison to the number of employees in FTE working in the total sector public administration and government services per COROP area the supply of natural gas and electricity to municipalities per COROP can be calculated. Afterwards, the supply of natural gas and electricity can be calculated per municipality. See the following explanation for the detailed calculation steps. First the number of FTE per municipality was calculated (A). The number of FTE per municipality size is known (A&O fonds gemeenten). According to the population of each municipality the municipality was assigned to one of the size classes: G4 >100.000 inhabitants (excl. G4) 50.000 until 100.000 inhabitants 20.000 until 50.000 inhabitants <20.000 inhabitants For each municipality the % of inhabitants was calculated relative to total number of inhabitants for all municipality of one size class. This percentage was multiplied by the number of FTE per municipality of that particular size. This results in the number of FTE per municipality (A). This number was added up per COROP (NUTS3) area (B). Per COROP (NUTS3) area the total number of FTE are known within the sector public administration and government services. The number of FTE working for municipalities per COROP (NUTS3) area (B) were divided by the total number of FTE in the sector public administration and government services to result in the percentage of FTE working in municipalities relative to all FTE in the sector public administration and government services per COROP (NUTS3) area (C). Per COROP the supply of natural gas and electricity for the sector public administration and government services is known (CBS/Statline). The percentage of FTE working in municipalities relative to all FTE in the sector public administration and government services per COROP (NUTS3) area (C) was multiplied by the supply of natural gas and electricity for the sector public administration and government services. This resulted in the supply of natural gas and electricity per municipality within a COROP (NUTS3) area (D). The final calculation to calculate total CO_2 equivalent for scope 1 and 2 started with the number of FTE per municipality (A). This number was divided by the sum of all FTE working for a municipality within one COROP (NUTS3) area to result in the percentage of FTE per municipality relative to the total FTE working in municipalities withing a COROP (NUTS3) area (E). This percentage (E) was multiplied by the supply of natural gas and electricity per municipality within a COROP (NUTS3) area (D) to result in the supply of natural gas and electricity per municipality (F).

<table>
<tr><th>Topic</th><th>Outcome</th></tr>
<tr><td></td><td>The amount of natural gas per municipality (F) was multiplied by the emission factor for natural gas (1,791 kg CO_2 equivalent per m^3; Table 11.1) and the amount of electricity was multiplied by the emission factor for electricity (0,405 kg CO_2 equivalent per kWh; Table 11.1; CO2emissiefactoren.nl). The amount of CO_2 equivalent is divided by the factor 1000 to result in Ton CO_2 equivalent for scope 1 (natural gas) and scope 2 (electricity).

Scope 1 fossil fuel for company vehicles
Part of scope 1 emissions is also the use of fossil fuel for company vehicles.
This calculation also started with the number of FTE per municipality (A). This number (A) was divided by all FTE working in all the Dutch municipalities to result in the percentage of FTE of that municipality relative to all FTE working in Dutch municipalities (G).

It is known how many company vehicles are used by the sector public administration and government services (H; CBS/Statline). To calculate the number of company vehicles for the Dutch municipalities in total (I) the number of company vehicles used by the sector public administration and government services in total (H) was multiplied by the average percentage of FTE working in municipalities.
The number of company vehicles for the Dutch municipalities in total (I) was multiplied by the percentage of FTE of that municipality relative to all FTE working in Dutch municipalities (G) to result in the number of company vehicles per municipality (J).
This (J) was multiplied by the number of km driven per company vehicle (all fuel types) and multiplied by the emission factor (0,181 kg CO_2 equivalent/km (TTW; Table 11.1 passenger transport by car)) to result in the CO_2 equivalent for company vehicles.

For scope 1 the CO_2 equivalent emissions for natural gas and company vehicles were added up to calculate total scope 1 CO_2 equivalent emissions.</td></tr>
<tr><td>Avoided emissions</td><td>In the calculations the supply of electricity to a COROP (NUTS3) area is used to calculate the supply of electricity to each Dutch municipality. If a municipality has solar panels the supply of electricity will be less and consequently also the supply of electricity to a COROP (NUTS3) area is less. The reduction in CO_2 equivalent emissions due to for example solar panels is therefore indirectly included in this calculation.</td></tr>
<tr><td>Asset class specific considerations</td><td>To eliminate the risk of double counting that arises from local and regional government related collaborations, companies, and projects were not taken into account in the financial statements of the municipalities.</td></tr>
<tr><td>Attribution</td><td>To calculate the CO_2 equivalent footprint following the PCAF principles, a general approach was developed. First, 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.
$$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$</td></tr>
<tr><td>Limitations</td><td>The limitations of current method is that the supply of natural gas and electricity is not known per municipality. Therefore, it is calculated according to the size of the municipality and several data on the aggregation level of the COROP (NUTS3) area.
There is also no data registered about company vehicles (number of vehicles, type of vehicle, type of fuel etc.) per municipality. However, by using the current model(s), the best possible result is achieved.</td></tr>
<tr><td>Data quality estimate</td><td>The method used for municipalities in this study is based on robust estimations of electricity and natural gas use, converted to CO_2 equivalent emissions using emission factors. For natural gas use, this is a known specific type of energy, but for electricity use, energy comes from undefined sources. This is in compliance with data quality level 3.
<table>
<tr><th>Score</th><th>Description</th></tr>
<tr><td>Score 1</td><td>Actual energy consumption, converted to CO_2eq-emissions using verified emission factors and detailed activity data specific to the type of energy consumed</td></tr>
<tr><td>Score 2</td><td>Actual energy consumption, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
</table></td></tr>
</table>

Topic	Outcome	
	Score 3	Modeled regional activity data based on robust assumptions, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
	Score 4	Modeled activity data in a country, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
	Score 5	Highly modeled activity or uncertain activity data in a country, converted to CO_2eq-emissions using default emissions factors for energy from undefined fuel source

5.1.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	Number of jobs (FTE) per size of municipality
Data File	Kopie van Ontwikkeling_Bezetting gemeente
data Source	A & O fonds gemeenten
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Received by e-mail: 25-9-2020
Link to webpage	https://personeelsmonitor2019.aeno.nl/
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruwe data Kopie van Ontwikkeling_Bezetting gemeente File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2017 (this calculation sheet only used for scope 1 fossil fuel for company vehicles) 20200929 scope 1 en 2 gemeenten 2018 20200929 scope 1 en 2 gemeenten 2019
unit of measurement	Occupation in FTE
Data quality	Data has been directly acquired from municipalities, using a questionnaire. Data quality is therefore indicated as high.
Selections	No specific selections
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Inhabitants per municipality
Data File	20200924 ruwe data bevolking per gemeente 20201021 ruwe data bevolking per gemeente 2019
data Source	CBS/Statline
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Date of modification: 27-5-2020 Date of download 2018: 24-9-2020 Date of download 2019: 21-10-2020
Link to webpage	https://opendata.cbs.nl/statline/portal.html?_la=nl&_catalog=CBS&tableId=03759ned&_theme=265
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruw data 20200924 ruwe data bevolking per gemeente 20201021 ruwe data bevolking per gemeente 2019 File with calculations:

	O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2017 (this calculation sheet only used for scope 1 fossil fuel for company vehicles) 20200929 scope 1 en 2 gemeenten 2018 20200929 scope 1 en 2 gemeenten 2019
UNIT OF MEASUREMENT	Number of inhabitants
DATA QUALITY	Based on registration data of the whole population. The data is checked, and corrected if necessary by CBS. For more information about the data quality see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/bevolkingsstatistiek
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Number of jobs (FTE) per COROP (NUTS3) area
DATA FILE	Ruwe data banen per COROP Ruwe data banen per COROP 2019
DATA SOURCE	Lisa; het werkgelegenheidsregister van Nederland
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	Date of modification: April 2020 Date of download 2018: 30-9-2020 Date of download 2019: 21-10-2020
LINK TO WEBPAGE	*https://www.lisa.nl/data/gratis-data/overzicht-lisa-data-per-corop*
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruwe data Ruwe data banen per COROP Ruwe data banen per COROP 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2018 20200929 scope 1 en 2 gemeenten 2019
UNIT OF MEASUREMENT	FTE
DATA QUALITY	Data from LISA are based on observations/measurements of all locations of companies and not only one company as a whole. Also self-employed persons are taken into account. This makes it possible to present a picture of employment at every geographic and sectoral level.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Supply of energy to the public administration and government services sector
DATA FILE	Ruwe data geleverde energie voor O sector COROP 20201021 ruwe data geleverde energie voor O sector COROP 2019
DATA SOURCE	CBS/Statline
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	Date of modification: 20-9-2020 Date of download 2018: 29-9-2020 Date of download 2019: 21-10-2020

LINK TO WEBPAGE	https://opendata.cbs.nl/statline/portal.html?_la=nl&_catalog=CBS&tableId=82538NED&_theme=278
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruwe data Ruwe data geleverde energie voor O sector COROP 20201021 ruwe data geleverde energie voor O sector COROP 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2018 20200929 scope 1 en 2 gemeenten 2019
UNIT OF MEASUREMENT	Natural gas: 1000 m^3 Electricity: 1000 kWh
DATA QUALITY	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Number of company vehicles owned by companies in the public administration and government services sector
DATA FILE	20200929 Ruwe data bedrijfsbestelautos O sector
DATA SOURCE	CBS/Statline
YEAR	Data used from 2017 and 2018 to calculate scope 1 fossil fuel use by vehicles
DOWNLOAD DATE	Date of modification: 26-3-2020 Date of download: 29-9-2020
LINK TO WEBPAGE	https://opendata.cbs.nl/statline/portal.html?_la=nl&_catalog=CBS&tableId=81481NED&_theme=410
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruwe data 20200929 Ruwe data bedrijfbestelautos O sector File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2017 (calculation scope 1 fossil fuel use by vehicles 2017) 20200929 scope 1 en 2 gemeenten 2018 (calculation scope 1 fossil fuel use by vehicles 2018)
UNIT OF MEASUREMENT	Number of company vehicles
DATA QUALITY	The research method of this data can be find here: 'Bezit bestelauto's'. Here you can find an additional research report: 'Bezit en gebruik bestelauto's'. Data comes from motor vehicle registration (RDW) and data is checked on content, quality, and usability by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

Topic	DESCRIPTION
Data	Average kilometers driven with a passenger vehicle with a Dutch registration per year
Data File	Ruwe data km bedrijfswagens
data Source	CBS/Statline
Year	Data used from 2017 and 2018 to calculate scope 1 fossil fuel use by vehicles
Download date	Date of modification: 17-9-2020 Date of download: 30-9-2020
Link to webpage	https://opendata.cbs.nl/portal.html?_la=nl&_catalog=CBS&tableId=71107ned&_theme=411
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2\Ruwe data Ruwe data km bedrijfswagens File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 1 en 2 20200929 scope 1 en 2 gemeenten 2017 (calculation scope 1 fossil fuel use by vehicles 2017) 20200929 scope 1 en 2 gemeenten 2018 (calculation scope 1 fossil fuel use by vehicles 2018)
unit of measurement	km
Data quality	The research method of this data can be find here: Verkeersprestaties personenauto's. The original data comes from the online kilometer registration (OKR) of the RDW. This is very reliable data.
Selections	No specific selections
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Gemeenten 2018 onbewerkte Iv3-data
Data File	20201014 totaal passiva per gemeente 2018
data Source	CBS/Statline
Year	Data used from 2018
Download date	Date of modification: 23-9-2019 Date of download: 14-10-2020
Link to webpage	*https://iv3statline.cbs.nl/#/IV3/nl/dataset/45042NED/table?ts=1602660057674*
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Balans totaal 20201014 totaal passiva per gemeente 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Balans totaal 20201014 totaal passiva per gemeente doorgerekend 2018
unit of measurement	Euro
Data quality	High data quality. Directly supplied by municipalities from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
Selections	No specific selections
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Gemeenten 2019 onbewerkte Iv3-data
Data File	20201021 totaal passiva per gemeente 2019
data Source	CBS/Statline
Year	Data used from 2019
Download date	Date of modification: 22-9-2020 Date of download: 21-10-2020
Link to webpage	*https://iv3statline.cbs.nl/#/IV3/nl/dataset/45046NED/table?ts=1603280104996*
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Balans totaal 20201021 totaal passiva per gemeente 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Balans totaal 20201021 totaal passiva per gemeente doorgerekend 2019
unit of measurement	Euro
Data quality	High data quality. Directly supplied by municipalities from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
Selections	No specific selections
Data transformations	No specific transformations

5.1.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	20200929 scope 1 en 2 gemeenten 2017 (Scope 1 fossil fuel use by vehicles 2017) 20200929 scope 1 en 2 gemeenten 2018 (Scope 1 natural gas use and Scope 2 electricity use 2018 and Scope 1 fossil fuel use by vehicles 2018) 20200929 scope 1 en 2 gemeenten 2019 (Scope 1 natural gas use and Scope 2 electricity use 2019)	
LOCATION	O:\205305 PCAF 2020\Werkmap\Gemeente\Scope 1 en 2	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Sheet: terugrekenen gemeente (in file 2018 and 2019)		
Gemeente	Municipality: Dutch code for municipality	-
COROPnr	Dutch COROP (NUTS3) code	-
FTE per gemeente	FTE per municipality	FTE
% FTE tov FTE COROP	Percentage of FTE per municipality relative to FTE working in the sector public administration and government services per COROP (NUTS3) area where that municipality belongs to	Percentage
Aardgas COROP m3	Natural gas supply per COROP area	m^3
Elektra COROP kWh	Electricity supply per COROP area	kWh
Aardgas gemeente m3	Calculation of natural gas supply per municipality	m^3
Elektra gemeente kWh	Calculation of electricity supply per municipality	kWh
Omrekenfactor aardgas	Emission factor for natural gas	kg CO_2 equivalent per m^3
Omrekenfactor elektra	Emission factor for electricity	kg CO_2 equivalent per kWh
Scope 1 CO2 equivalent aardgas	Attribution of natural gas to the CO_2 equivalent emissions	Kg
Scope 2 CO2 equivalent elektra	Attribution of electricity to the CO_2 equivalent emissions	Kg
Ton CO2 scope 1	Attribution of natural gas to the CO_2 equivalent emissions	Ton
Ton CO2 scope 2	Attribution of electricity to the CO_2 equivalent emissions	Ton
Sheet CO2 bedrijfsautos (in file 2017 and 2018)		
Gemeente	Municipality: Dutch code for municipality	
COROPnr	Dutch COROP (NUTS3) code	
FTE per gemeente	FTE per municipality	FTE
% FTE tov FTE COROP	Percentage of FTE per municipality relative to FTE working in the sector public administration and government services per COROP (NUTS3) area where that municipality belongs to	Percentage
Aantal bedrijfswagens	Number of company vehicles per municipality	Number
Omrekenfactor kg CO2/voertuigkilometer	Emission factor for passenger transport by car	kg CO_2 equivalent/km
Scope 1 CO2 equivalent auto	Attribution of fossil fuel for company vehicles to the CO_2 equivalent emissions	Ton

