Triodos Bank

Triodos Bank Greenhouse Gas accounting methodology

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Guidehouse

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1 Introduction

1.1 Background and objective

Triodos Bank's mission is to make money work for positive social, environmental and cultural change. To that end we believe profit doesn't need to be at the expense of the world's most pressing environmental problems. That's why we only finance sustainable organisations and enterprises transitioning to sustainable approaches, from organic food and farming businesses, to pioneering renewable energy enterprises, recycling companies and nature conservation projects.

Triodos Bank wants to finance the urgent need for a transition to a sustainable economy of the future, helping to create the conditions for people to live a better quality of life. As a bank in a new, more sustainable economy, this means helping to develop a society that lives within its environmental means; beneath a safe environmental ceiling and above a fair social floor. For us, that doesn't just mean avoiding financing companies that harm the environment or have a negative impact on people's lives. It means only and exclusively financing projects, people and business that positively benefit society, the environment and culture.

According to the International Panel on Climate Change's 2018 report, we need to keep the global increase in temperature from pre-industrial levels to under 1.5 degrees. To do that means urgently decarbonizing our economy. It means generating renewable energy, increasing the efficiency of energy supply, improving the reliability of renewable energy systems, and involving society more closely in this transition. Together this represents an enormous challenge and it's one that we, and others, will play a role in, helping to finance the kind of change that's needed. And we cannot act as an industry, alone. The scale of the challenge requires urgent action from government, civil society, and business alike. It is both essential and possible.

Financial institutions, as investors in the economy, have a crucial and constructive role to play in this effort; by no longer financing brown assets that emit greenhouse gas (GHG) emissions and contribute to global warming and instead, by focusing on assets that have a positive impact on people and the environment they depend on.

To understand if their contribution to the low or no carbon transition is on track, financial institutions first need to understand the impact of the decisions they make about where they choose to lend and invest. In particular, they need to know what impact their decisions will have on the environment. That's why Triodos Bank is an active member of the Dutch Partnership Carbon Accounting Financials (PCAF), whose goal is to harmonise GHG accounting rules, use this information to set GHG reduction targets and to steer lending and investments towards a low-carbon economy. The group was launched at the seminal Paris Climate Conference in 2015. And Triodos Bank, participated in the launch of the Dutch PCAF methodology, delivered by this collaborative group as planned, two years later in November 2018. We report the GHG emissions of our portfolio since then and this methodology report describes how we are putting that work into practice.

PCAF's approach is open source and collaborative. It aims to learn from, and contribute to, similar initiatives to be even more transparent about the GHG footprint of financial institution's loans and investments.
Peter Blom (CEO of Triodos Bank and Chair of the Global Alliance for Banking on Values (GABV): "I foresee that PCAF are us going to make a tangible impact. The reason is that there is a real need for measurement, transparency, and accountability. That is really important for the financial sector at the moment, because there is a willingness to contribute to the whole climate urgency issue from a financial point of view. But you also have to prove what exactly did you achieve: what was you impact as a financial institution. And PCAF can help with that."[1]

Towards the end of 2020 PCAF's 88 members collectively were disclosing the greenhouse gas emissions. The establishment of an equivalent to PCAF in the United States in 2019, led by our fellow GABV member, Amalgamated Bank, the establishment of a PCAF UK equivalent in 2020, and a Climate Change Commitment signed by 34 GABV member banks at the end of 2020, committing them to assess and report on their GHG emissions within three years using the PCAF methodology, is further evidence of that the breadth and relevance of this work in the financial sector.

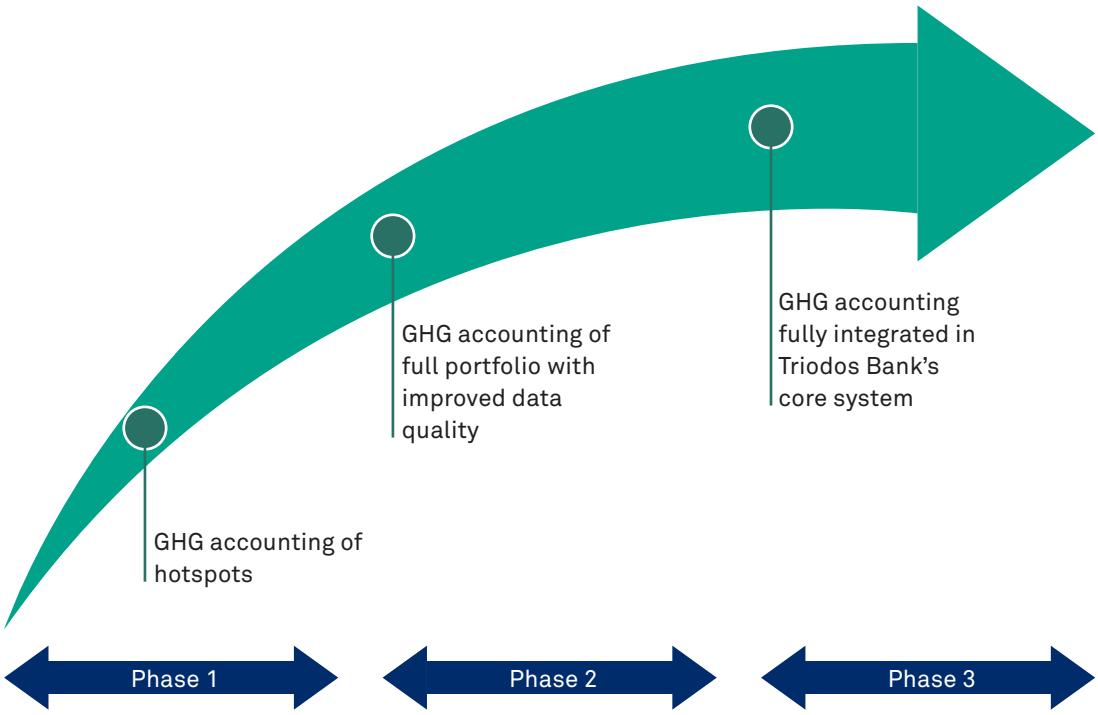
1 https://carbonaccountingfinancials.com/