5.2 Scope 3

5.2.1 General Factsheet

TOPIC	Outcome
Scopes Covered	Scope 3 covers all other indirect emissions. Some examples of scope 3 activities 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 Coverage	Data is collected for all 355 municipalities in The Netherlands. This means the portfolio coverage ratio for this sector will be 100%.
Data	For scope 3, most recent data about CO_2 equivalent emissions to the air by the Dutch economy was data of the year 2018. Therefore for scope 3 data of the years 2017 and 2018 were used for the calculations. Data about the standard business format (standaard bedrijfsindeling) comes from the Dutch National Statistics office (CBS). CBS uses the standard business format to classify business units to their main activity. Data about CO_2 equivalent emissions to the air by the Dutch economy comes from the Dutch National Statistics office (CBS). The data contain emission numbers of harmful substances to the air by activities of the Dutch economy. 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. Data about the monetary value of all produced goods and services in the Netherlands comes from the Dutch National Statistics office (CBS). Data about the expenses of municipalities comes from the Dutch National Statistics office (CBS). The source of the data are the municipalities. They deliver the data to CBS. The data has not been edited or checked by CBS. Data about budgeted costs per sub-function and category of the municipality of Roosendaal are used to have a more objective approach of assigning a sub-function and category to a sectoral production category (standard business format; CBS).
Emission factors used	No emission factors are used.
Calculation steps	Municipalities purchase goods and services, but on the other hand a municipality also delivers goods and services to clients/customers. In both streams scope 3 emissions are involved. To make a distinction between the two streams the IV3 spending database was used twice to link sub-functions and categories to the sectoral production categories (the standard business format; CBS). The sub-functions are the task fields of a municipality, such as safety, education, and social domain. In total, there are 8 functions and 54 sub-functions. These sub-functions were linked to a sectoral production category (standard business format; CBS) by taking into account the goods and services a municipality delivers to clients/customers. For example the spending in the social domain. Within the function of governance only the sub-function “other land and buildings” were taken into account to calculate scope 3 emissions, the other sub-functions within governance were not relevant for calculating CO_2 equivalent emissions. These sub-functions are for example treasury and salaries etc. without a direct CO_2 equivalent footprint. The sub-functions have been linked to one or more sectoral production categories. When a sub-function was linked to more than one sectoral production category the attribution per sectoral production category was determined according to the average spending per sub-function in the budget over the years 2020/2021/2022/2023/2024 of the municipality of Roosendaal. Because of a good relationship between het PON & Telos and the municipality

	of Roosendaal it was possible to receive this data. The data was used for two purposes. First it was used to check whether the link between sub-function and sectorial production category was correct. For this check any municipality could have been chosen, because each municipality has to use the same task fields to register their financial figures (https://www.vraagbaakiv3gemeenten.nl). Second, it was used to determine the percentage of attribution of a sectoral production category when a sub-function was linked to more than one sectoral production category. This is a different method than was used in 2019. In 2019, the CO_2 equivalent emissions and the monetary value of a sector was divided proportionally over the different sectoral production categories when a sub-function was linked to more than one sectoral production category. Although current method is based on one municipality it improved the method of calculation, because the percentage of attribution of a sub-function to a sector is less subjective than in 2019. The municipality of Roosendaal is a middle-sized municipality so the spending of this municipality is probably not that the same as for a large or small municipality. Therefore the current method can be improved for next year by using the same data from several municipalities of different sizes and regions. The categories describe spending on purchasing goods and services. Only category 3 "Goods and Services" is relevant to calculate the scope 3 emissions for the categories. These expenses describe the goods and services that are delivered for a payment, in a hire or purchase construction. 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 all goods with a lifespan greater than one year. Category 3.3 (areal lease) and category 3.4 (social benefits in kind) are not taken in considerations because of the underlying goods or services. Category 3.5 describes the insourced employees, and 3.8 are other goods and services such as tools, food, and other expenses. The categories have been linked to one or more sectoral production categories. Categories 3.2, 3.5, and 3.8 were linked to more than one sectoral production category. For category 3.2 and 3.5 the average spending per category in the budget over the years 2020/2021/2022/2023/2024 of the municipality of Roosendaal were used to calculate the percentage of attribution of a sectoral production category. These percentages were used in further calculations. Category 3.8 was linked also to more than one sectoral production category, but it was not clear enough according to the budget of the municipality of Roosendaal which spending belonged to which sectoral production category, therefore it was decided to calculate with 25% for industrial goods, 50% for production and distribution and trade in electricity, natural gas, steam, and cooled air, and 25% for services (maintenance, engineers, administration etc.). In 2019, the CO_2 equivalent emissions and the monetary value of a sector were divided proportionally over the different sectoral production category when a category received more than one sectoral production category. Although current method is based on one municipality it improved the method of calculation. For category 3.8 a more realistic distribution was chosen compared to dividing it proportionally over the different sectoral production categories. Per sectoral production category the total CO_2 equivalent emissions are known (CBS, 2017/2018). Per sectoral production category also the total monetary value for all produced goods and services are known. Per sub-function and category the total monetary value was calculated according to the distribution over the sectoral production categories and the same method was used for the total CO_2 equivalent emissions. The monetary value of sub-function and category were added up and also the total CO_2 equivalent emissions were added up. Than the sum of total CO_2 equivalent emissions was divided by the sum of the total monetary value and this value was multiplied by the costs for that particular sub-function x category for the municipality to result in kg CO_2 equivalent emissions per sub-function x category per municipality. Finally, kg and ton of CO_2 equivalent emissions was calculated per municipality. There is one qualifying remark that has to be taken into account in this approach. The expenses on natural gas and electricity are also included in the spending on category 3.8. Therefore, in the end, the scope 1 and scope 2 emissions are subtracted from the total scope 3 emissions to avoid double counting. Unfortunately, there are still remaining expenses on electricity, warmth and gas under scope 3. These should actually be represented in the scope 1 and scope 2 statistics. These are however not separated from other expenses, so it was decided to keep them under scope 3. For these reasons it is important to note that the

<table>
<tr><td></td><td>results for scope 3 will be slightly overestimated, and for scope 1 and scope 2 slightly underestimated.</td></tr>
<tr><td>Avoided emissions</td><td>Not applicable</td></tr>
<tr><td>Asset class specific considerations</td><td>To eliminate the risk of double counting that arises from local and regional government related collaborations, companies, and projects were not taken into account in the financial statements of the municipalities.

As mentioned before: the expenses on natural gas and electricity are also included in the spending on category 3.8. Therefore, in the end, the scope 1 and scope 2 emissions are subtracted from the total scope 3 emissions to avoid double counting.</td></tr>
<tr><td>Attribution</td><td>To calculate the CO_2 equivalent footprint following the PCAF principles, a general approach was developed. First, 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.

$$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$</td></tr>
<tr><td>Limitations</td><td>Although the method of dividing the sub-functions and categories to the sectoral production category is improved in comparison to 2019, the distribution is still partly subjective. The subjective part is reduced by using the budget on spending per sub-function and category of the municipality of Roosendaal. Next year this method can be further improved when it is possible to use budgets of more municipalities of different sizes.

Another limitation is the 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.</td></tr>
<tr><td>Data quality estimate</td><td>The scope 3 calculations are based on local actual expenses, and national averages on CO_2 equivalent emissions. Therefore, this method is scaled into quality score 3.

<table>
<tr><th>Score</th><th>Description</th></tr>
<tr><td>Score 1</td><td>Actual energy consumption, converted to CO_2eq-emissions using verified emission factors and detailed activity data specific to the type of energy consumed</td></tr>
<tr><td>Score 2</td><td>Actual energy consumption, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 3</td><td>Modeled regional activity data based on robust assumptions, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 4</td><td>Modeled activity data in a country, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 5</td><td>Highly modeled activity or uncertain activity data in a country, converted to CO_2eq-emissions using default emissions factors for energy from undefined fuel source</td></tr>
</table>
</td></tr>
</table>

5.2.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	Standard business format: description per sectoral production category The description of the sectoral production category in this document is used to link sub-functions and categories to one or more sectoral production categories.
Data File	2019EPO4 SBI Structuur_DEF
data Source	CBS
Year	Januari 2019
Download date	Date of download: 22-7-2020
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-2019
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Ruwe data 2019EPO4 SBI Structuur_DEF
unit of measurement	Not applicable
Data quality	Not applicable
Selections	Not applicable
Data transformations	Not applicable

Topic	DESCRIPTION
Data	CO_2 equivalent emissions to the air by the Dutch economy
Data File	20200924 2017 CO2 equiv per euro bbp per sector
data Source	CBS/Statline Statline > Natuur en Milieu > Milieu > Milieurekeningen (nationale rekeningen) > Emissies naar de lucht door Nederlandse economie; nationale rekeningen
Year	Data used from 2017 and 2018 to calculate scope 3 Most recent data available was 2018
Download date	Date modification: 19 November 2019 Date of download: 22-7-2020
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/83300NED/table?ts=1601537694697
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Ruwe data CO2 equivalent 2017 2018 per sector File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet 20200924 2017 CO2 equiv per euro bbp per sector
unit of measurement	CO_2 equivalent: mln kg
Data quality	The research method used to obtain these data can be find here: 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.
Selections	CO_2 equivalents of several sectors were added up because the monetary value of these sectors were not presented separately. The following sectors were added up: GHI MN OPQ

	RSTU
Data transformations	Calculations were made with the data as described in the sections calculation steps.

Topic	DESCRIPTION
Data	The monetary value of all produced goods and services in the Netherlands
Data File	20200924 2017 CO2 equiv per euro bbp per sector
data Source	CBS/Statline Statline > Macro-economie > Nationale rekeningen > Bbp, finale bestedingen en productie > Bruto binnenlands product > Opbouw binnenlands product (bbp); nationale rekeningen.
Year	Data used from 2017 and 2018 to calculate scope 3
Download date	Date of modification: 24-6-2020 Date of download: 14-10-2020
Link to webpage	https://opendata.cbs.nl/#/CBS/nl/dataset/84087NED/table?ts=1601538240382
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Ruwe data 20201014 opbouw bbp per sector 2017 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet 20200924 2017 CO2 equiv per euro bbp per sector
unit of measurement	Mln Euro
Data quality	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 these data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/nationale-rekeningen
Selections	No specific selections
Data transformations	Calculations were made with the data as described in the section calculation steps.

TOPIC	DESCRIPTION
DATA	Expenses of all Dutch municipalities per IV3/COFOG code
DATA FILE	20200928 ruwe data gemeenten onbewerkte Iv3 data 2017 20200928 ruwe data gemeenten onbewerkte Iv3 data 2018
DATA SOURCE	CBS/Statline
YEAR	Data used from 2017 and 2018 to calculate scope 3
DOWNLOAD DATE	Date of modification: 2017: 24 September 2018 2018: 23 September 2019 Date of download: 28-9-2020
LINK TO WEBPAGE	2017: https://iv3statline.cbs.nl/portal.html?_la=nl&_catalog=IV3&tableId=45038NED&_theme=7 2018: https://iv3statline.cbs.nl/portal.html?_la=nl&_catalog=IV3&tableId=45042NED&_theme=7
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3 \Ruwe data 2017: 20200928 ruwe data gemeenten onbewerkte Iv3 data 2017 2018: 20200928 ruwe data gemeenten onbewerkte Iv3 data 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet 20200924 Scope 3 gemeenten 2017 20200924 Scope 3 gemeenten 2018
UNIT OF MEASUREMENT	1000 Euro
DATA QUALITY	High data quality. Directly supplied by municipalities from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	Calculations were made with the data as described in the section calculation steps.

TOPIC	DESCRIPTION
DATA	Budgeted costs per sub-function of the municipality of Roosendaal
DATA FILE	20200923 Gemeente Roosendaal scope 3 categorien
DATA SOURCE	Municipality of Roosendaal
YEAR	Costs booked for the year 2018 classified by different categories Costs budgeted for the years 2020/2021/2022/2023/2024
DOWNLOAD DATE	Date received: 23-9-2020
LINK TO WEBPAGE	Received by e-mail
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Ruwe data 20200923 Gemeente Roosendaal scope 3 categorien Sheet: ruwe data Roosendaal File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet 20200923 Gemeente Roosendaal scope 3 categorien Sheets: duurzame goederen; ingeleend personeel; overige goederen en diensten
UNIT OF MEASUREMENT	Euros
DATA QUALITY	High quality, direct output of the internal accounting system of the municipality of Roosendaal

SELECTIONS	Only categories 3.1 (expenses on the purchase or sale of areal positions), 3.2 (purchases of sustainable goods and services), 3.5 (the insourced employees), and 3.8 (other goods and services) were taken into account.
DATA TRANSFORMATIONS	The average costs budgeted over the 5 mentioned years was calculated to determine the percentage of costs per sectoral production category of the total costs within one category.

TOPIC	DESCRIPTION
DATA	Budgeted costs per category of the municipality of Roosendaal
DATA FILE	20200825 Gemeente Roosendaal scope 3 sub-functions
DATA SOURCE	Municipality of Roosendaal
YEAR	Costs booked for the year 2018 classified by different categories Costs budgeted for the years 2020/2021/2022/2023/2024
DOWNLOAD DATE	Date received: 19-8-2020
LINK TO WEBPAGE	Received by e-mail
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Ruwe data 20200825 Gemeente Roosendaal scope 3 sub-functions Sheet: Ruwe data Roosendaal File with calculations: O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet 20200825 Gemeente Roosendaal scope 3 sub-functions Sheets: Berekening verdeling; Overzicht verdeling
UNIT OF MEASUREMENT	Euros
DATA QUALITY	High quality, direct output of the internal accounting system of the municipality of Roosendaal
SELECTIONS	For function governance only the sub-function “other land and buildings” were taken into account
DATA TRANSFORMATIONS	The average costs budgeted over the 5 mentioned years was calculated to determine the percentage of costs per sectoral production category of the total costs within one category.

5.2.3 Final Database

TOPIC	DESCRIPTION	
DATA FILE	20200924 Scope 3 gemeenten 2017 20200924 Scope 3 gemeenten 2018	
LOCATION	O:\205305 PCAF 2020\Werkmap\Gemeenten\Scope 3\Factsheet	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Sheet Gemeenten_2017_onbewerkte_lv3_d		
Taakveld/balanspost	Sub-functions	-
Categorie	Categories	-
Gemeenten	All Dutch municipalities	-
2e plaatsing (1000 euro)	Costs per municipality for all sub-functions x categories	1000 Euro
Alleen positieve getallen	Only positive numbers (costs) are used for the calculations	1000 Euro
BBP obv taakveld	Monetary value per sub-function	Mln Euro
CO2 equivalent obv taakveld	CO_2 equivalent emissions per sub-function	Mln Kg
BBP obv taakveld	Monetary value per category	Mln Euro
CO2 equivalent obv taakveld	CO_2 equivalent emissions per category	Mln Kg
Som BBP taakveld + categorie	Sum of monetary value of sub-function and category	Mln Euro
Som CO2 equivalent taakveld + categorie	Sum of CO_2 equivalent of sub-function and category	Mln Kg
Kg/Euro	Sum of CO_2 equivalent / sum of monetary value	Kg/Euro
Kg CO2 equivalent per post per gemeente	Costs per municipality per sub-function and per category multiplied by 1000 Euro by column Kg/Euro	Kg
Sheet: Scope 3 gemeente		
Gemeenten	All Dutch municipalities	-
Gemeente code	Dutch code for municipality	
Scope 3 CO2 equivalent (kg)	Sum of kg CO_2 equivalent of all sub-functions x category per municipality	Kg
Scope 3 CO2 equivalent (ton)	Sum of kg CO_2 equivalent of all sub-functions x category per municipality	Ton

Data of scope 1 natural gas use and fossil fuel use by vehicles, scope 2, and scope 3 of the municipalities are merged in one document for 2018 and 2019.
Data location:
O:\205305 PCAF 2020\Werkmap\Gemeenten\BNG
Kopie van gemeenten data scopes 2018_omgerekend naar 2020 indeling
Kopie van gemeenten data scopes 2019_omgerekend naar 2020 indeling

Data location of the files with the final calculations for BNG Bank and NWB Bank:
BNG : O:\205305 PCAF 2020\Werkmap\Gemeenten\BNG
20201020 leningen BNG 2018
20201020 leningen BNG 2019

NWB: O:\205305 PCAF 2020\Werkmap\Gemeenten\NWB bank
20201019 gem prov NWB 2019 2018

6 Other local governments approach

6.1 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 jobs (FTE) is known, while for the municipalities the number of jobs (FTE) per municipality had to be calculated.
For scope 1 natural gas use and scope 2 electricity use, data of the years 2018 and 2019 were used for the calculations. Data of the year 2019 was the most recent data available.
For scope 1 fossil fuel use by company vehicles, data of the years 2017 and 2018 were used for the calculations. Data of the year 2018 about the number of company vehicles and kilometers was the most recent data available.
For scope 3, most recent data about CO_2 equivalent emissions to the air by the Dutch economy was data of the year 2018. Therefore for scope 3 data of the years 2017 and 2018 were used for the calculations.

Emission factors for natural gas, electricity, and company vehicles

Emission factors for natural gas, electricity, and for a company vehicle are used.
In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.

6.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	Number of jobs (FTE) working in the sector public administration and government services per province
Data File	20201001 ruwe data FTE in overheid per provincie 20201021 ruwe data FTE in overheid per provincie 2019
data Source	Lisa; het werkgelegenheidsregister van Nederland
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Date of modification: April 2020 Date of download 2018: 1-10-2020 Date of download 2019: 21-10-2020
Link to webpage	*https://www.lisa.nl/data/gratis-data/overzicht-lisa-data-per-provincie*
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20201001 ruwe data FTE in overheid per provincie 20201021 ruwe data FTE in overheid per provincie 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201001 scope 1 en 2 provincie 2018 20201021 scope 1 en 2 provincie 2019
Unit of measurement	FTE
Data quality	Data from LISA are based on observations/measurements of all locations of companies and not only one company as a whole. Also self-employed persons are taken into account. This makes it possible to present a picture of employment at every geographic and sectoral level.
Selections	No specific selections
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Number of jobs (FTE) working at the province
Data File	20201001 ruwe data FTE per provincie
data Source	A&O-fonds provincies
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Date of download 2018: 1-10-2020
Link to webpage	*https://personeelsmonitorprovincies.onderzoek.nl/index.cfm?action=main.report*
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20201001 ruwe data FTE werkend bij de provincie File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201001 scope 1 en 2 provincie 2017 (this calculation sheet only used for scope 1 fossil fuel for company vehicles) 20201001 Scope 1 en 2 provincies 2018 20201021 scope 1 en 2 provincie 2019
Unit of measurement	FTE
Data quality	Data has been directly acquired from provinces, using a questionnaire. Data quality is therefore indicated as high.

SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Supply of energy to the public administration and government services sector per province
DATA FILE	20201001 ruwe data geleverde energie sector overheid per provincie 20201021 ruwe data geleverde energie sector overheid per provincie 2019
DATA SOURCE	CBS/Statline
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	Date of modification: September 2020 Date of download 2018: 1-10-2020 Date of download 2019: 21-10-2020
LINK TO WEBPAGE	CBS Open data StatLine
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20201001 ruwe data geleverde energie sector overheid per provincie 20201021 ruwe data geleverde energie sector overheid per provincie 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201001 Scope 1 en 2 provincies 2018 20201021 scope 1 en 2 provincie 2019
UNIT OF MEASUREMENT	Natural gas: 1000 m^3 Electricity: 1000 kWh
DATA QUALITY	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific tranformations

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
DATA SOURCE	CBS/Statline
YEAR	Data used from 2017 and 2018 to calculate scope 1 fossil fuel use by vehicles
DOWNLOAD DATE	Date of modification: 26-3-2020 Date of download: 29-9-2020
LINK TO WEBPAGE	CBS Open data StatLine
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20201001 ruwe data bedrijfbestelautos O sector landelijk File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201001 Scope 1 en 2 provincies 2017 (calculation scope 1 fossil fuel use by vehicles 2017) 20201001 Scope 1 en 2 provincies 2018 (calculation scope 1 fossil fuel use by vehicles 2018)

UNIT OF MEASUREMENT	Number
DATA QUALITY	The research method of this data can be find here: 'Bezit bestelauto's'. Here you can find an additional research report: 'Bezit en gebruik bestelauto's'. Data comes from motor vehicle registration (RDW) and data is checked on content, quality, and usability by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Average kilometers driven with a passenger vehicle with a Dutch registration per year
DATA FILE	20201001 ruwe data km bedrijfswagens
DATA SOURCE	CBS/Statline
YEAR	Data used from 2017 and 2018 to calculate scope 1 fossil fuel use by vehicles
DOWNLOAD DATE	Date of modification: 17-9-2020 Date of download: 30-9-2020
LINK TO WEBPAGE	CBS Open data StatLine
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20201001 ruwe data km bedrijfswagens File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201001 Scope 1 en 2 provincies 2017 (calculation scope 1 fossil fuel use by vehicles 2017) 20201001 Scope 1 en 2 provincies 2018 (calculation scope 1 fossil fuel use by vehicles 2018)
UNIT OF MEASUREMENT	km
DATA QUALITY	The research method of this data can be find here:Verkeersprestaties personenauto's. The original data comes from the online kilometer registration (OKR) of the RDW. This is very reliable data.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Provincies 2018 onbewerkte Iv3-data
DATA FILE	20201014 totaal passiva provincie 2018
DATA SOURCE	CBS/Statline
YEAR	Data used from 2018
DOWNLOAD DATE	Date of modification: 23-9-2019 Date of download: 14-10-2020
LINK TO WEBPAGE	*https://iv3statline.cbs.nl/#/IV3/nl/dataset/45043NED/table?ts=1602676730545*
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Balans totaal 20201014 totaal passiva provincie 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Balans totaal 20201014 totaal passiva provincie doorgerekend 2018

UNIT OF MEASUREMENT	Euro
DATA QUALITY	High data quality. Directly supplied by provinces from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Provincies 2019 onbewerkte Iv3-data
DATA FILE	20201021 totaal passiva provincie 2019
DATA SOURCE	CBS/Statline
YEAR	Data used from 2019
DOWNLOAD DATE	Date of modification: 22-9-2020 Date of download: 21-10-2020
LINK TO WEBPAGE	*https://iv3statline.cbs.nl/#/IV3/nl/dataset/45047NED/table?ts=1607547635424*
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Balans totaal 20201021 totaal passiva provincie 2019 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Balans totaal 20201021 totaal passiva provincie doorgerekend 2019
UNIT OF MEASUREMENT	Euro
DATA QUALITY	High data quality. Directly supplied by provinces from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	CO_2 equivalent emissions to the air by the Dutch economy
DATA FILE	CO2 equivalent 2017 2018 per sector
DATA SOURCE	CBS/Statline Statline > Natuur en Milieu > Milieu > Milieurekeningen (nationale rekeningen) > Emissies naar de lucht door Nederlandse economie; nationale rekeningen
YEAR	Data used from 2017 and 2018 to calculate scope 3 Most recent data available was 2018
DOWNLOAD DATE	Date modification: 19 November 2019 Date of download: 22-7-2020
LINK TO WEBPAGE	StatLine - Emissies naar lucht door de Nederlandse economie; nationale rekeningen (cbs.nl)
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data CO2 equivalent 2017 2018 per sector File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201014 scope 3 provincie 2017 20201014 scope 3 provincie 2018
UNIT OF MEASUREMENT	CO_2 equivalent: mln kg
DATA QUALITY	The research method used to obtain these data can be find here: 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.
SELECTIONS	CO_2 equivalents of several sectors were added up because the monetary value of these sectors were not presented separately. The following sectors were added up: GHI MN OPQ RSTU
DATA TRANSFORMATIONS	Calculations were made with the data as described in the section calculation steps of municipalities (scope 3).

TOPIC	DESCRIPTION
DATA	The monetary value of all produced goods and services in the Netherlands
DATA FILE	20200928 Opbouw_bbp per sector 2017 2018
DATA SOURCE	CBS/Statline Statline > Macro-economie > Nationale rekeningen > Bbp, finale bestedingen en productie > Bruto binnenlands product > Opbouw binnenlands product (bbp); nationale rekeningen.
YEAR	Data used from 2017 and 2018 to calculate scope 3
DOWNLOAD DATE	Date of modification: 24-6-2020 Date of download: 22-7-2020
LINK TO WEBPAGE	StatLine - Opbouw binnenlands product (bbp); nationale rekeningen (cbs.nl)
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 20200928 Opbouw_bbp per sector 2017 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201014 scope 3 provincie 2017 20201014 scope 3 provincie 2018
UNIT OF MEASUREMENT	Mln Euro
DATA QUALITY	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 these data can be find here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/nationale-rekeningen
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	Calculations were made with the data as described in the section calculation steps of municipalities (scope 3).

TOPIC	DESCRIPTION
DATA	Expenses of all Dutch provinces per IV3/COFOG code
DATA FILE	2017: 20201001 ruwe data provincies onbewerkte Iv3 data 2017 2018: 20201001 ruwe data provincies onbewerkte Iv3 data 2018 Spending per sub-function and category per province
DATA SOURCE	CBS/Statline
YEAR	Data used from 2017 and 2018 to calculate scope 3
DOWNLOAD DATE	Date of modification: 2017: 24-9- 2018 2018: 23-9-2019 Date of download: 1-10-2020
LINK TO WEBPAGE	2017 StatLine - Provincies 2017 onbewerkte Iv3-data (cbs.nl) 2018 StatLine - Provincies 2018 onbewerkte Iv3-data (cbs.nl)
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Provincie\Ruwe data 2017: 20201001 ruwe data provincies onbewerkte Iv3 data 2017 2018: 20201001 ruwe data provincies onbewerkte Iv3 data 2018 File with calculations: O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet 20201014 scope 3 provincie 2017 20201014 scope 3 provincie 2018
UNIT OF MEASUREMENT	1000 Euro
DATA QUALITY	High data quality. Directly supplied by provinces from internal accounting systems. They deliver the data to CBS. The data has not been edited by CBS.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	Calculations were made with the data as described in the section calculation steps of municipalities (scope 3).

6.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	20201001 scope 1 en 2 provincie 2017 (Scope 1 fossil fuel use by vehicles 2017) 20201001 score 1 en 2 provincie 2018 (Scope 1 natural gas use and Scope 2 electricity use 2018 and Scope 1 fossil fuel use by vehicles 2018) 20201021 scope 1 en 2 provincie 2019 (Scope 1 natural gas use and Scope 2 electricity use 2019)	
LOCATION	O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Sheet: aardgas en elektra provincie (in file 2018 and 2019)		
Provincie	Dutch provinces	-
FTE provincie	FTE per province	FTE
FTE total overheid	Total FTE working in governance per province	FTE
% FTE provincie	Percentage of FTE per municipality relative to FTE working in the sector public administration and government services per province	Percentage
Geleverde aardgas m3	Natural gas supply per province	m^3
Geleverde elektra kWh	Electricity supply per province	kWh
Aardgas provincie m3	Calculation of natural gas supply per province	m^3
Elektra provincie kWh	Calculation of electricity supply per province	kWh
Omrekenfactor aardgas	Emission factor for natural gas	kg CO_2 equivalent per m^3
Omrekenfactor elektra	Emission factor for electricity	kg CO_2 equivalent per kWh
Scope 1 CO2 equivalent aardgas	Attribution of natural gas to the CO_2 equivalent emissions	Ton
Scope 2 CO2 equivalent elektra	Attribution of electricity to the CO_2 equivalent emissions	Ton
Sheet CO2 autos (in file 2017 and 2018)		
Provincie	Dutch provinces	
FTE provincie	FTE per province	FTE
% FTE provincie	FTE per municipality	Percentage
# bedrijsautos	Number of company vehicles per municipality	Number
Omrekenfactor kg CO2/voertuigkilometer	Emission factor for passenger transport by car	kg CO_2 equivalent/km
Scope 1 CO2 equivalent auto	Attribution of fossil fuel for company vehicles to the CO_2 equivalent emissions	Ton

TOPIC	DESCRIPTION	
DATA FILE	20201014 scope 3 provincies 2017 20201014 scope 3 provincies 2018	
LOCATION	O:\205305 PCAF 2020\Werkmap\Provincie\Factsheet	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Sheet: berekening 2017 (file 2017) / blad 1 (file 2018)		
Taakveld/balanspost	Sub-functions	-
Categorie	Categories	-
Provincie	All Dutch provinces	-
2^e plaatsing (1000 euro)	Costs per province for all sub-functions x categories	1000 Euro

Alleen positieve getallen	Only positive numbers (costs) are used for the calculations	1000 Euro
BBP obv taakveld	Monetary value per sub-function	Mln Euro
CO2 equivalent obv taakveld	CO_2 equivalent emissions per sub-function	Mln Kg
BBP obv taakveld	Monetary value per category	Mln Euro
CO2 equivalent obv taakveld	CO_2 equivalent emissions per category	Mln Kg
Som BBP taakveld + categorie	Sum of monetary value of sub-function and category	Mln Euro
Som CO2 equivalent taakveld + categorie	Sum of CO_2 equivalent of sub-function and category	Mln Kg
Kg/Euro	Sum of CO_2 equivalent / sum of monetary value	Kg/Euro
Kg CO2 equivalent per post per provincie	Costs per province per sub-function and per category multiplied by 1000 Euro by column Kg/Euro	Kg
Provincie	All Dutch provinces	-
Scope 3 CO2 equivalent (kg)	Sum of kg CO_2 equivalent of all sub-functions x category per province	Kg
Scope 3 CO2 equivalent (ton)	Sum of kg CO_2 equivalent of all sub-functions x category per province	Ton

Data location of the files with the final calculations for BNG and NWB Bank:
BNG : O:\205305 PCAF 2020\Werkmap\Gemeenten\BNG
20201020 leningen BNG 2018
20201020 leningen BNG 2019

NWB: O:\205305 PCAF 2020\Werkmap\Gemeenten\NWB bank
20201019 gem prov NWB 2019 2018

7 Water authorities approach

The climate monitor water authorities[15] (Arcadis, 2020) 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 in the three scopes in detail, and per individual water authority. Therefore, the description of this approach is brief. For more information on the realization of the emissions, please consult the 'klimaatmonitor waterschappen 2020' (Arcadis, 2020).

7.1 General approach

<table>
<tr><th>Topic</th><th>Outcome</th></tr>
<tr><td>Scopes Covered</td><td>The klimaatmonitor waterschappen covers all three scopes in detail. The following table shows the underlying themes of the scopes.

<table>
<tr><th>Emission</th><th>Scope</th></tr>
<tr><td>Natural gas installations and buildings</td><td>Scope 1</td></tr>
<tr><td>Diesel installations and buildings</td><td>Scope 1</td></tr>
<tr><td>Other fuels installations and buildings</td><td>Scope 1</td></tr>
<tr><td>Fuel company vehicles</td><td>Scope 1</td></tr>
<tr><td>Fuel freight transport</td><td>Scope 1</td></tr>
<tr><td>Process emissions drainage biogas</td><td>Scope 1</td></tr>
<tr><td>Electricity installations and buildings</td><td>Scope 2</td></tr>
<tr><td>Warmth installations and buildings</td><td>Scope 2</td></tr>
<tr><td>Fuel private cars</td><td>Scope 3</td></tr>
<tr><td>Fuel commuter traffic</td><td>Scope 3</td></tr>
<tr><td>Public transport</td><td>Scope 3</td></tr>
<tr><td>Fuel business flights</td><td>Scope 3</td></tr>
<tr><td>Diesel outsourced sewage sludge transport</td><td>Scope 3</td></tr>
<tr><td>Diesel outsourced maintenance water systems</td><td>Scope 3</td></tr>
<tr><td>Diesel outsourced freight transport</td><td>Scope 3</td></tr>
<tr><td>Purchase of metal salts</td><td>Scope 3</td></tr>
<tr><td>Purchase of polymer</td><td>Scope 3</td></tr>
</table>
Source: Arcadis 2020[16]</td></tr>
<tr><td>Portfolio Coverage</td><td>Data is collected for all 21 water authorities in the Netherlands. This means the portfolio coverage ratio will be close to 100%.</td></tr>
<tr><td>Data</td><td>Data was used from the climate monitor water authorities (Arcadis, 2020). 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 in detail, and per individual water authority.