In 2020 Triodos Bank participated in the development of the Global GHG Accounting and Reporting Standard for the Financial Industry ("The Standard"), launched in November 2020. The Standard provides banks, asset managers, and asset owners a free, standardized, robust, and clear way of measuring and reporting GHG emissions tied to lending and investment portfolios[2]. "The launch of this first ever global standard is a key milestone," says Giel Linthorst, director at Guidehouse and executive director of the PCAF secretariat. "The PCAF standard is a foundational piece for many other climate initiatives."[3]
Our GHG accounting methodology has been aligned with the Standard for our Annual Report in 2020.

As the only pan-European values-based bank, we also want to understand, monitor and in future help to steer on the basis of applying this approach internationally. We will share this experience inside and outside the PCAF group as part of a powerful, collective effort to demonstrate how a bank can keep its influence within a safe environmental ceiling, while playing a powerful role in keeping addressing the challenge of climate change.

1.2 Approach

In alignment with the PCAF methodology, Triodos Bank wants to develop a robust and comprehensive GHG accounting approach that suits its portfolio and business. This approach is built on principles of consistency, transparency, prudence, and accuracy with a focus on data quality. As a result, Guidehouse (then: Navigant), a management consultancy with extensive expertise in this area, and serving as PCAF's secretariat, helped Triodos Bank develop an implementation plan for GHG accounting in May 2018 to detail the approach, priorities, timeline and resource required for the roll-out. We have applied a phased approach (see below) to implement GHG accounting, starting with hotspots that covered around 68% of our direct loans and funds' investments in 2018.



In phase 2 as off 2019, all other loans and direct funds' investments are also covered within the scope of PCAF. For these assets and where no emissions can be determined with detailed higher quality data we make an estimate based on the outstanding amounts and the average emission per financed euro in that sector.

In 2020, we have updated this GHG accounting methodology in line with the global Standard. Most important difference is the application of a new attribution approach towards private mortgages, using the Loan-to-Value ratio to attribute our share in the emissions of a residential mortgage.

2 https://carbonaccountingfinancials.com/newsitem/the-partnership-for-carbon-accounting-financials-pcaf-launches-first-global-standard-to-measure-and-report-financed-emissions#newsitemtext
3 https://guidehouse.com/insights/energy/2020/pcaf-standard-financed-emissions

Emission factors were also updated in 2020. This was performed by Guidehouse and reviewed by Triodos Bank and the external auditor responsible for the review of the reported emissions in our Annual Report. New emission factors were added for specific subsectors, providing better estimates for these categories. To align with the Science Based Targets initiative (SBTi), we have applied differently sourced (IFI GHG methodology) emission factors for the renewable energy sector.

The year 2020 has proven to provide an unexpected challenge regarding the appearance of COVID-19, which has impacted energy use and GHG emissions globally. Preliminary insights show that overall energy demand has decreased in 2020. The decline in energy demand in industrial and commercial operations has outweighed the increase in demand in residential operations. The analysis of effects of COVID is at this stage not reflected in the emission factors for 2020, as detailed quantitative information per sector is currently not available to perform an accurate impact analysis.

1.3 Structure of this document

In this document, we will provide a comprehensive description of the GHG accounting methodology - based on PCAF. We follow the same structure as reported in Triodos Bank's integrated annual report. In each chapter, specific data quality scores are presented which enable Triodos Bank to identify opportunities to improve data quality over time.

Next to describing the guiding principles for GHG accounting, we present the GHG accounting of Triodos Bank's own operations, employee commuting, business travel and paper use. These are all items that the organisation has footprinted for many years.

While much of this document is relatively technical, the purpose that underpins it is fundamental to the long-term health of the planet we depend on. It is also only a starting point. Triodos Bank looks forward to collaborating further with members of PCAF, and others, to develop a credible, harmonised and easily understood approach to align the GHG emissions of our loans and funds' investments with the Paris Agreement.

For a description of the results of the implementation of GHG accounting, i.e. our GHG footprint, readers should view Triodos Bank's annual report at www.annual-report-triodos.com.

2 Definitions

2.1 Loans

In this report loans are defined as all loans and advances to customers within Triodos Bank, excluding short term cash loans.

2.2 Investments

Investments are defined as all types of financial products within the fund management of Triodos Investment Management and in Triodos Regenerative Money Centre. This includes equity, loans, and bonds, but excludes liquidities held in the funds.

2.3 Treasury securities

Part of our balance sheet consists of assets used for treasury purposes, e.g. cash and cash equivalents, loans and advances to banks, debt and investment securities, etc. These assets are currently not considered in scope of PCAF as these do not comprise activities that fall within the investment and lending portfolio.

2.4 Greenhouse Gases (GHG)

Greenhouse gases are defined as gases in the atmosphere that absorb and emit radiation. This process is the fundamental cause of the greenhouse effect. The GHG Protocol[4] recognises seven greenhouse gases: Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF3). In our methodology all emissions are converted to CO_2 equivalents, or CO_2eq, using the conversion ratios determined by the Intergovernmental Panel on Climate Change (IPCC). A carbon dioxide equivalent (CO_2eq) is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO_2 that would have the same global warming potential (GWP), when measured over a specified timescale (generally,100 years).