Arcadis acquired the data from water authorities via an questionnaire, in which quantitative and qualitative data were collected.</td></tr>
</table>

[15] https://www.uvw.nl/waterschappen-bereiken-energie-en-klimaatambities-2020/
[16] https://www.uvw.nl/waterschappen-bereiken-energie-en-klimaatambities-2020/

Emission factors used	The consumed fuel, warmth, and electricity can be converted to CO_2 equivalent emissions using grid emission factors. Within the Netherlands, www.co2emissiefactoren.nl gives a list of widely accepted and uniform grid emission factors. PCAF has chosen to use the grid emission factor related to direct emissions, expressed under column TTW value on www.co2emissiefactoren.nl. In chapter 11 of this report is explained which emission factors are used and why these emission factors are used. The 'klimaatmonitor waterschappen' (Arcadis, 2020) uses the same emission factors from www.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, the CO_2 equivalent emissions are recalculated, bases on the raw values of the fuel, warmth, and electricity use in the report. There are a few exceptions to be made due to a lack of information on certain emission factors as provided in the monitor. A few important notes below. WTW factor used instead of TTW: **Fuel company vehicles and freight transport**: Insufficient information is provided in order to calculate the TTW factor. Therefore the original WTW factor is used for both these indicators. **Process emissions drainage biogas**: For the drainage of biogas the WTW- and the TTW factor have the exact same factor. Calculation was therefore not necessary and the WTW factor was used. **Purchase of metal salts and polymer**: Insufficient information is provided in order to calculate the TTW factor. Therefore the original WTW factor is used for both these indicators. Other notes: **Other fuels installations and buildings**: For other fuels it is not specified which fuels this concerns. It is however stated that other fuels consists mostly of LPG. We therefore use the TTW factor for LPG. Emission factors for LPG are listed for liters, while the total amount of other fuels is listed as gigajoules (GJ). We used a list of emission factors by RVO to recalculate the gigajoules to kg's. We then used the rule of thumb stated on p. 84 of the monitor which states that 0,52kg equals 1 liter. **Electricity installations and buildings**: Water authorities use a lot of electricity in their processes. This electricity is mainly green and from sources outside of The Netherlands accompanied with a Guarantee of Origin (GoO). For footprint calculations, it is now customary to convert green electricity from foreign sources acquired with GoO's with a emission factor for grey electricity. This assumption is based on new insights and the fact that GoO's do not contribute to the greening of the Dutch electricity production. This approach differs from the approach in the 'klimaatmonitor waterschappen' (Arcadis, 2020), and therefore the outcomes are different as well. **Warmth installations and buildings**: The origin of the purchased warmth is not specified in the monitor. We are therefore unable to determine which emission factor to use. When unable to determine the origin of the warmth it is advised to use the STEG factor. We thus used the TTW factor for STEG. **Fuel business flights**: CO2emissiefactoren.nl differentiates between 3 types of business flights according to the total distance of a flight. It is unclear what percentage of the fuel use can be prescribed to a which category of distance. The category of >2.500km flights seems to very nearly match the presented CO_2 scores for the fuel business flights indicator. Therefore the TTW factor for >2.500km flights was used here.

	Because of this different set of emission factors in the PCAF approach, the GHG-emissions in this report will be slightly different than in the Arcadis report, and the data quality reduced from 1 (PCAF report 2019) to 2 (PCAF report 2020).
Calculation steps	For the exact calculation steps per scope, consult the Arcadis (2020) report[17]. For scope 2 electricity installations and buildings, only sustainable energy generated in the Netherlands resulted in zero CO_2 equivalent emissions. To calculate the CO_2 equivalent emissions of sustainable energy from outside the Netherlands the emission factor for grey energy was used (Table 11.1). The emission factor for grey energy was used because sustainable energy from outside the Netherlands has no direct impact in the Netherlands itself.
Avoided emissions	Avoided emissions can only be subtracted in the projects methodology (PCAF, 2019). In this approach we use the corporate loans methodology. For the corporate loans methodology the PCAF report states: "avoided emissions are not appropriate for this asset class". Data on renewable energy use per water authority are available in the Arcadis (2020) report. Avoided emissions as such are however not calculated. In the future, when PCAF develops a more elaborate plan to deal with avoided emissions, this could be interesting to follow up.
Asset class specific considerations	The Arcadis (2020) report gives a lot of specific considerations and recommendations for the water authorities sector. For a detailed presentation, please refer to the climate monitor for water authorities (Arcadis, 2020).
Attribution	As a basic attribution principle, the lender accounts for a portion of the GHG emissions of the financed company determined by the ratio between the lender's exposure and the enterprise value of the company (in this asset class total balance sheet of the company). For this, the actual outstanding exposure is used. This means adjusting the numerator of the attribution factor annually (end-of-year exposure), resulting in the attribution to decline to 0 at the end of the lifetime of the loan (when it is fully repaid). $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$
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.16
Data quality estimate	The method for water authorities is scaled into data quality level 2, because of the detailed underlying information provided in the Arcadis (2020) study. The data is however not audited. Especially the data on energy consumption is of high liability. The transport data is more model based and might therefore also be quality level 2.5.

Data quality	Description
1	Actual energy consumption, converted to CO_2 eq-emissions using verified emission factors and detailed activity data specific to the type of energy consumed
2	Actual energy consumption, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source
3	Modeled regional activity data based on robust assumptions, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
4	Modeled activity data in a country, converted to CO_2 eq-emissions using emissions factors for energy from undefined fuel source
5	Highly modeled activity or uncertain activity data in a country, converted to CO_2 eq-emissions using default emissions factors for energy from undefined fuel source

[17] https://www.uvw.nl/waterschappen-bereiken-energie-en-klimaatambities-2020/

7.2 Data factsheet per datafile used

Topic	DESCRIPTION
Data	Emission factors In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
Data File	20201002 emissiefactoren
data Source	CO2emissiefactoren
Year	2017-2020
Download date	23-09-2020
Link to webpage	https://www.co2emissiefactoren.nl/wijzigingen-overzicht/
Internal location	O:\205305 PCAF 2020\Werkmap\Emissiefactoren
unit of measurement	kg/GJ, kg/Nm3 & kg/kWh
Data quality	High. These emission factors are the official factors recommended by the Dutch government and PCAF harmonized approach.
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Dutch emissions list RVO
Data File	Nederlandse-energiedragerlijst-versie-januari-2020
data Source	RVO
Year	2020
Download date	23-10-2020
Link to webpage	https://www.rvo.nl/sites/default/files/2020/03/Nederlandse-energiedragerlijst-versie-januari-2020.pdf
Internal location	O:\205305 PCAF 2020\Werkmap\Waterschappen\Data
unit of measurement	GJ / kg
Data quality	High. These emission factors are the official factors recommended by the Dutch government.
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Fuel, warmth and electricity use per water authority
Data File	Klimaatmonitor-Waterschappen-2019
data Source	Arcadis, 2020
Year	2019
Download date	21-09-2020
Link to webpage	https://www.uvw.nl/waterschappen-bereiken-energie-en-klimaatambities-2020/
Internal location	O:\205305 PCAF 2020\Werkmap\Waterschappen\Data
unit of measurement	multiple
Data quality	The method for water authorities is scaled into data quality level 2, because of the detailed underlying information provided in the Arcadis (2020) study. The data is however not audited. Especially the data on energy consumption is of high

	liability. The transport data is more model based and might therefore also be quality level 2.5.
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	Different emission factors used (TTW instead of WTW). Therefore slightly different outcomes than in the original Arcadis report.

TOPIC	DESCRIPTION
DATA	Total paasiva per water authority 2018 and 2019
DATA FILE	Totale passiva [euro]
DATA SOURCE	Unie van Waterschappen, WAVES, ABF Research
YEAR	2018 and 2019
DOWNLOAD DATE	23-10-2020
LINK TO WEBPAGE	https://live-waves.databank.nl/jive
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterschappen\Data
UNIT OF MEASUREMENT	Euro
DATA QUALITY	High data quality. Directly supplied by water authorities from internal accounting systems.
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Allocation purchased electricity 2019
DATA FILE	Verdeling ingekochte elektriciteit (002).pdf
DATA SOURCE	Unie van Waterschappen, acquired via mail
YEAR	2019
DOWNLOAD DATE	11-12-2020
LINK TO WEBPAGE	None, acquired via mail
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Waterschappen\Data
UNIT OF MEASUREMENT	kWh
DATA QUALITY	High data quality. Directly supplied by water authorities from internal accounting systems.
SELECTIONS	
DATA TRANSFORMATIONS	Transformed into excel table (file: Verdeling ingekochte elektriciteit Tabel omzetting)

7.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	Totaaloverzicht emissies waterschappen 2018 en 2019	
LOCATION	O:\205305 PCAF 2020\Werkmap\Waterschappen	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Naam waterschap	Name water authority	-
Scope 1	Total kg CO_2 equivalent emission per water authority in scope 1	Ton
Scope 2	Total kg CO_2 equivalent emission per water authority in scope 2	Ton
Scope 3	Total kg CO_2 equivalent emission per water authority in scope 3	Ton
Scope 1/2/3	Total kg CO_2 equivalent emission per water authority in total	Kg's
lening bank	Total loan distributed by the bank in euros	Euros
Balans totaal	Total balance sheet in euros	Euros
CO2 door bank	The total CO_2 equivalent emissions in kilograms that can be attributed to the bank	Kg's

8 Educational institutions approach

8.1 General factsheet

Topic	Outcome
Scopes Covered	**Scope 1 and 2 of the education sector** Scope 1 emissions are the direct GHG emissions of the different education sectors. 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. Therefore scope 2 only includes purchased electricity. Data of actual natural gas and electricity use per educational organization is not available. Data of the cost 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[18], water use is less than 5% of the total costs of energy and water.
Portfolio Coverage	Data is collected for approximately 7755 educational institutions in the Netherlands. This means the portfolio coverage ratio for this sector will be around 70% (not all institutions in the education asset class are necessarily schools)
Data	Data about the supply of energy to the education sector comes from the Dutch National Statistics office (CBS). Data is about 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. The data comes from connection registers of the energy compagnies. It is based on actual energy consumption and therefore very reliable. Data about transaction prices for natural gas and electricity come from the Dutch National Statistics office (CBS). The data is obtained from energy companies by sending them surveys. Data of addresses of the locations of the education organizations, data of number of pupils/students per location of the education organizations, costs for energy per education organization, and total activa per education organization come from DUO: the Dutch Education Service of Ministry of Education, Culture and Science. In a few cases missing data was extracted from annual reports. If that is the case, it is shown in the calculations sheets and the annual reports are included in the data folders.
Emission factors used	Emission factors for natural gas and electricity are used. In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
Calculation steps	Per municipality it is known how much natural gas and energy 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 was calculated per municipality and afterwards the percentage of costs for natural gas and electricity was calculated relative to the total costs for natural gas plus electricity. % of costs for natural gas for the education sector per municipality (A) = costs for natural gas / total costs for natural gas + electricity % of costs for electricity for education sector per municipality (B) = costs for electricity / total costs for natural gas + electricity

[18] http://32lessenvoordetoekomst.nl/wp-content/uploads/2018/02/24.Energie-besparen-op-school-Factsheet-energiegegevens.pdf

	The average price for natural gas was calculated according to 4 consumption classes provided by CBS. To calculate the price for natural gas per m3 the conversion factor for natural gas of 0.03165 GJ/m3 was used (Klimaatmonitor,2020; energie inhoud aardgas onderwaarde in GJ/m3). The average price for electricity was calculated according to 6 consumption classes provided by CBS. Per education organization the costs for total energy and water is known (DUO). As stated earlier, the costs for water are not taken into account. The total costs for energy has to be divided in costs for natural gas and costs for electricity. An education organization can have several schools located in different municipalities. Per school location the municipality and the number of students is known. According to this information the percentage of students per education organization per municipality was calculated. % students per education organization per municipality (C) = number of students per education organization per municipality / total number of students per education organization. The next step was to divide the total costs for energy per education organization to the municipalities that have locations of that organization according to the % of students (C). Costs per education organization per municipality = % of students per education organization per municipality (C) * total costs for energy of education organization. The costs per education organization per municipality was 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). Thereafter, the costs for natural gas and electricity per education organization per municipality were added up to come to the total costs for natural gas (D) and electricity (E) per education organization. According to the total costs for natural gas (D) and electricity (E) per education organization the correct price per GJ for natural gas and per kWh for electricity was chosen according to the usage of natural gas and electricity (lower price when use is higher). To convert GJ natural gas to m3 the conversion factor for natural gas of 0.03165 GJ/m3 was used (Klimaatmonitor, 2020). The costs for natural gas and electricity per education organization were divided by the cost per m3(natural gas) and per kWh (electricity). Thereafter, the m^3 natural gas was multiplied by the emission factor for natural gas (Table 11.1) and divided by 1000 to result in ton of CO_2 equivalent for scope 1. The kWh electricity was multiplied by the emission factor for electricity (Table 11.1) and divided by 1000 to result in ton of CO_2 equivalent for scope 2. Per education organization the total balance sheet (equity + total debts) was used to make the following calculation: $$\sum_{i=1}^{n} \mathbf{CO_2eq} \times \frac{\mathbf{Outstanding\ loan}}{\mathbf{Total\ balance\ sheet}}$$ There is a difference between the method used this year in comparison to 2019. This year it is taken into account that one education organization can have schools in different municipalities. In addition, the number of pupils/students per location were taken into account in the calculation as well. In 2019, the average annual use of natural gas and electricity was used of the municipality where the headquarters of the education organization was located. The method of this year is a small improvement compared to last year because different schools in different municipalities within one education organization is mainly an issue for primary schools and the percentage of loans to primary school by the bank is small. Therefore, the impact of this improvement is small

<table>
<tr><td>Avoided emissions</td><td>In the calculations the total costs for energy is used to calculate total ton of CO_2 equivalent. 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 CO_2 equivalent emissions due to for example solar panels is therefore indirectly included in this calculation.

Unfortunately, no specific data on renewable energy is available for education organizations.</td></tr>
<tr><td>Asset class specific considerations</td><td>No additional considerations.</td></tr>
<tr><td>Attribution</td><td>To calculate the CO_2 equivalent footprint following the PCAF principles, a general approach was developed. First, 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.

$$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$</td></tr>
<tr><td>Limitations</td><td>A 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 was used.

For some locations of an education organization the number of students was missing. If the number of students was missing, this location was left out of the calculations.

For some education organizations the total costs for energy and water was missing. If a missing education organization was in the loan portfolio of the bank. The data was gathered by the annual report of the education organization.</td></tr>
<tr><td>Data quality estimate</td><td>In this study, the method used for educational organizations is based on robust estimations of electricity and natural gas, because estimations can be made based on actual expenditure on energy (gas and electricity consumption) per education organization.
For natural gas use, this is a known specific type of energy, but for electricity use, energy comes from undefined sources. That is why scope 1 has a data quality value of 1.5, and scope 2 has a data quality estimate of 2. This results in a data quality score of 1.75 for the education sector.

<table>
<tr><th>Score</th><th>Description</th></tr>
<tr><td>Score 1</td><td>Actual energy consumption, converted to CO_2eq-emissions using verified emission factors and detailed activity data specific to the type of energy consumed</td></tr>
<tr><td>Score 2</td><td>Actual energy consumption, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 3</td><td>Modeled regional activity data based on robust assumptions, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 4</td><td>Modeled activity data in a country, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source</td></tr>
<tr><td>Score 5</td><td>Highly modeled activity or uncertain activity data in a country, converted to CO_2eq-emissions using default emissions factors for energy from undefined fuel source</td></tr>
</table>
</td></tr>
</table>

8.2 Data factsheet per datafile used

Topic	DESCRIPTION
Data	Supply of energy to the education sector
Data File	20200927 ruwe data geleverd aardgas en elektra sector onderwijs per gemeente
data Source	CBS
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Date of modification: September 2020 Date of download 2018: 17-8-2020 Date of download 2019: 1-10-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82538NED/table?ts=1597657120347
Internal location	Original data: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 20200927 ruwe data geleverd aardgas en elektra sector onderwijs per gemeente File with calculations: O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2018\Factsheet 20200907 geleverde gas en elektriciteit aan onderwijs per gemeente O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2019\Factsheet 20200927 geleverde gas en elektriciteit aan onderwijs per gemeente 2019
unit of measurement	Natural gas: 1000 m3 Electricity: 1000 kWh
Data quality	Data quality score: 2. Highly reliable data, because of the manner of registration. There have been a lot of control- and correction methods used, which can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/leveringen-van-elektriciteit-en-aardgas-via-het-openbare-net
Selections	No specific selections
Data transformations	No specific transformations

TOPIC	DESCRIPTION
DATA	Transactions prices for natural gas and electricity
DATA FILE	20200927 ruwe data transactieprijzen aardgas en elektriciteit
DATA SOURCE	CBS
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	Data of download: 2018: 3-9-2020 2019: 15-9-2020
LINK TO WEBPAGE	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81309NED/table?ts=1599143752393
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 20200927 ruwe data transactieprijzen aardgas en elektriciteit File with calculations: O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2018\Factsheet 20200903 prijzen aardgas en elektriciteit 2018 O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2019\Factsheet 20200915 prijzen aardgas en elektriciteit 2019
UNIT OF MEASUREMENT	Natural gas: GJ calculated to m^3 Electricity: euro per kWh
DATA QUALITY	The research method to obtain these data can be find here:korte onderzoeksbeschrijving Aardgas en elektriciteit, gemiddelde prijzen van eindverbruikers. The data is obtained from energy companies by sending them surveys.
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 TRANSFORMATIONS	For the minimum and maximum usage per class the total price was calculated (euro per GJ). This was used to choose the correct price per education organization. If the organization uses less energy 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 were used to calculate the percentage of costs for natural gas and electricity per municipality (see previous data file and calculation steps).

TOPIC	DESCRIPTION
DATA	Energy-content of natural gas
DATA FILE	Energie-inhoud aardgas (onderwaarde_in GJ_m3) 2020
DATA SOURCE	Klimaatmonitor
YEAR	2017 - 2020
DOWNLOAD DATE	23-09-2020
LINK TO WEBPAGE	https://klimaatmonitor.databank.nl/Jive
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Woningcorporaties\Data
UNIT OF MEASUREMENT	GJ/m3
DATA QUALITY	Official statistic. https://www.infomil.nl/onderwerpen/duurzaamheid-energie/energiebesparing/vragen-antwoorden/overige-vragen/omrekening-verbruik/
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Emission factors In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
DATA FILE	20201002 emissiefactoren
DATA SOURCE	CO2emissiefactoren
YEAR	2017-2020
DOWNLOAD DATE	23-09-2020
LINK TO WEBPAGE	https://www.co2emissiefactoren.nl/wijzigingen-overzicht/
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Emissiefactoren
UNIT OF MEASUREMENT	kg/GJ, kg/Nm3 & kg/kWh
DATA QUALITY	High. These emission factors are the official factors recommended by the Dutch government and PCAF harmonized approach.
SELECTIONS	No specific selections.
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Addresses of schools and universities These files has been used as a reference to sometimes check addresses, authority numbers, and BRIN numbers.
DATA FILE	Several files see: internal locations in this table
DATA SOURCE	DUO: Education Service of Ministry of Education, Culture and Science
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	Primary school, secondary school, secondary vocational education, higher professional education and university education data of modification: 1-9-2020 Date of download: 25-8-2020 for the year 2018 Date of download: 15-9-2020 for the year 2019
LINK TO WEBPAGE	***Primary schools*** https://duo.nl/open_onderwijsdata/databestanden/po/adressen/adressen-po-3.jsp ***Secondary schools*** https://duo.nl/open_onderwijsdata/databestanden/vo/adressen/adressen-vo-2.jsp ***Special secondary schools*** https://duo.nl/open_onderwijsdata/databestanden/po/adressen/adressen-po-2.jsp ***Secondary vocational education*** https://duo.nl/open_onderwijsdata/databestanden/mbo/adressen/adressen-mbo-1.jsp ***Higher professional education and university education*** https://duo.nl/open_onderwijsdata/databestanden/ho/adressen/adressen-ho1.jsp
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 03-alle-vestigingen-bo 02-alle-vestigingen-vo 20201015 Kopie 02-hoofdvestigingen-sbo-so-en-vso 01-adressen-instellingen 01-instellingen-hbo-en-wo
UNIT OF MEASUREMENT	Not applicable
DATA QUALITY	Registration data
SELECTIONS	Not applicable
DATA TRANSFORMATIONS	Not applicable

TOPIC	DESCRIPTION
DATA	Number of pupils or students per education organization
DATA FILE	Several files see: internal locations in this table
DATA SOURCE	DUO: Education Service of Ministry of Education, Culture and Science
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	**Primary schools and secondary schools** Publication date: 1-10-2018 for the year 2018. Date of download 15-8-2020. Publication date: 1-10-2019 for the year 2019. Date of download 15-8-2020. Date of download special VO 2018: 15-10-2020 Date of download special VO 2019: 19-10-2020 **Secondary vocational education** Publication date: 1-10-2019. Date of download: 27-9-2020. **Higher professional education and university education** Publication date: 1-10-2019. Date of download: 27-9-2020.
LINK TO WEBPAGE	**Primary schools** https://duo.nl/open_onderwijsdata/databestanden/po/leerlingen-po/po-totaal/bo-gewicht-leeftijd.jsp **Secondary schools** https://duo.nl/open_onderwijsdata/databestanden/vo/leerlingen/leerlingen-vo-1.jsp **Special secondary schools** https://duo.nl/open_onderwijsdata/databestanden/po/leerlingen-po/po-totaal/leerlingen-po-7.jsp **Secondary vocational education** https://duo.nl/open_onderwijsdata/databestanden/mbo/onderwijsdeelnemers/deelnemers-mbo1.jsp ***Higher professional education*** https://duo.nl/open_onderwijsdata/databestanden/ho/ingeschreven/hbo-ingeschr/ingeschrevenen-hbo1.jsp ***University education*** https://duo.nl/open_onderwijsdata/databestanden/ho/ingeschreven/wo-ingeschr/ingeschrevenen-wo1.jsp
INTERNAL LOCATION	Original data: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 01-leerlingen-po-soort-po-cluster-leeftijd-2018-2019 01-leerlingen-po-soort-po-cluster-leeftijd-2019-2020 01-leerlingen-vo-per-vestiging-naar-onderwijstype-2018 01-leerlingen-vo-per-vestiging-naar onderwijstype-2019 20201015 aantal leerlingen speciaal onderwijs 2018 20201019 aantal leerlingen speciaal onderwijs 2019 01-deelnemers-per-instelling-bestuur-plaats-gemeente-provincie-type-mbo-2015-2019 01a-ingeschrevenen-hbo-2019 01a-ingeschrevenen-wo-2019 Files with calculations: O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2018\Factsheet 20200907 vestigingen bo # leerlingen 2018 verdeling bevoegdgezag en gemeente 20201209 check herkomst totaal aantal leerlingen VO 2018 20201209 Totaal aantal leerlingen per BRIN VO2018 20201209 tussen rekenstap voor aantal leerlingen VO 2018 20200914 lasten per gemeente en bevoegdgezag VO 20200914 lasten per gemeente en bevoegdgezag MBO

	20200914lasten per gemeente per bevoegdgezag HBO WO 20201019 twee missende NWB Bank 2018 20201020 dubbele bevoegdgezagen BNG Bank Final calculation sheet: 20200922 finale versie alle onderwijsgroepen 2018 O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2019\Factsheet 20200922 lasten per gemeente per bevoegdgezag PO 2019 20201209 check aantal leerlingen VO 20201209 totaal aantal leerlingen VO toegevoegd 20201209 tussen rekenstap aantal leerlingen VO 2019 20201013 lasten per gemeente per bevoegdgezag VO 2019 20201011 # leerlingen mbo 2019 20200922 lasten per gemeente per bevoegdgezag mbo 2019 20201011 # leerlingen hbo 2019 20201011 # leerlingen wo 2019 20200922 lasten per gemeente per bevoegdgezag HBO WO 20201019 twee missende NWB Bank 2019 20201019 dubbele bevoegdgezagen BNG 2019 Final calculation sheet: 20200922 finale versie alle onderwijsgroepen 2019
UNIT OF MEASUREMENT	Not applicable
DATA QUALITY	Registration data
SELECTIONS	Not applicable
DATA TRANSFORMATIONS	Not applicable

TOPIC	DESCRIPTION
DATA	Costs for energy and water per education organization
DATA FILE	20200825 Kopie van 14-lasten-2014-2018 20200915 Kopie van 14-lasten-2019
DATA SOURCE	DUO: Education Service of Ministry of Education, Culture and Science
YEAR	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
DOWNLOAD DATE	2018: publication date 18-9-2019. Downloaded 17-8-2020. 2019: publication date 15-9-2020. Downloaded 15-9-2020.
LINK TO WEBPAGE	https://duo.nl/open_onderwijsdata/publicaties/financien/xbrl.jsp 2018: 14. Lasten 2014-2018 2019: 14. Lasten 2015-2019
INTERNAL LOCATION	Original data 2018: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 20200825 Kopie van 14-lasten-2014-2018 Original data 2019: O:\205305 PCAF 2020\Werkmap\Onderwijs\ Ruwe data 20200915 Kopie van 14-lasten-2019
UNIT OF MEASUREMENT	Euros
DATA QUALITY	Schoolboards send the data to DUO. The numbers are not checked by an accountant or by OCW/DUO.
SELECTIONS	No specific selections
DATA TRANSFORMATIONS	No specific transformations

Topic	Description
Data	Total activa per education organization
Data File	20200819 Kopie van 01-balans-2014-2018 20200915 Kopie van 01-balans-2019
data Source	DUO: Education Service of Ministry of Education, Culture and Science
Year	Data used from 2018 and 2019 to calculate scope 1 natural gas use and scope 2 electricity use
Download date	Year 2018: publication date 18-9-2019. Downloaded 17-8-2020. Year 2019: publication date 15-9-2020. Downloaded 15-9-2020.
Link to webpage	https://duo.nl/open_onderwijsdata/publicaties/financien/xbrl.jsp 2018: 01. Balans 2014-2018 2019: 01. Balans 2015-2019
Internal location	Original data 2018: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 20200819 Kopie van 01-balans-2014-2018 Original data 2019: O:\205305 PCAF 2020\Werkmap\Onderwijs\Ruwe data 20200915 Kopie van 01-balans-2019
unit of measurement	Euros
Data quality	Schoolboards send the data to DUO. The numbers are not checked by an accountant or by OCW/DUO.
Selections	No specific selections
Data transformations	No specific transformations

8.3 Final Database

Topic	Description	
Data File	Finale versie alle onderwijsgroepen 2018 Finale versie alle onderwijsgroepen 2019	
Location	O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2018\Factsheet O:\205305 PCAF 2020\Werkmap\Onderwijs\Belangrijk\2019\Factsheet	
Sheet	Finale berekening	
Column-name	**description**	**unit**
Type	Type of eduation: PO, VO, MBO, HBO, WO	
Bevoegdgezag	Unique number for education organization	
Kvknummer	Unique number for a company registered by the Dutch Kamer van Koophandle	
Kosten aardgas	This was calculated see calculation steps Costs for natural gas per education organization	euro
Kosten elektra	This was calculated see calculation steps Costs for electricity per education organization	euro
Prijs aardgas (euro per GJ)	According to the total cost of natural gas the correct price per GJ was chosen.	Euro/GJ
Prijs elektra (euro per kWh)	According to the total cost of electricity the correct price per kWh was chosen.	Euro/kWh
Aardgas (GJ)	Calculated Costs for natural gas (euro) / price for natural gas (euro per GJ)	GJ

Energie inhoud aardgas (GJ/m3)	Fixed number	GJ/m^3
Aardgas (m3)	Calculated Natural gas (GJ) / Energy content natural gas (GJ/m^3)	m^3
Elektra (kWh)	Calculated Costs for electricity (euro) / price for electricity (euro per kWh)	kWh
Emissiefactor aardgas	Fixed number	
Emissiefactor elektra	Fixed number	
Aardgas scope 1 (ton)	Calculated (Natural gas (m3) * emission factor natural gas) / 1000	Ton
Elektra scope 2 (ton)	Calculated (Electricity (kWh) * emission factor electricity) / 1000	Ton
Totaal Activa	Provided by ministry of Education, Culture and Science	Euro

Data location of the files with the final calculations for BNG and NWB Bank:
BNG : O:\205305 PCAF 2020\Werkmap\Gemeenten\BNG
20201020 leningen BNG 2018
20201020 leningen BNG 2019

NWB: O:\205305 PCAF 2020\Werkmap\Gemeenten\NWB bank
20201019 gem prov NWB 2019 2018

9 HealthCare institutions approach

9.1 Sector specific considerations

As from 2018, energy costs are no longer available as a single indicator in the yearly reports on healthcare institutions (DigiMV) provided by the Ministry of Health, Welfare and Sport. In the composed yearly reports, costs made for the purchase of energy, are combined with the total costs of maintenance.

It is not possible to derive electricity and natural gas costs from the combined figure for energy and maintenance. While energy costs can be quite stable over time, the costs for maintenance can vary greatly amongst different institutions and years. Making a reliable estimate is not possible due to these fluctuations.

The general factsheet has been composed based on the approach from last year's PCAF report by Het PON & Telos. This is the approach used to come to carbon emission numbers for reporting year 2018.

For reporting year 2020, an estimation has been made based on sector specific electricity and natural gas use. This data is retrieved from CBS Statline, and is highly reliable because it is based on network registrations. Electricity use has increased by 1.65%, while natural gas use has declined by 2.53% between 2017 and 2018 in the healthcare sector. These trends have been used to estimate the energy use for individual healthcare institutions in reporting year 2020 (2018).

9.2 General factsheet

Topic	Outcome
Scopes Covered	In this methodology, scope 1, 2 and parts of scope 3 are covered. 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 consumption of purchased electricity, heat or steam. Because the heat and steam use per healthcare organization is unknown, scope 2 will be based on the use of purchased electricity Scope 3 covers all other indirect emissions. Some examples of scope 3 activities in healthcare include emissions from employee commuting and business travel. No exact data was available, so estimations had to be made.
Portfolio Coverage	Data is collected for all healthcare institutions in The Netherlands. Unfortunately, the data provided by the Ministry of Health, Welfare and Sport is not complete, and has a lot of missing values. Therefore, roughly 70% of all healthcare institution can be provided with a carbon footprint. Striving towards an as-high-as-possible coverage rate, some missing data was complimented by data from individual annual reports. This was done for clients from which the loan was >1% of the total healthcare sector portfolio.