2.5 Avoided emissions

Avoided emissions are emissions that are avoided outside of a company's scope 1, 2, and 3[5] inventories and require a project or product accounting methodology. Any estimates of avoided emissions must be reported separately from a company's scope 1, 2, and 3 emissions, rather than included or deducted from the scope 3 inventory. For Triodos Bank, avoided emissions occur mainly when investing in renewable energy.

2.6 Sequestered emissions

As informed by the GHG Protocol1, plants and trees absorb carbon (as CO_2) from the atmosphere during photosynthesis. Before this carbon is put back into the atmosphere, it resides in one of several "carbon pools." These pools include (a) above ground biomass (e.g., vegetation) in forests, farmland, and other terrestrial environments, (b) below ground biomass (e.g., roots), and (c) biomass-based products (e.g., wood products) both while in use and when stored in a landfill. Carbon can stay in pools for very long periods of times, which means an increase in the stock of sequestered carbon stored in these pools represents a net removal of carbon from the atmosphere.

4 http://www.ghgprotocol.org/
5 Scope 1, 2 and 3 are explained in chapter 3.1

3 Guiding principles

In line with PCAF and GHG Protocol, the methodology per sector is constructed using the following basic accounting principles:

- Completeness
- Consistency
- Transparency
- Prudence
- Balance
- Accuracy

Each element ensures the methodology is robust and pragmatic for use now and for the future.

3.1 Completeness

In order to ensure completeness, the scope must be defined to determine the emissions accounted for in Triodos Bank's value chain. The GHG Protocol[6] standardises this by categorising direct and indirect emissions in three scopes (see Box 1 and Figure 1). Activities within the value chain of an organisation are direct or indirect depending on the consolidation approach chosen by an organisation.

GHG Protocol Scopes 1, 2, & 3

- **Scope 1:** All direct GHG emissions by Triodos Bank (natural gas in offices and fuel use by our car fleet)
- **Scope 2:** Indirect GHG emissions by Triodos Bank (purchased electricity)
- **Scope 3:** Other indirect emissions not covered in Scope 2; in total 15 categories within Scope 3 are defined, such as purchased good and services, business travel, employee commuting, end of life treatment of sold products, or in the case of Triodos Bank mostly emissions associated with loans and funds' investments (i.e. Scope 3: category 15)

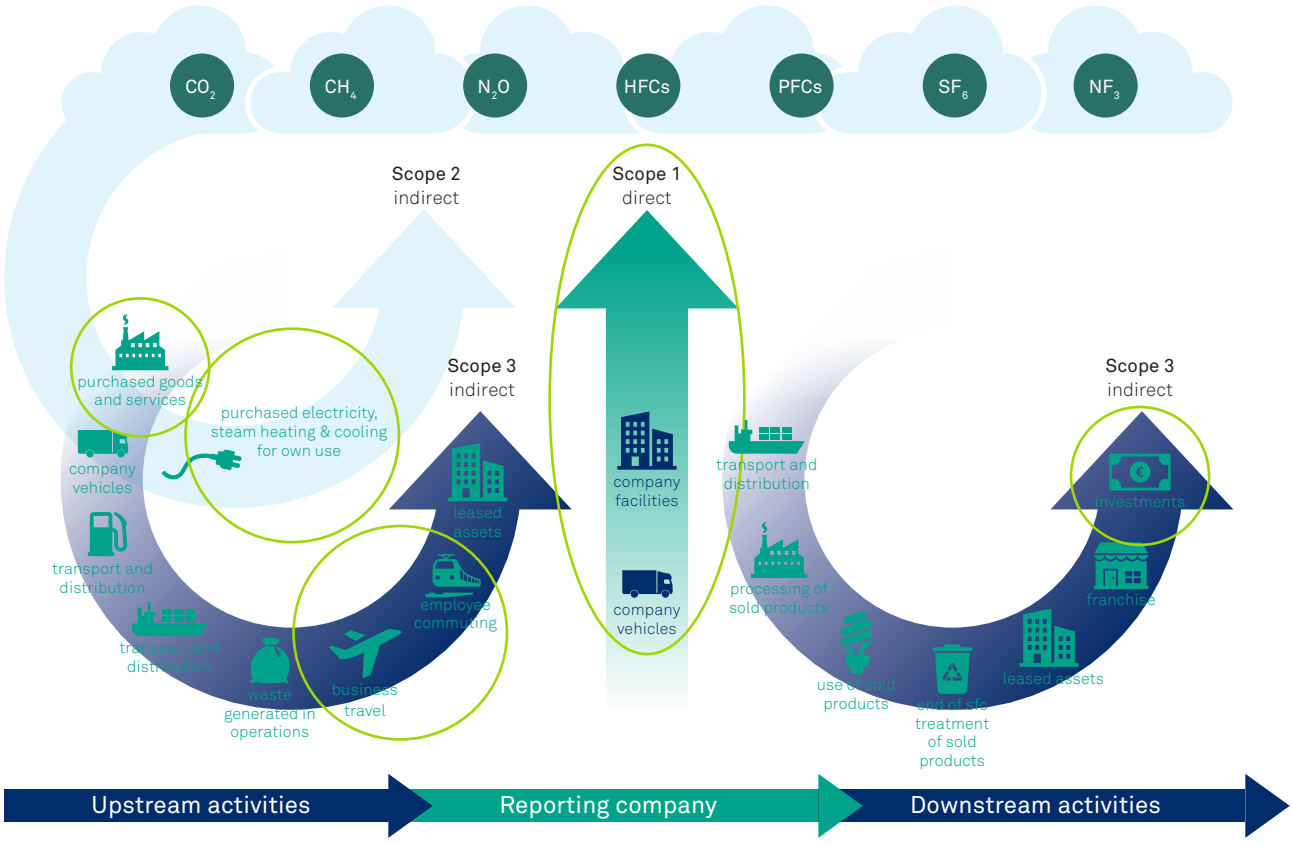


Figure 1. Covered (green) categories and scopes within GHG Protocol Scopes

6 The Greenhouse Gas (GHG) Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), sets the global standard for how to measure, manage, and report greenhouse gas emissions.