Data	Data on energy costs per healthcare institute per year, are coming from yearly reports on healthcare institutions (DigiMV) provided by the Ministry of Health, Welfare and Sport. They combine the data of all individual yearly financial statements. The total balance sheet per organizations is provided by the yearly reports on healthcare institutions (DigiMV) provided by the Ministry of Health, Welfare and Sport. They combine the data of all individual yearly financial statements. Data about transaction prices for natural gas and electricity come from the Dutch National Statistics office (CBS). The data is obtained from energy companies by sending them surveys. Geographically based annual averages (provinces/NUTS2) for commuting distance data is coming from the Dutch National Statistics Office (CBS). Just as the Geographically based annual averages (provinces/NUTS2) for business travel distance and Distance travelled per means of transportation data. Conversion factor for passenger kilometers to vehicle kilometers (the average occupancy rate of vehicles is 1.39 per car) (www.co2emissiefactoren, 2018) Healthcare sector specific electricity and natural gas use data is retrieved from CBS Statline, and is highly reliable because it is based on network registrations. The trends have been used to estimate the energy use for individual healthcare institutions in reporting year 2020 (2018). In a few cases missing data was extracted from annual reports. If that is the case, it is shown in the calculations sheets and the annual reports are included in the data folders.
Emission factors used	The following emission factors from Table 11.1 are used. Emission factor for natural gas, electricity (unknown source), and passenger transport by car, trains with unknown fuel source and type, for busses with unknown fuel source, trams, and metro. In chapter 11 of this report is explained which emission factors are used and why these emission factors are used.
Calculation steps	**Scope 1** 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. The actual natural gas use per organization is unknown, but the costs of natural gas consumption are mentioned in the financial statements collected by the Ministry of Health, Welfare and Sport. This means that some estimations had to be made to come to the actual CO_2 equivalent emissions, but the estimations were done using an accurate reliable database. Natural gas use is estimated by the expenditure on natural gas and the average yearly price index of natural gas. Because natural gas gets cheaper per m3 if one consumes more, averages had to be used to come to estimates. CBS provides these numbers, making it possible to come to reliable estimations. Subsequently, the emission factor for natural gas has been used to determine the CO_2 equivalent emission of natural gas used in healthcare organizations. In some rare cases, the needed 2017 data was missing in the datafile provided by DigiMV, but 2016 was available. When this occurred, an estimation has been made based on sector specific electricity and natural gas use. This data is retrieved from CBS Statline, and is highly reliable because it is based on network registrations. Electricity use was unchanged over 2016-2017, while natural gas use has declined by 3.66% between 2016 and 2017 in the healthcare sector. **Scope 2** Scope 2 emissions include the indirect GHG emissions from consumption of purchased electricity, heat or steam. Because the heat and steam use per healthcare organization is unknown, scope 2 will be based on the use of purchased electricity. As exact figures per

	organization are not known, estimations had to be made using multiple calculation factors to result in as exact data as possible. Electricity use is estimated in roughly the same way as natural gas use. The actual electricity use per organization is unknown, but the costs of electricity consumption are mentioned in the financial statements collected by the Ministry of Health, Welfare and Sport. This means that some estimations had to be made to come to the actual CO_2 equivalent emissions, but the estimations were done using a reliable database. Furthermore, electricity use is estimated by the expenditure on electricity and the average yearly price index of electricity. Because natural gas prices decrease per kWh if one consumes more, averages had to be used to come to a reliable estimation. CBS provides these numbers, making it possible to come to reliable estimations. The emission factor for electricity consumption has been used to determine the CO_2 equivalent emission for the healthcare organizations. In some rare cases, the needed 2017 data was missing in the datafile provided by DigiMV, but 2016 was available. When this occurred, an estimation has been made based on sector specific electricity and natural gas use. This data is retrieved from CBS Statline, and is highly reliable because it is based on network registrations. Electricity use was unchanged over 2016-2017, while natural gas use has declined by 3.66% between 2016 and 2017 in the healthcare sector. **Scope 3** Scope 3 covers all other indirect emissions. Some examples of scope 3 activities in healthcare include emissions from employee commuting and business travel. No exact data was available, so estimations had to be made. Estimations were made on the basis of regional commuting and business travel statistics from CBS, and the number of employees per organization. On average, Dutch employees are traveling 3020 km per year commuting from and to work (CBS, 2017), but these numbers vary geographically. For other corporate business trips, employees travel on average 433 kilometer a year (CBS, 2017). Unfortunately, some geographically specific data on travel statistics was missing. For this estimation, 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 is unavailable too, the data for the whole Netherlands was used. From these trips, 74% of the distance is travelled by car, either as driver or passenger. 11.8% of the distance travelled is done by train, 6.5% per bicycle, 2.8% by bus/tram/metro and 0.8% walking. The rest of the distance covered is done in unknown ways. Using the location of the healthcare organization, the above mentioned statistics, the emissions factors for mobility, and the total number of employees per organization (in FTE), an estimation was made of the CO_2 equivalent footprint of commuting and business travel. **Reporting year 2019** For reporting year 2019, an estimation has been made based on sector specific electricity and natural gas use. This data is retrieved from CBS Statline, and is highly reliable because it is based on network registrations. Electricity use has increased by 1.65%, while natural gas use has declined by 2.53% between 2017 and 2018 in the healthcare sector. These trends have been used to estimate the energy use for individual healthcare institutions in reporting year 2019 (2018).
Avoided emissions	In the calculations the total costs for energy is used to calculate total ton of CO_2 equivalent. If a healthcare institution generates its own electricity by for example solar panels than the costs for energy will be lower. The reduction in CO_2 equivalent emissions due to for example solar panels is therefore indirectly included in this calculation. Unfortunately, no specific data on renewable energy is available for healthcare institutions.

Asset class specific considerations	As stated in the introduction, from 2018, energy costs are no longer available as a single indicator in the yearly reports on healthcare institutions (DigiMV) provided by the Ministry of Health, Welfare and Sport. In the composed yearly reports, costs made for the purchase of energy, are combined with the total costs of maintenance. It is not possible to derive electricity and natural gas costs from the combined figure for energy and maintenance. While energy costs can be quite stable over time, the costs for maintenance can vary greatly amongst different institutions and years. Making a reliable estimate is not possible due to these fluctuations. Even though the same DigiMV data was used, compared to the PCAF 2019 report, some changes have occurred in the outcomes. In last years report, missing data was supplemented by 2015 data. This data is now however outdated and not relevant anymore. It was therefore decided not to use this 2015 data in this report. There have been some changes in the source data for regional commuting and business travel statistics from CBS. The data collection by CBS has been updated: the statistics are calculated by means of the "Onderweg in Nederland" research (ODiN). This is the successor of the "verplaatsingen in Nederland" research (OViN; 2010-2017). The ODiN has been changed on several critical components in comparison to the OViN report, and is therefore not comparable over time[19]. The new ODiN database enables filters for the working population. So compared to the 2019 PCAF report, only the working population has been taken into account. In 2019, the whole population, including retired people and children, where in the equation. Therefore, the average number of kilometers per person, and consequently the total scope 3 outcome, are significantly higher in this report, compared to the PCAF 2019 report.
Attribution	To calculate the CO_2 equivalent footprint following the PCAF principles, a general approach was developed. First, 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. $$\sum \boldsymbol{CO_2eq} \times \frac{\boldsymbol{Outstanding\ loan}}{\boldsymbol{Total\ balance\ sheet}}$$
Limitations	Ideally, emissions from other sources in the primary process of healthcare organizations would be taken into account as well. For example from other gasses used for medical procedures, from ambulances and trauma helicopters. 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 covers all other indirect emissions. Some examples of scope 3 activities prominent in healthcare include emissions from employee commuting, business travel, waste processing, and food processing. Unfortunately, no data was available to make estimations for waste and food processing.
Data quality estimate	The GHG emissions per healthcare organization are ideally calculated using energy consumption data per client account. When this is not available, other methods were used. This of course will increase the uncertainty level of the calculations. The method used for healthcare organizations in this study is based on robust estimations of electricity and natural gas. These estimations can be made based on actual expenditure on gas and electricity consumption per client. For natural gas use, this is a known specific type of energy, but for electricity use, energy comes from undefined sources. That is why scope 1 has a data quality value of 1.5, and scope 2 has a data quality estimate of 2. Scope 3 level data was estimated based on national averages. Therefore, this method has a data quality score of 4.

[19] https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland

Score	Description
Score 1	Actual energy consumption, converted to CO_2eq-emissions using verified emission factors and detailed activity data specific to the type of energy consumed
Score 2	Actual energy consumption, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
Score 3	Modeled regional activity data based on robust assumptions, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
Score 4	Modeled activity data in a country, converted to CO_2eq-emissions using emissions factors for energy from undefined fuel source
Score 5	Highly modeled activity or uncertain activity data in a country, converted to CO_2eq-emissions using default emissions factors for energy from undefined fuel source

9.3 Data factsheet per datafile used

Different annual reports of individual healthcare organizations were used to compliment missing data. These can be found on the following location: O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data\Jaarverslagen. The file "aanvullende data uit jaarverslagen" describes were the data was used for.

TOPIC	DESCRIPTION
DATA	Concern codes and KvK data per healthcare organisation
DATA FILE	x7conc_total_VOLLEDIG
DATA SOURCE	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
YEAR	2017
DOWNLOAD DATE	26-10-2020
LINK TO WEBPAGE	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
UNIT OF MEASUREMENT	-
DATA QUALITY	Data is acquired by CIBG from individual annual reports of healthcare organisations. The source data in the annual report is audited, the composite dataset of CIBG is not.
SELECTIONS	Tab: x7conc_total_VOLLEDIG_1
DATA TRANSFORMATIONS	No specific transformations

TOPIC	DESCRIPTION
DATA	Energy costs natural gas and electricity
DATA FILE	x7conc_total_VOLLEDIG
DATA SOURCE	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
YEAR	2017
DOWNLOAD DATE	26-10-2020
LINK TO WEBPAGE	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
UNIT OF MEASUREMENT	-
DATA QUALITY	Data is acquired by CIBG from individual annual reports of healthcare organisations. The source data in the annual report is audited, the composite dataset of CIBG is not.
SELECTIONS	Tab: x7conc_total_VOLLEDIG_20
DATA TRANSFORMATIONS	No specific transformations

Topic	DESCRIPTION
Data	Energy prices natural gas and electricity
Data File	Aardgas__en_elektriciteitsprijzen_26102020_154803
data Source	CBS, Statline
Year	2017
Download date	26-10-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81309NED/table?ts=1603723562973
Internal location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
unit of measurement	Natural gas: euro per GJ Electricity: euro per kWh
Data quality	The research method to obtain these data can be find here:korte onderzoeksbeschrijving Aardgas en elektriciteit, gemiddelde prijzen van eindverbruikers. The data is obtained from energy companies by sending them surveys.
Selections	Tab: Aardgas__en_elektriciteitsprijz
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Energy use per sector
Data File	Energiebalans__aanbod__verbruik__sector_27102020_095118
data Source	CBS, Statline
Year	2017-2018
Download date	27-10-2020
Link to webpage	https://opendata.cbs.nl/statline#/CBS/nl/dataset/83989NED/table?ts=1603793762059
Internal location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
unit of measurement	PJ
Data quality	Based on registration data. For more information, see: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/nederlandse-energiehuishouding--neh--
Selections	Tab: Energiebalans__aanbod__verbruik
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Energy-content of natural gas
Data File	Energie-inhoud aardgas (onderwaarde_in GJ_m3) 202
data Source	Klimaatmonitor
Year	2017 - 2020
Download date	23-09-2020
Link to webpage	https://klimaatmonitor.databank.nl/Jive
Internal location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
unit of measurement	GJ/m3
Data quality	Official statistic. https://www.infomil.nl/onderwerpen/duurzaamheid-energie/energiebesparing/vragen-antwoorden/overige-vragen/omrekening-verbruik/
Selections	No specific selections.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Villages and cities overview in the Netherlands.
Data File	Woonplaatsen_in_Nederland_2017_27102020_155216
data Source	CBS, Statline
Year	2017
Download date	27-10-2020
Link to webpage	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83689NED/table?ts=1603810311539
Internal location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
unit of measurement	-
Data quality	Official statistic. Geographic allocations.
Selections	Tab: Woonplaatsen_in_Nederland_2017_
Data transformations	No specific transformations

<table>
<tr><th>TOPIC</th><th>DESCRIPTION</th></tr>
<tr><td>DATA</td><td>Average mobility per person per year</td></tr>
<tr><td>DATA FILE</td><td>Mobiliteit__per_persoon__motieven_27102020_162614</td></tr>
<tr><td>DATA SOURCE</td><td>CBS, Statline</td></tr>
<tr><td>YEAR</td><td>2018-2019 (2017 data not available)</td></tr>
<tr><td>DOWNLOAD DATE</td><td>27-10-2020</td></tr>
<tr><td>LINK TO WEBPAGE</td><td>https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84713NED/table?ts=1603811773192</td></tr>
<tr><td>INTERNAL LOCATION</td><td>O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data</td></tr>
<tr><td>UNIT OF MEASUREMENT</td><td>km</td></tr>
<tr><td>DATA QUALITY</td><td>Based on survey statistics of ODiN (onderzoek Onderweg in Nederland). For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland</td></tr>
<tr><td>SELECTIONS</td><td>
<table>
<tr><th>Option</th><th>Population</th><th>sex</th><th>charachteristics</th><th>motives</th><th>margin</th></tr>
<tr><td>selection</td><td>Populatie: 12 jaar of ouder</td><td>Totaal mannen en vrouwen</td><td>Participatie: werkzaam 30 uur pw of meer</td><td>Van en naar het werk</td><td>Waarde</td></tr>
<tr><td>selection</td><td></td><td></td><td></td><td colspan="2">Zakelijk, beroepsmatig</td></tr>
<tr><td>reasoning</td><td>kinderen uitzonderen</td><td>totaal</td><td>we gaan uit van FTE, dus fulltime (andere keuze optie was totaal, of 12-30 uur pw)</td><td>woon werk verkeer & andere dienstreizen</td><td>totaal</td></tr>
</table>
</td></tr>
<tr><td>DATA TRANSFORMATIONS</td><td>See pivot source data
Unfortunately, some geographically specific data on travel statistics was missing. For this estimation, 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 is unavailable too, the data for the whole Netherlands was used. In that we, the estimation is as specific as possible.</td></tr>
</table>

TOPIC	DESCRIPTION
DATA	Transportation methods used per person per province
DATA FILE	Mobiliteit__persoonskenmerken_27102020_163942
DATA SOURCE	CBS, Statline
YEAR	2018 (2017 not available)
DOWNLOAD DATE	27-10-2020
LINK TO WEBPAGE	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84709NED/table?ts=1603813016233
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
UNIT OF MEASUREMENT	-
DATA QUALITY	Based on survey statistics of ODiN (onderzoek Onderweg in Nederland). For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland
SELECTIONS	Tab: 2018
DATA TRANSFORMATIONS	See Pivot. Other means of transportation not taken into account. Unfortunately, some geographically specific data on travel statistics was missing. For this estimation, 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 is unavailable too, the data for the whole Netherlands was used. In that we, the estimation is as specific as possible.

TOPIC	DESCRIPTION
DATA	Transportation methods used per person per province
DATA FILE	Mobiliteit__persoonskenmerken_27102020_163942
DATA SOURCE	CBS, Statline
YEAR	2019 (2017 not available)
DOWNLOAD DATE	27-10-2020
LINK TO WEBPAGE	https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84709NED/table?ts=1603813016233
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
UNIT OF MEASUREMENT	-
DATA QUALITY	Based on survey statistics of ODiN (onderzoek Onderweg in Nederland). For more information, see https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/onderweg-in-nederland
SELECTIONS	Tab: 2019
DATA TRANSFORMATIONS	See Pivot. Other means of transportation not taken into account. Unfortunately, some geographically specific data on travel statistics was missing. For this estimation, 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 is unavailable too, the data for the whole Netherlands was used. In that we, the estimation is as specific as possible.

TOPIC	DESCRIPTION
DATA	FTE per healthcare institution
DATA FILE	x7conc_total_VOLLEDIG
DATA SOURCE	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
YEAR	2017
DOWNLOAD DATE	26-10-2020
LINK TO WEBPAGE	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets
INTERNAL LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
UNIT OF MEASUREMENT	FTE
DATA QUALITY	Data is acquired by CIBG from individual annual reports of healthcare organisations. The source data in the annual report is audited, the composite dataset of CIBG is not.
SELECTIONS	Tab: x7conc_total_VOLLEDIG_7
DATA TRANSFORMATIONS	Sum of personnel in paid employment, self-employed persons and hired staff.

Topic	DESCRIPTION
Data	Total balance sheet per healthcare organization
Data File	x7conc_total_VOLLEDIG
data Source	CIBG; Ministerie van Volksgezondheid Welzijn en Sport
Year	2017
Download date	26-10-2020
Link to webpage	https://www.jaarverantwoordingzorg.nl/gegevens-bekijken/verantwoordingsgegevens-per-verslagjaar-datasets
Internal location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen\Data
unit of measurement	EUR
Data quality	Data is acquired by CIBG from individual annual reports of healthcare organisations. The source data in the annual report is audited, the composite dataset of CIBG is not.
Selections	Tab: x7conc_total_VOLLEDIG_11
Data transformations	-

9.4 Final Database

Topic	DESCRIPTION	
Data File	Scope 1 & 2 zorginstellingen 2017	
Location	O:\205305 PCAF 2020\Werkmap\Zorginstellingen	
Sheet	Eindsheet	
Column-name	**description**	**unit**
ConcernCode	ConcernCode	
c_kvk	Company registration number (1/2)	
c_kvk	Company registration number (2/2)	
c_naam	Name of the healthcare institution	
Data jaar aardgas	Year of data used for natural gas calculations	
Data jaar elektra	Year of data used for electricity calculations	
Scope 1 aardgas (2017)	Total scope 1 natural gas emissions for 2017	kg CO2-eq
Scope 2 elektriciteit (2017)	Total scope 2 electricity emissions for 2017	kg CO2-eq
Scope 1 aardgas (2018)	Total scope 1 natural gas emissions for 2018	kg CO2-eq
Scope 2 elektriciteit (2018)	Total scope 2 electricity emissions for 2018	kg CO2-eq

TOPIC	DESCRIPTION	
DATA FILE	Scope 3 zorginstellingen 2018-2019	
LOCATION	O:\205305 PCAF 2020\Werkmap\Zorginstellingen	
SHEET	Eindsheet	
COLUMN-NAME	DESCRIPTION	UNIT
ConcernCode	ConcernCode	
Code_v9	V9 code	
c_kvk	Company registration number (1/2)	
c_kvk	Company registration number (2/2)	
c_naam	Name of the healthcare institution	
Bus/tram/metro (2018)	CO2-eq emissions from bus/tram/metro use	Kg
Fiets (2018)	CO2-eq emissions from bicycle use	Kg
Lopen (2018)	CO2-eq emissions from walking	Kg
Personenauto (passagier) (2018)	CO2-eq emissions from cars (passenger)	Kg
Personenauto (bestuurder) (2018)	CO2-eq emissions from cars (driving)	Kg
Trein (2018)	CO2-eq emissions from train use	Kg
Bus/tram/metro (2019)	CO2-eq emissions from bus/tram/metro use	Kg
Fiets (2019)	CO2-eq emissions from bicycle use	Kg
Lopen (2019)	CO2-eq emissions from walking	Kg
Personenauto (passagier) (2019)	CO2-eq emissions from cars (passenger)	Kg
Personenauto (bestuurder) (2019)	CO2-eq emissions from cars (driving)	Kg
Trein (2019)	CO2-eq emissions from train use	Kg

Data location of the files with the final calculations for BNG and NWB Bank:
BNG Bank: O:\205305 PCAF 2020\Werkmap\Zorginstellingen\BNG Bank
NWB Bank: O:\205305 PCAF 2020\Werkmap\Zorginstellingen\NWB Bank

10 Other organisations approach

10.1 General factsheet

Topic	Outcome
Scopes Covered	Scope 1, 2, and 3 emissions of companies classified as mobility, and other. However, the scopes are in most of the cases not presented individually. Therefore, the results are not presented per scope, but only as a total amount of CO_2 equivalent. 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 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 Coverage	Data is collected by hand, for a selection of the organizations in the loan portfolio. Unfortunately, for a big number of organizations, data availability is inadequate. This means the portfolio coverage ratio for this sector will be around 50%.
Data	Due to the big diversity of the companies, the data that was used consist mostly of self-published annual reports of the companies. Relatively big companies often use these reports to report their annual emissions. Most companies however fail to report their CO_2 equivalent emissions. This is something that needs improvement to improve the other organizations approach. When data on all three scopes are missing, emission data based on the standard industrial classifications (SBI in Dutch) was used.
Emission factors used	No emission factors used.
Calculation steps	Some companies report their own CO_2 equivalent emissions, mostly in kilotons. We convert these emission outcomes from kilotons to kilograms in order to make further calculations. CO_2 equivalent emissions for companies that do not self-report, are obtained via CBS statline by looking at CO_2 equivalent emissions based on the Standard Industrial Classifications (SBI). Every company is classified via SBI codes. For each SBI code a measure for total CO_2 equivalent emission is available. De total CO_2 equivalent emission for a particular SBI code are divided by the total net revenue for that SBI. We now know the average CO_2 equivalent 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 self-report emissions. We multiply the average CO_2 equivalent emissions per net revenue by the total net revenue of each company. We now know the total CO_2 equivalent emissions based on SBI codes. From the self-reported CO_2 equivalent emissions (when available) or the CO_2 equivalent emissions based on SBI code we continue to calculate which part of the total emissions can be attributed to the bank. We do so by looking at the total loan distributed by the bank for each company and divide this by their total balance (equity + total debts). We then multiply this outcome by the total of CO_2 equivalent emissions for that company as found above
Avoided emissions	Some bigger 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 CO_2 equivalent 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 companies in this sector are (partly) owned by municipalities or other regional authorities. This could lead to double counting. Care should be taken that the companies are not also included in the scope 3 emissions of the public sector.

<table>
<tr><td>Attribution</td><td>Final outcome is the total of CO_2 equivalent emissions that can be attributed to the bank. The following formula was used:

$$\sum_{i=1}^{n} \mathbf{CO_2eq} \times \frac{\textbf{Outstanding loan}}{\textbf{Total balance sheet}}$$</td></tr>
<tr><td>Limitations</td><td>The data available is highly dependent on the disclosure of information of individual companies. Especially relatively smaller companies do not disclose information on emissions.</td></tr>
<tr><td>Data quality estimate</td><td>It is difficult to come up with a data quality estimate for this asset class. Most of the footprints are based on Proxy data on the basis of region or country, but some of the data is actual audited primary energy data. Therefore, no general data quality estimate can be provided.

<table>
<tr><th>Score</th><th>Description</th></tr>
<tr><td>Score 1</td><td>Audited GHG emissions data or actual primary energy data</td></tr>
<tr><td>Score 2</td><td>Non-audited GHG emissions data, or other primary data</td></tr>
<tr><td>Score 3</td><td>Averaged data that is peer/(sub)-sectorspecific</td></tr>
<tr><td>Score 4</td><td>Proxy data on the basis of region or country</td></tr>
<tr><td>Score 5</td><td>Estimated data with very limited support</td></tr>
</table>
</td></tr>
</table>

10.2 Data Factsheet per datafile used

Topic	DESCRIPTION
Data	Net revenue per SBI code
Data File	Net revenue per SBI code
data Source	CBS
Year	2018
Download date	23-9-2020
Link to webpage	*https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81837NED/table?ts=1600943979516*
Internal location	O:\205305 PCAF 2020\Werkmap\Overige organisaties\2020\Data
unit of measurement	Net revenue in millions of euros
Data quality	Data is acquired on the basis of actual tax forms from Dutch companies and organizations. The data is therefor of high quality. More information about the accuracy and checks and controls can be found here: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/statistiek-financien-van-ondernemingen
Selections	All types of organizations on 1 digit of the SBI; net revenue in millions for 2018.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	CO_2 equivalent emissions to the air by the Dutch economy
Data File	Greenhouse gas equivalent per SBI code
data Source	CBS/Statline Statline > Natuur en Milieu > Milieu > Milieurekeningen (nationale rekeningen) > Emissies naar de lucht door Nederlandse economie; nationale rekeningen
Year	2018
Download date	22-7-2020
Link to webpage	*https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83300NED/table?dl=67B3*
Internal location	O:\205305 PCAF 2020\Werkmap\Overige organisaties\2020\Data
unit of measurement	CO_2 equivalent: mln kg
Data quality	The research method used to obtain these data can be find here: 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.
Selections	All types of organizations on 1 digit of the SBI; greenhouse gas equivalent in millions for 2018.
Data transformations	No specific transformations

Topic	DESCRIPTION
Data	Emission CO2 per company
Data File	Emissieregistratie 2020
data Source	www.emissieregistratie.nl
Year	2018
Download date	18-9-2020
Link to webpage	*http://www.emissieregistratie.nl/erpubliek/erpub/selectie/criteria.aspx*
Internal location	O:\205305 PCAF 2020\Werkmap\Overige organisaties\2020\Data
unit of measurement	Carbon dioxide in kilograms
Data quality	The data is acquired by RIVM, in the means of a survey. Data has been checked for irregularities. For more information: http://www.emissieregistratie.nl/erpubliek/content/explanation.nl.aspx#dataverzameling
Selections	Company name; carbon dioxide in kilograms for 2018
Data transformations	No specific transformations

10.3 Final database

TOPIC	DESCRIPTION	
DATA FILE	Projects 2020 overview	
LOCATION	O:\205305 PCAF 2020\Werkmap\Overige organisaties\2020\Data	
COLUMN-NAME	**DESCRIPTION**	**UNIT**
Bron 1	Source used to obtain annual report	Text
Bron 2	Alternative source used to obtain annual report	Text
Geraadpleegd op	Date on which data was retrieved	Date
SBI	Code for determining SBI	Number
SBI letter	SBI code	Letter
SBI 2	Alternative code for determining SBI	Number
Data CO2	Indicates availability of CO_2 related data	Text
Scope 1 in kiloton CO2	If available shows scope 1 emissions	Kilotons
Scope 2 in kiloton CO2	If available shows scope 2 emissions	Kilotons
Scope 3 in kiloton CO2	If available shows scope 3 emissions	Kilotons
CO2 gegevens in kt	Adds up all three scopes if available	Kilotons
CO2 exact in kg	Shows total emissions in kilograms	Kilograms
Gemiddelde CO2 (kg)/ omzet (MLN) naar SBI	Average CO_2 equivalent emissions in kg's per million of euros of revenue categorized per SBI.	Kilograms/ MLN euros
Naam dochter 1	Subsidiary company	Text
Naam dochter 2	Subsidiary company	Text
Netto omzet in MLN	Net revenue in millions of euros	MLN euros
CO2 totaal per bedrijf in kg	Total CO_2 equivalent emissions in kilograms. Different from 'CO_2 exact in kg' because here it also shows the calculated CO_2 for companies that did not self-report.	Kilograms
Totaal aan leningen in euro's	Total loan distributed by the bank in euros	Euros
Dochters totaal leningen in MLN	Total loan distributed by the bank to subsidiary companies in euros	Euros
Totaal aan leningen in MLN	Total loan distributed + total loan distributed to subsidiary companies in euros	Euros
Totaal activa in MLN	Total balance sheet in millions of euros	MLN euros
CO2 door bank	The total CO_2 equivalent emissions in kilograms that can be attributed to the bank	Kilograms
Opmerkingen	Remarks	Text

11 Emission factors

For the development of the carbon footprint of clients from BNG Bank and NWB Bank, CO_2 equivalent emission factors were used to transform energy into kilograms CO_2 equivalent. The emission factors used in this publication are published at www.CO2emissiefactoren.nl. The list of emission factors is prepared by a collaboration of Milieu Centraal, Stimular, SKAO, Connekt and The National Government of The Netherlands. The aim of this list is to present the emission factors on a scientific, and uniform matter. PCAF The Netherlands has embraced this list of widely accepted grid emission factors, and recommends using this for the Dutch context.

CO2emissiefactoren gives three different options for every emission factor. Well-to-wheel (WTW), Tank to Wheel (TTW), and Well to Tank (WTT). PCAF has chosen to use the grid emission factor related to direct emissions, expressed under column TTW. These are only the emissions produced by the end user. It does not include the emissions caused by the energy production phase (WTT). This is different from the reports for BNG Bank and NWB Bank of last year, in which the WTW factor was used. The decision to use TTW values this year, is based on the desire to align the report with the PCAF harmonized approach.

A CO_2 equivalent emissions factor can change over time. The factors sometimes change because of new scientific insights, but they can also change because the context described by the factors is changing. This is for instance the case for the emission factor for electricity from an unknown source. This emission factor covers the national energy production mix (e.g. the mutual relationship between coal, nuclear, and renewable energy sources). This factor is changing yearly, because the national energy mix is changing yearly.

In this report, three basic principles are being used to determine what emission factor to use, when emission data is longitudinally presented. These are in accordance with the basic principles in the climate monitor for Dutch water authorities (Arcadis, 2020).

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 2017 means using the emission factor of 2017.
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 2017 means using the emission factor of 2017.

Changes in emission factors over time due to new methodology or scientific insights: use the most recent emission factor. E.g. data from 2017 means using the emission factor of 2020. In this case this is also stated at www.CO2emissiefactoren.nl. They give an advise to use the revised emission factor 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.

An overview of the emission factors used per year can be found in Table 11.1. in general, for every calculation and approach, 2019 emissionfactors were used, except for electricity. CO2emissiefactoren prescribes to use the most recent emission factor, because of methodological reasons.

Table 11.1 emission factors used per data year (TTW)

Source	Emission factor (kg CO_2 eq/unit)	Emission factor (kg CO_2 eq/unit)	Emission factor (kg CO_2 eq/unit)	Emission factor (kg CO_2 eq/unit)	Note	Choices made
	2017	**2018**	**2019**	**2020**		
Natural gas (m3)	1.791	1.791	1.791	1.785	Slight decrease due to revised energy mix.	Use the emission factor in accordance to the data year
Diesel (liter)	-	-	2.606	2.606		Use the emission factor in accordance to the data year
Other fuels (LPG in liters)	-	-	1.61	1.61	Emission factor for LPG is used since 'other fuels' consists mostly of LPG.	Use the emission factor in accordance to the data year
Fuel company vehicles	-	-	WTW	WTW		Use the WTW factor as used in the *klimaatmonitor*
Fuel freight transport	-	-	WTW	WTW		Use the WTW factor as used in the *klimaatmonitor*
Process emissions drainage biogas	-	-	WTW	WTW		Use the WTW factor as used in the *klimaatmonitor*
Grey energy	-	-	0.572	0.572		Use the emission factor in accordance to the data year
Electricity from unknown sources (kWh)	~~0.301~~	~~0.361~~	~~0.361~~	0.405	Slight increase due to new methodology	Use the most recent emission factor
Passenger transport by car, unknown fuel & weight (vehicle km)*	0.181	0.181	0.181	0.163	Slight decrease due to technological development and actualization	Use the emission factor in accordance to the data year
Public transport in general (traveled kms)	-	-	0.025	0.025		Use the emission factor in accordance to the data year
Public transport by train (traveled kms; unknown train type)	0.005	0.005	0.005	0.005	No changes in emission factors 2017-2020	Use the emission factor in accordance to the data year
Public transport by busses (traveled kms; type unknown)	0.113	0.113	0.113	0.113	No changes in emission factors 2017-2020	Use the emission factor in accordance to the data year
Public transport by trams (traveled kms)	0	0	0	0	No changes in emission factors 2017-2020	Use the emission factor in accordance to the data year
Public transport by metro (traveled kms)	0	0	0	0	No changes in emission factors 2017-2020	Use the emission factor in accordance to the data year
Passenger transport by airplane intercontinental >2.500km (traveled kms)	-	-	0.137	0.137		Use the emission factor in accordance to the data year
District heating (STEG)	32.53	32.53	32.53	32.53	No changes	Use the emission factor in accordance to the data year
Metal salts	-	-	WTW	WTW		Use the WTW factor as used in the *klimaatmonitor*
Polymer	-	-	WTW	WTW		Use the WTW factor as used in the *klimaatmonitor*
Source	*LINK*	*LINK*	*LINK*	*LINK*	*LINK*	

*The basic assumption is an average road type and a medium weight class. A fuel mix of 79.3% petrol, 15.8% diesel, 1.5% LPG, 3.0% petrol hybrid and 0.2% electric (these assumptions are made by co2emmissiefactoren)

ANNEX A. Under Construction:

Carbon footprint approach for drinking water utilities

In the Netherlands, there are ten drinking water utilities that produce and distribute water to consumers and companies within their own geographical area. They do this by extracting groundwater or surface water, purifying the water, and distribute it via water distribution networks. Most of the drinking water utilities are clients of as well BNG Bank as NWB Bank, Therefore, Het PON & Telos was asked to develop a new approach in order to acquire a carbon footprint for all ten water utilities. This chapter will elaborate on the options and possibilities to develop a methodology approach for this asset class.