We aim to be as complete as possible in our GHG accounting, covering all scopes of the GHG Protocol that are material to our GHG inventory. Next to Scope 1 and 2, we report on our emissions from employee commuting, business travel and paper use (upstream Scope 3). However, the main focus of this report is on our Scope 3 category: 15 Investments.

3.2 Consistency

The methodology for Triodos Bank is consistent with internationally recognised standards (i.e. GHG Protocol Corporate Value Chain Accounting and Reporting Standard, World Resources Institute, WRI and World Business Council for Sustainable Development, WBCSD; 2004), the sector-led harmonised GHG accounting approach developed by the Dutch Partnership Carbon Accounting Financials and the Global GHG Accounting and Reporting Standard for the Financial Industry (the Standard) from PCAF. Next to consistency with international standards and approaches, our methodology is consistent within the selected sectors, i.e. covering the relevant emissions from Scope 1 and 2 of our borrowing customer or investee in all cases.

3.3 Transparency

Being transparent is a core value and principle in everything we do. We aim to reflect this in our GHG accounting too, both with the applied methodology and its results in this report. In addition, we are committed to disclose our GHG footprint on an annual basis in our annual report.

3.4 Prudence

In our GHG accounting we strive to be prudent and use numbers that are conservative. If the methodology has limitations or good data is not available, we select the methodology or data that is most negative for our performance. This means that when this situation occurs, we overestimate the generated emissions associated with our portfolio and underestimate the avoided or sequestered emissions. To improve the estimations of our financed emissions, we implement data quality scoring. Per sector, a data quality scorecard is developed. Knowing the potential of data quality improvement will enable us to take action to increase data quality and to improve the quality of our overall GHG footprint.

Figure 2 below is a general visualisation of how each sector's data quality is scored. Each score, starting with score 1 as the highest quality of data and ending with score 5 as the lowest, corresponds to a particular type of data source which will vary depending on the sector in question.

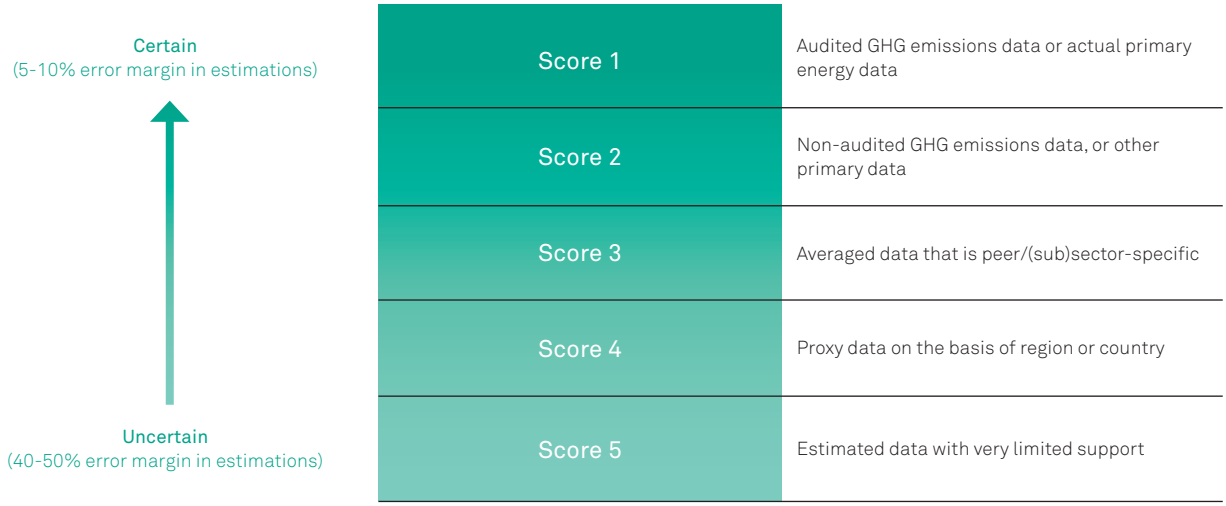


Figure 2. General data quality scoring

From the figure, it is apparent that the level of certainty is also an element that determines the accuracy of the overall GHG footprint.

As well as data quality and uncertainty associated with emission data, financial data on the revenue or total balance sheet of our clients also has different levels of quality, however these are not scored as these are already regularly improved due to legislative financial reporting requirements.

3.5 Balance

In line with the GHG Protocol and PCAF, Triodos Bank will account for its financed emissions based on proportional share. Attribution factors to attribute the emissions of our client to our share are defined per sector, or project, or based on conservative averages per sector and country.

3.6 Accuracy

We aim to be as accurate as possible in our GHG accounting. On the one hand, the methodology ensures accuracy by attributing Triodos Bank's share of the GHG footprint of our clients. On the other, the use of data quality scoring linked to a level of uncertainty enables us to improve data quality and improve the accuracy of our GHG footprint. Results will appear in our annual report and are subject to audit with limited assurance.

4 Emissions from own operations (Scope 1 & 2)

In this chapter, the GHG accounting approach is presented for the GHG emissions from Triodos Bank's own operations in the various countries.

4.1.1 Scope

In line with the GHG Protocol Corporate Value Chain Accounting and Reporting Standard (WRI & WBCSD; 2004), Triodos Bank follows an operational approach to account for the emissions from our own operations, which means Triodos Bank accounts for all the emissions from operations in the various countries over which it has operational control. This includes:

- Scope 1 (direct): emissions arising from gas used to heat our offices and the energy use in our car fleet.
- Scope 2 (indirect) emissions: emissions arising from purchase of electricity and district heating.

4.1.2 Accounting approach and emission factors

Triodos Bank partners with the Climate Neutral Group (CNG) to calculate and compensate our GHG emissions from our own operations. The CO_2 Management Application of CNG is used to calculate our Scope 1 and 2 emissions. CNG determines emission factors for the calculation of the amount of GHG emissions caused by Triodos Bank on an annual basis.

In order to calculate our Scope 1 and 2 emissions, we measure the use of natural gas and electricity for our offices and the energy use for our car fleet. This includes the total amount of natural gas (m3) split up into natural gas, green gas by offsetting, biogas, heating oil and district heating to heat our offices. The total amount of electricity (kWh) is split up into grey, wind, hydro, sun, biomass, or a mix of green electricity. For the energy use for our car fleet, we measure consumption of diesel, petrol, LPG, biodiesel, and electricity.

Emission factors of CNG are applied to this data to derive our Scope 1 and 2 emissions.

4.1.3 Data quality scorecard, assumptions and limitations

Scope 1 and 2 emission data is collected by Local Environmental Managers (LEMs) in the various countries. They complete all data, including underlying evidence, in the application of CNG. The LEM of The Netherlands checks if the input of all data and evidence has been done correctly. After the completion of this phase all data is consolidated by the Finance Division (using a four eyes principle). Finally, an external auditor checks if all relevant data has been entered accurately and approves the outcome.

As we use primary data (i.e. actual data on our energy use in our offices, car fleet, and purchased electricity) to account for our Scope 1 and 2 emissions, this calculation is performed to the highest data quality level.

5 Emissions from upstream activities (Scope 3)

In this chapter we briefly discuss the scope and methodology that we apply to account for emissions from our activities upstream.

5.1.1 Scope

In line with the GHG Protocol Corporate Value Chain Accounting and Reporting Standard (WRI & WBCSD; 2004), Triodos Bank has also annually accounted for the following emissions:

- Emissions related to our employee commuting (Scope 3 category 7),
- Business travel (Scope 3 category 6) and
- Procurement of paper (Scope 3 category 1).

5.1.2 Accounting approach and emission factors

As with our Scope 1 and 2 emission calculations, Triodos Bank partners with Climate Neutral Group (CNG) to calculate and compensate for its emissions from above upstream activities. The CO_2 Management Application of the CNG is used to calculate these Scope 3 emissions. CNG uses emission factors for the calculation of the amount of GHG emissions caused by these upstream activities on an annual basis. For paper procurement, we measure office paper and the paper we consume for printed materials (brochures, envelopes, etc). This data is specific to the countries where we operate and tracked by total use (kg) and per employee per year.

Regarding business travel, air travel is based on an emission factor per kilometre per year and measured based on routes indicated as linked between visited airports, determined by the IATA code. Travel by commuting and road transport are divided because environmental pollution associated with each is different. Cars are split up between diesel, petrol, LPG, biodiesel, and electric. Public transport is divided between bus, train and underground. Data on employee commuting is collected through detailed, internal surveys.

Emission factors of CNG are being applied to this data to quantify our upstream Scope 3 emissions.

5.1.3 Data quality scorecard, assumptions and limitations

As we use mostly primary data (km travelled, transport type, paper type and kg, etc.) to account for these Scope 3 emissions, we believe this calculation is performed to the highest data quality level.

6 Scope 3, Investments - Environment: avoided emissions from Renewable Energy

In this chapter we present our methodology to assess the avoided emissions of our loans and funds' investments in the renewable energy sector. In contrast to the other chapters, avoided emissions are calculated based on a different methodology which compares to a baseline. According to the GHG Protocol avoided emissions are not part of Scope 3 but should be reported separately.

6.1.1 Scope

All subsectors categorised under renewable energy are within scope. These include:

Table 1. Triodos Bank's subsectors for renewable energy

Triodos Bank's Subsector
Wind
Solar
Hydro energy
Biomass
Heat and cold storage
Other renewable energy

For the biomass, heat and cold storage, and other renewable energy subsectors, Triodos Bank has collected CO_2 or energy savings calculations from the project. These calculations are used in our accounting approach. For the wind, solar, and hydro energy subsectors, avoided emissions are calculated using the accounting approach below.

6.1.2 Accounting approach and emission factors

Avoided emissions of renewable energy are calculated by combining primary data collected by us with established emission factors based on the emission factor of the assets that are pushed out of the grid mix by introducing a new renewable asset. The methodology for calculation is as follows:

$$\frac{CO_2\,eq}{(kWh\ (production)} \times Total\ production\ (kWh)\ of\ project \times \frac{Outstanding\ Triodos\ loan\ \&\ investments}{Project\ Equity+Debt} = CO_2eq_{avoided}$$

The emission factors (CO_2eq per kWh production) are derived from the Operating Margin emission factor of the International Financial Institutions (IFI) dataset.