The harmonized approach report for the Dutch financial sector (2019), does not describe a specific asset class for drinking water utilities. However, the asset class of corporate/SME loans or project finance are getting closest. The harmonised approach prescribes for loans that are designated for a clearly ring-fenced activity, to use the protocol for project finance, even if these loans are not structured as project finance. Because of the ring-fenced character of drinking water utilities, the project finance asset class is being followed. It is proposed that GHG data for project finance should not be based on generic input-output models, but on project-specific (in this case utility-specific source data). Therefore, the objective is to look for data sources specifically describing GHG-emissions of drinking water utilities.

Towards a carbon footprint for drinking water utilities

More and more drinking water utilities are thriving to be climate-neutral in the near future (Snip, Oesterholt & van der Brand, 2017). A lot of utilities have set goals for climate neutrality in 2020 or 2025. The branch organisation Vewin collects a lot of operational data of all drinking water companies, however, this data does not include information about greenhouse gas emissions (Vewin, 2020).

In order to enable the drinking water utilities to calculate their carbon footprint in a uniform way, the Watercycle Research Institute has developed a new method tailored for this sector (Snip & Oesterholt, 2019). It describes all the activities included in the process of winning ground and surface water, and turning it in to drinking water for the end-consumers (households and companies). The method is described elaborately, and based on the GHG-protocol (Word Resources Institute, 2015), on which the PCAF methodology is based as well (PCAF, 2019).

Unfortunately, the publication on how to measure carbon footprints for drinking water utilities has not led to any publication on actual CO_2 equivalents per utility yet. Looking at the yearly reports of individual drinking water utilities, only two of them report on CO_2 equivalent emissions. Oasen Drinkwater has reported a gross CO_2 equivalent footprint of

26,208 ton, and a net (minus avoided emissions) CO_2 equivalent footprint of 10,777 ton in 2019 (Oasen, 2020), whereas Brabant Water (2020) reported a CO_2 equivalent footprint of 23,527 ton in 2019.

Table 3.1 Water production and climate impact per utility.

Utility	CO_2 eq footprint (ton)	Clean Water Production (x1,000 m^3)	CO_2 eq intensity (kg/m^3)
Oasen Gross.	26,208	43,000	0.61
Oasen Net.	10,777	43,000	0.25
Brabant Water	23,527	196,000	0.12

As seen in Table 3.1, the footprints reported by the two drinking water utilities do not show a consistent image. The CO_2 equivalent footprint of Brabant Water is lowest, while they produce almost five times as much clean water as Oasen. Because of the high level of resemblance in the operations of both utilities, this seems unlikely. An explanation might be that both drinking water utilities use different methods to come to their CO_2 equivalent footprints. Unfortunately, both utilities are not transparent about the method used to come to their CO_2 equivalent footprint. Therefore, these CO_2 equivalent footprints cannot be used in the 2020 PCAF report.

Setting the scopes

In order to develop a method in which the carbon footprints of drinking water utilities are comparable to each another, a clear and uniform image of scopes covered is crucial. The following scope classification is based on the 2019 Watercycle Research Institute report (Snip & Oesterholt) and the GHG-protocol. It is therefore in compliance with the PCAF harmonized approach report (2019).

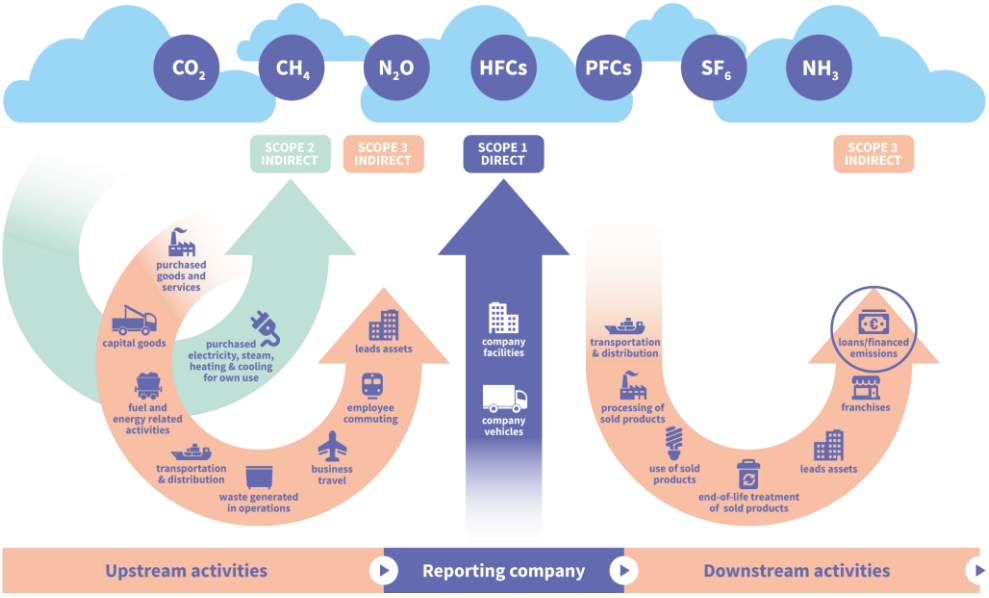

Figure 1. The scope definitions from the GHG Protocol (Image based GHG Protocol).

Scope1

Scope 1 emissions are the direct emissions of the drinking water utilities:

- CH_4 and CO_2 emitted during the winning and treating of groundwater, based on measurements in impurified and purified water.
- GHG-emissions from natural gas use
- Emissions from diesel power units
- Emissions from fuel use of company cars

A first option to come to GHG-emissions for drinking water utilities is to make use of data provided by emission registration[20]. The data is acquired by the National Institute for Public Health and the Environment (RIVM), based on surveys, scientific models, and actual emission data. It gives information about national emissions, municipal emissions, and sector and company specific emissions (when available).

The total GHG-emission of the drinking water utilities sector is available, and because the 10 drinking water utilities make up the whole sector, the clean water production volumes can be used as a weighing factor to distribute the sector emissions. The high level of resemblance in the operations of the utilities makes this a credible weighing solution. Therefore, we have to calculate the GHG emissions for the drinking water utilities by using the total emissions of the sector provided by Pollutant Release and Transfer Register as provided in Table 3.2 (Emissieregistratie, 2020). The most recent year of this source is 2018. The CO_2 equivalent of the emissions of methane are calculated by multiplying with the global warming potential of methane of 28 kg CO_2-eq / kg CH_4 (Greenhouse Gas Protocol, 2016).

As shown in Table 3.2, only scope 1 is covered in the emission registration data. Methane emissions from the degassing of groundwater are emitted during the process of winning groundwater. Therefore, they are part of scope 1. These emissions do not occur when water is won from surface water. Groundwater makes up for about 65% of all the water won in the Netherlands. The other emissions come from fuel consumption, such as natural gas and diesel/petroleum. Indirect emissions from secondary energy use such as electricity (scope 2), are not represented in this data.

[20] http://emissieregistratie.nl/erpubliek/bumper.nl.aspx

Table 3.2 scope 1 GHG emissions per activity of drinking water utilities (2018).

Activity	Description	Greenhouse gas	Ton	Global warming potential (kg CO_2/unit)	CO_2 equivalent (ton)
Degassing of groundwater	A part of the Dutch drink water is obtained through the extraction and processing of ground water. Gasses dissolved in the water are released during this process, including methane. Shallow groundwater extraction for use in agriculture or on construction sites is not included in this document, as this water contains no methane. (Jansen et al., 2019)	Methane (CH_4)	1,844	28	51,644
Collection, purification and distribution of water	Emissions of CO_2, from stationary combustion sources based on fuel consumption (fuel oil, Gas/diesel oil, lpg, natural gas & petroleum). (Honig et al., 2020)	Carbon dioxide (CO_2)	6,986	1	6,986
Collection, purification and distribution of water	Emissions of CH_4, from stationary combustion sources based on fuel consumption (fuel oil, Gas/diesel oil, lpg, natural gas & petroleum). (Honig et al., 2020)	Methane (CH_4)	0.70	28	20
Total scope 1					**58,650**

The degassing of groundwater has the largest impact on the total carbon footprint in scope 1. On a yearly basis, this causes an emission of roughly 52 tons CO_2 equivalent. In order to assign these emissions to drinking water utilities, an emission factor has to be conducted. This step is shown in Table 3.3.

Table 3.3 Scope 1 GHG intensity per activity of drinking water utilities (2018).

Activity	Greenhouse gas	CO_2 equivalent (ton)	Drinking water produced (mln m^3)	CO_2 equivalent (kg/m^3)
Degassing of groundwater	Methane (CH_4)	51,644	809[21]	0.063
Collection, purification and distribution of water	Carbon dioxide (CO_2)	6,986	1,199	0.0058
Collection, purification and distribution of water	Methane (CH_4)	19.70	1,199	1.643E-05

This makes it possible to distribute the emissions back to the drinking water utilities, as shown in Table 3.4, this results in a scope 1 carbon footprint of 13,657 tons CO_2 equivalent for Brabant Water, and an emission of 2,996 ton CO_2 equivalent for Oasen.

[21] Only applicable to ground water winning. (Vewin, 2020)

Table 3.4 Total scope 1 CO_2 equivalents per water utility (2018)

Drinking water utility	Production (x1,000 m^3)	CO_2 equivalent (ton)
Brabant water		
- Groundwater	196,000	13,657
- Surface water	0	0
Total scope 1		**13,657**
Oasen	43,000	
- Groundwater	43,000	2,996
- Surface water	0	0
Total scope 1		**2,996**

Scope 2

Scope 2 emissions are the indirect emissions of the drinking water utilities. These include the emissions of electricity use.

The process of collection, purification and distribution of drinking water uses a lot of electricity. In 2018, the average electricity use for production and distribution was 0.51 kWh/m^3 drinking water (Vewin, 2020). This would mean that the whole sector uses 611 million kWh per year, which would be accompanied with a huge CO2 equivalent footprint. However, Vewin reports that all the energy used by drinking water utilities is renewable. The renewable energy is derived from own solar panels, and/or they purchase renewable energy from example windmill parks elsewhere in Europe. Based on tank to wheel (TTW) emission factors, this would mean that there are no emissions for electricity use, and that scope 2 emissions would therefore be non-existing[22].

Scope 3

Scope 3 emissions are related to all other indirect upstream and downstream activities of the drinking water utilities. A few examples based on information from the Watercycle Research Institute (2019) are:

- Emissions from business flights
- Purchase and use of chemicals
- Transportation and distribution
- Transport of residual materials
- Purchase of drinking water or impurified water.

Scope 3 emissions are not generally available for drinking water companies. Only Oasen has published figures on the entire carbon footprint and the breakdown in scopes. Oasen (2020) states that scope 3 emissions make up for about 68% of the total net emissions. This percentage is used to estimate scope 3 emissions for all other drinking water companies. This is a plausible estimate, assuming that there is a high level of resemblance in the operations of these utilities. Drinking water utilities can be subjected to different kinds of challenges per region. Methods used to clean the impurified water can differ for different kinds of soil types and groundwater depths. Therefore, this estimate comes with a higher

[22] Wind power, solar power, water power and biomass al have a TTW emission factor of 0 kg CO2/kWh

level of uncertainty than the methods proposed for scope 1 and scope 2. Table 3.5 shows the results for Oasen and Brabant Water.

Table 3.5 scope 3 CO_2 equivalent estimates for water utilities

Water utility	Scope 1 emission (ton CO_2 equivalent)	Estimated scope 3 emission (ton CO_2 equivalent)
Brabant water	13,657	29,144
Oasen	2,996	6,394

Quality check

As stated before, only two companies (Oasen, and Brabant Water) provide primary emissions data in their annual reports. This data is compared with the results from Table 3.5 to assess the quality of the calculations. Table 3.6 shows the comparison of the data from the annual reports, and the calculated data. The estimation for Oasen based on this new methodology is quite close to the actual CO_2 equivalent reported in the Oasen 2019 annual report. However for Brabant Water table 3.6 shows an overestimation of the emission value compared to the results reported in the annual report. As stated before, an explanation might be that both drinking water utilities use different methods to come to their CO_2 equivalent footprints. Unfortunately, both utilities are not transparent in their annual reports about the method used to calculate these figures. Het PON & Telos is currently in contact with both drinking water companies, in order to retrieve more information about their methodologies.

Table 3.6 Comparison between reported and calculated estimates of CO_2 equivalent emissions.

Company		Scope 1 (ton CO_2 equivalent)	Scope 2 (ton CO_2 equivalent)	Scope 3 (ton CO_2 equivalent)	Total (ton CO_2 equivalent)
Oasen (2018)	Annual report	3,439	0	7,338	10,777
	Calculated	2,996	0	6,394	9,390
Brabant Water (2019)	Annual report	23,527			23,527
	Calculated	13,657	0	29,144	42,801

Conclusions

In this chapter, a new methodology is presented to include the CO_2 equivalent emissions of the drinking water utilities into the PCAF 2020 report. This methodology is mostly based on the emission registration figures, presented yearly by the National Institute for Public Health and the Environment (RIVM). Other data was distracted from Vewin (the branch organisation) and individual annual reports. The method is partly based on the Watercycle Research Institute report (2019) on measuring CO_2 equivalent footprints for drinking water utilities.

As stated in the quality check, the estimations based on this new method are quite close to the actual CO_2 equivalent reported in the Oasen 2019 annual report. However, for Brabant Water the new method shows an overestimation of the emission value compared to the results reported in the annual report. It is expected that the scope 1 estimations are quite close to reality. These are estimated with trustworthy data from a scientific model and institute.

Relying on the information provided by VEWIN (2020), it is assumed that all energy used for this scope is 100% based on renewable energy. Therefore there are no scope 2 emissions (TTW).

Scope 3 has the highest level of uncertainty. The emissions in scope 3 are based on the allocation of emissions over the scopes of one water utility (Oasen, 2020). This is a plausible estimate, assuming that there is a high level of homogeneity in the technics, procedures, and chemicals used by the water utilities. Drinking water utilities can be subjected to different kinds of challenges per region. Methods used to clean the impurified water can differ for different kinds of soil types and groundwater depths.

Irrespective of the proposed methodology, the best way to assess the drinking water utilities carbon footprint is to follow a similar kind of approach as Arcadis (2020) is following and executing for the Water Authorities. In the case of the water utilities, it is possible to take a survey at every drinking water utility, in order to acquire the right data. This survey can be based on the framework developed by the Watercycle Research Institute (2019). Het PON & Telos would advise to look into the options of developing a study in this direction to make this methodology stronger in the future.

Het PON & Telos will be getting in touch with the Watercycle Research Institute and Vewin, to get an update on the latest status of their plans to report about carbon footprints of water utilities. in addition, we will get in touch with Oasen and Brabant Water, to see if we can get more insights in the methodology they used in order to come to the presented carbon footprints in their annual reports.

For now, the methodology presented in this chapter can be used, as a temporary solution. It is, with the data available, the best and most reliable estimation that can be made at this moment. The PCAF harmonized approach (2019) states for most sectors that scope 1 and scope 2 should be covered as a minimum requirement, and scope 3 if available and relevant . We would therefore advise, to only report scope 1 and scope 2 emissions for the water utilities sector, since scope 3 has a high level of uncertainty.

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Het PON & Telos is a social knowledge organization at the heart of society. We consider it our mission to improve social decision-making. We do this by linking scientific knowledge to practical knowledge. In this process every voice counts. We collect, investigate, analyze, and interpret opinions and facts using stimulating approaches and innovative methods. In doing so, we are always focused on sustainable development: the harmonious connection between social, environmental and economic objectives. In this way we contribute to the quality of society at large, now and in the future.

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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