In previous years, an IEA dataset (CO_2 Emissions from Fuel Combustion 2017) was used to calculate the grid emission factors of the various nations. This dataset represents an average grid emission factor and does not account for what a renewable power source would actually replace in the energy system. Hence, from this year onwards, Triodos Bank will be using the Operating Margin (OM) emission factor per country from the International Financial Institutions (IFI) dataset[7]. The OM is based on emission factors from the power plants with the highest variable operating costs. These are the power plants that will be replaced first when utilising new renewable power sources. Hence, this factor provides a more realistic insight in the contribution of new renewable power sources and is consistent with PCAF and aligns with the Science Based Targets initiative (SBTi).

7 https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting

6.1.3 Data quality scorecard, assumptions and limitations

Accounting for avoided emissions from renewable energy is ideally calculated based on the actual electricity production in the year of reporting. However, below in Table 2, several methods with different data quality levels can be applied if this is not the case.

Table 2. Data quality scorecard for renewable energy

Data quality (highest to lowest)	Description
1	• Audited or verified GHG emission data from the project, in accordance with the GHG Protocol and/or UNFCC or another credible certification scheme • Actual annual production (kWh, MJ) of the project • Annual production (kWh) estimated by a third party based on P50/P90 assessment of potential production adjusted with the NL Windex factor[8]
2	Estimated annual production (kWh) based on P50/P90 assessment of potential production
3	Non-audited or non-verified project specific GHG data, calculated by an independent expert for which we cannot verify alignment with the GHG Protocol and/or UNFCC or another credible certification scheme
4	Estimated annual production (kWh) based on capacity (MW) of project combined with average load factors per country
5	Emission intensity factors (emissions avoided per million euro invested) per technology from own system or peer financial institutions

As suggested by PCAF, for renewable energy projects, it is customary to have outside experts calculate predictions in production by percentiles based on historic data. This may include wind measurements or hydraulic flows. The P50 value serves as a prediction of when production may exceed a probability of 50% in a given year; for P90 it is 90%[9]. In line with PCAF, emission calculations based on P50 are preferred to P90, if no figures on the actual electricity production are available. Otherwise, emission calculations on a project basis, or other, factors such as capacity or a monetary sum, will support assumptions for the emission calculation.

After the avoided emissions have been calculated per project, these emissions are attributed to Triodos Bank based on the ratio between our outstanding loans and funds' investments and the total project equity and debt. If no data is available on the current total project equity and debt, assumptions are made based on the project administration at the time of loan or investment origination.

8 More information on the Windex can be found at the CBS website on Wind energy; electricity production, capacity, and supply of wind, 2002-2019. The supply of wind for wind energy is reported in the so-called Windex. The Windex is only available for wind on land. A Windex of 100 means that the supply of wind is equal to the average of all months in the period 1996-2005. This period is chosen because it is seen as a representative period for a long time series and also because a consistent time series of data is available for this period.

9 See PCAF (2017) report.

7 Scope 3, Investments - Environment: emissions from Organic Farming

In this chapter we present our GHG accounting methodology for our loans and funds' investments in the sector organic farming.

7.1.1 Scope

All subsectors categorised under organic farming are within scope. These include:

Table 3. Triodos Bank's subsectors for organic farming

Triodos Bank's Subsector
Dairy
Horticulture
Meat
Arable
Mixed
Fruit growing/farming
Poultry/egg production
Aquaculture
Forestry *
Other organic farming

* The Triodos Bank's subsector entitled Forestry will be discussed separately, as this is subject to a different GHG accounting approach linked to sequestered emissions.

7.1.2 Accounting approach and emission factors

The emissions from our loans and funds' investments in organic farming are assessed by combining the collected data (e.g. hectares of land, kilograms of produce) from our clients with supporting external references.
The methodology for calculating CO_2eq based on hectare data is as follows:

$$\frac{CO_2\,eq}{Hectares} \times Total\ hectares \times \frac{Outstanding\ Triodos\ loan\ \&\ investments}{Balance\ sheet\ total} = CO_2eq$$

The methodology for calculating CO_2eq based on kilogram data is as follows:

$$\frac{CO_2\,eq}{kilograms\ of\ produce} \times Total\ kilograms\ of\ produce \times \frac{Outstanding\ Triodos\ loan\ \&\ investments}{Balance\ sheet\ total} = CO_2eq$$

As we already collect data on hectares from our organic farming clients for impact reporting purposes, the emission intensity factor per hectare is calculated based on data from public databases like the Food and Agriculture Organisation of the United Nations (FAO) FAOstat[10]. Often these public databases provide average emission intensities for a crop or livestock. Where available, better quality data is used. For our top-20 clients based on outstandings and emissions we have made efforts to collect better quality data such as actual yield data. As Triodos Bank invests in organic farming, these emission factors are adjusted based on studies that compare the emission intensity of organic versus conventional farming. After emissions have been estimated per client, these emissions are attributed to Triodos Bank based on the ratio between our outstanding loan and the balance sheet total of the client recorded in our system.

10 http://www.fao.org/faostat/en/#home

Case Study: A look into calculating GHG emissions of organic farming

The FAO database[11] and report on Organic Agriculture and Climate Change Mitigation (2011)[12] were primarily used to calculate emission levels attributable to Triodos Bank. Because Triodos Bank data captures the impact of loans and funds' investments by hectare of land use, a factor of GHG emissions per hectare is needed. To derive these factors, it is required to combine production, emissions, and yield data from FAO. A conversion such as the one below is used in deriving an emission intensity per hectare of land use.

$$\frac{\Sigma\ Total\ production\ (tonnes)_{\ Arable\ crops}}{\Sigma\ Hectares_{\ Arable\ crops}} \times \frac{\Sigma\ CO_2eq_{\ Arable\ crops}}{\Sigma\ Total\ production\ (tonnes)_{\ Arable\ crops}} = \frac{CO_2eq_{\ Arable\ crops}}{Hectares_{\ Arable\ crops}}$$

It is also possible to simply divide the total emissions from crops by the total hectares if this is known. However, many times the yield data (tonnes/ha) is presented without knowing the total amount of hectares used. It is therefore not possible to convert unless all three elements (total area, total production, total emissions) are known.

Secondly, in this case, area data for livestock (Triodos Bank's subsector Meat and Dairy) was only known per LSU (LSU = livestock unit equivalent to an adult cow). Eurostat livestock unit (LSU) coefficients[13] were used to convert the specific type of animal (i.e. pig, goat, cow) per hectare because the FAO database had indicators based on LSU/hectare and yield (hg)/animal. In this way a similar GHG intensity factor was derived.

Finally, based on the FAO report[7], average emissions from organic farming per hectare are around 57% lower than conventional dairy farming. This percentage is used to convert the above GHG intensity factor for conventional farming to organic farming.

7.1.3 Data quality scorecard, assumptions and limitations

Emissions from organic farming can be calculated in different ways depending on the data availability and data quality. Based on the various data sources available and in line with PCAF, we have developed the data quality scorecard presented in Table 4 below.

Table 4. Data quality scorecard for organic farming

Data quality score (highest to lowest)	Description
1	Audited GHG emission data from our clients, in accordance with the GHG Protocol
2	Primary data such as yield data collected by Triodos Bank client, converted to CO_2eq-emissions using verified emission factors specific to the emission source
3	• Sector-specific physical-activity based source data, used to calculate GHG emissions with an approved GHG calculation tool[14], or comparable sector-specific and physical-activity based databases or tools issued by credible institutions such as the FAO • Estimated carbon emissions based on hectares, type of farming and regions, using verified emission factors • Non-audited or non-verified GHG emission data provided by our clients
4	Specific emission data from life cycle analysis (LCA) in specific regions that overlap with Triodos Bank loans and funds' investments
5	Extended Environmental Input Output (EEIO) databases (i.e. EXIOBASE or GTAP) that provide sector-level data on emissions per revenue[15] per country

11 For instance, the FAO data base (http://www.fao.org/faostat/en/#data) and FAO report (see footnote 3) was used to derive emission intensities per hectare.
12 See FAO (2011), Organic Agriculture and Climate Change Mitigation, http://www.fao.org/fileadmin/templates/organicag/pdf/11_12_2_RTOACC_23_webfiles.pdf
13 https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Livestock_unit_(LSU)
14 Such as the IFC Carbon Emissions Estimation Tool (IFC-CEET), Agence Française du Développement (AFD) Carbon calculation tool
15 In EEIO databases gross output production (expressed in euro) can be used as a proxy for revenue. Gross output is defined as "the total value of sales by producing enterprises (their turnover) in an accounting period (e.g. a quarter or a year), before subtracting the value of intermediate goods used up in production". Gross output production is "calculated by summing the intermediate and final sales" which matches well with the definition of "revenue".

In general, audited GHG emissions are the highest quality and the most desirable. As organic farmers are often smallholder farmers, audited data is not available. A client in the organic farming sector could also gather primary data that enables Triodos Bank to perform the calculations by using available GHG accounting tools, such as Cool Farm Tool[16]. For example, a client could report the number of cows, the milk yield, and the processes involved on the specific farm to effectively calculate an emission factor on a client basis. Triodos Bank would be able to store this information per client to perform optimal GHG accounting. Otherwise, due to the specific nature of organic farming techniques as they vary regionally and among clients, scientific literature and/or a combination of sectoral database approximations is used to derive an emission factor for Triodos Bank's subsectors.

16 https://coolfarmtool.org/

8 Scope 3, Investments - Environment: emissions from Sustainable Property

In this chapter, we present the methodology, scope, accounting approach and data quality scoring for our loans and funds' investments in the sustainable property sector, as selected in our hotspot analysis.

8.1.1 Scope

All subsectors categorised under the sustainable property sector are within scope. These include:

Table 5. Triodos subsectors for sustainable property

Triodos Subsector
Property development
Shared workspace/Offices
Nature development *
Private sustainable property
Other sustainable property

* The Triodos Bank's nature development subsector will be discussed separately as this is subject to a different GHG accounting approach linked to sequestered emissions.

8.1.2 Accounting approach and emission factors

The sustainable property sector can be accounted for using Triodos Bank's collected data on building type and floor area and supporting literature regarding types of buildings and their associated emissions. In general, the methodology for calculation is as follows:

$$((\text{gas consumption}) \times (EF_{gas}) + (\text{electricity consumption}) \times (EF_{electricity})) \times \frac{\text{Outstanding Triodos loans \& investments}}{\text{Property value or Balance sheet total}} = CO_2eq$$

Gas and electricity consumption of the buildings are estimated based on emission factors provided by literature[17] multiplied by the total floor space (m^2) of a property loan or investment. Using emission factors (EF) for gas and electricity derived from sources such as CO_2emissiefactoren.nl, Central Bureau of Statistics (CBS) and the European Commission building database gives us the Scope 1 and 2 emissions of the property. Because Triodos Bank only finances sustainable properties, a percentage reduction of the average emissions of a property type is considered. To attribute these emissions to Triodos Bank, an attribution factor is applied that divides the outstanding loan by the property value, or balance sheet total, of the customer.

8.1.3 Data quality scorecard, assumptions and limitations

For sustainable property, we have developed a detailed data quality scorecard to identify data improvements and improve data quality over time. Table 6 below describes the data quality scoring for sustainable property in more detail.

17 See ECN 2016 report for Dutch building types and their associated energy consumptions and CBS StatLine 2019 data on average gas and electricity consumption for different buildings

Table 6. Data quality scorecard for sustainable property

Data quality (highest to lowest)	Description
1	• Audited GHG emission data from our clients, in accordance with the GHG Protocol • Actual energy consumption, converted to CO_2eq-emissions using verified emission factors specific to the type of energy consumed
2	Actual energy consumption, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
3	• Estimated energy consumption based on energy performance/energy label and floor area, converted to CO_2eq-emissions using emission factors for energy from undefined energy source • Non-audited or non-verified GHG emission data provided by our clients
4	Estimated energy consumption per type of property and floor area, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
5	Average energy consumption per type of property in a country, converted to CO_2eq-emissions using emission factors for energy from undefined energy source

If specific property data on actual energy consumption (e.g. from energy bills) is not known, many countries have energy performance ratings in place. For example, The Netherlands applies an energy label scheme from scale A to G mainly based on the insulation and installation quality of the property[18]. The implication is that higher-labelled buildings will require less energy consumption. However, this data is better supported by knowing the size of the floor area per building. For example, a highly energy-efficient building may require more consumption than a lower efficient building if the floor space is much larger. If none of this data can be gathered, average energy consumption per type of property in a country can be applied by, for instance, using the EU Buildings database[19] or national databases and literature.

18 https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels-gebouwen/bestaande-bouw/energielabel-utiliteitsgebouwen

19 https://ec.europa.eu/energy/en/eu-buildings-database

9 Scope 3, Investments - Environment: sequestered emissions from Nature Development and Forestry

In this chapter we present our methodology to account for the sequestered emissions from our loans and funds' investments in the nature development and forestry subsectors. As these emissions follow a different accounting approach, we will account and report on them separately.

9.1.1 Scope

Triodos Bank's subsectors of forestry (administered in the organic farming sector) and nature development (administered in the sustainable property sector) are within the scope of sequestered emissions.

9.1.2 Accounting approach and emission factors

Sequestered emissions of forestry are calculated by using data in the AFOLU USAID Carbon Calculator on emissions per hectares of different species and stages of forestry development including harvesting, thinning, and fertilizer usage. For nature development the sequestered emissions are calculated by taking a sample mix of species found in cooler temperate climates. All rotational period emissions per hectare are averaged per species over a period of 30 years. Then, an average of these emission factors is calculated to approximate the mixed varieties of species found in nature development.

$$Average\ \frac{CO_2eq}{Hectare\ (ha)_{per\ species\ of\ tree}}\ x\ Total\ hectares\ (ha)\ x\ \frac{Outstanding\ Triodos\ loans\ \&\ investments}{Project\ Equity+Debt} = CO_2eq_{sequestered}$$

The attribution factors shown above are then multiplied by this figure in order to attribute these emissions to Triodos Bank's activity.

Sequestered emissions of grassland (incl. heathland) are also calculated using AFOLU USAID data.

$$Average\ \frac{CO_2eq}{Hectare\ (ha)_{per\ species\ of\ tree}}\ x\ Total\ hectares\ (ha)\ x\ \frac{Outstanding\ Triodos\ loans\ \&\ investments}{Project\ Equity+Debt} = CO_2eq_{sequestered}$$

9.1.3 Data quality scorecard, assumptions and limitations

The following data scoring is used to score and improve data quality on nature development and forestry over time.

Table 7. Data quality scorecard for sequestered emissions in nature development and forestry

Data quality (highest to lowest)	Description
1	• Audited carbon sequestration data from the clients in nature development and forestry, in accordance with the GHG Protocol • Annual, actual incremental growth of the specific species of land/trees being financed in a known region
2	• Carbon sequestration data calculated by Triodos Bank or a third-party data provider, based on primary data and using verified emission (sequestration) factors specific to the sequestration source
3	• Estimated carbon sequestered emissions based on hectares, species of land/trees and regions, using verified emission factors • Non-audited or non-verified GHG emission data provided by our clients
4	Estimated carbon sequestered emissions based on hectares and regions for unknown species of land/trees, using verified emission factors
5	Average, global sequestered emissions for any unknown species of land/trees using verified emission factors

10 Scope 3, Investments - Environment: emissions from Private Mortgages

In this chapter, we present the developed methodology, including the scope, accounting approach and data quality scores, for the GHG accounting of the private mortgages sector.

10.1.1 Scope

All outstanding private residential mortgages that are recorded in our system are within scope.

We account for the Scope 1 and 2 emissions of each house (i.e. the fossil fuel use to heat the house and purchased electricity and/or heat by the owner/user of the house = total energy consumption of the house).

10.1.2 Accounting approach and emission factors

In line with Dutch PCAF accounting methods, the Scope 1 and 2 emissions associated with a mortgage to a residential house were until 2019 100% attributed to Triodos Bank, as the assumption was that Triodos Bank is often the only provider of a mortgage and is directly engaged with its customer. From reporting year 2020 onwards, Triodos Bank adopts a loan-to-value (LTV) ratio to be consistent with the global PCAF Standard. This new attribution approach assumes the residential property owner also takes ownership of the building's emissions.

The following formula is used to calculate the GHG emissions attributed to our private residential mortgages:

$$((\text{gas consumption}) \times (EF_{\text{gas,energy label}})) + (\text{electricity consumption}) \times (EF_{\text{electricity,energy label}})) \times \frac{\text{Outstanding Triodos mortgage}}{\text{Property value}} = CO_2eq_{\text{energy label}}$$

As regulated by EU policy, many member states have implemented building scores based on energy efficiency, often so-called energy performance schemes or energy labels. Depending on the energy label of the house in a specific country, the gas consumption and electricity consumption can be estimated. An emission factor (EF) for gas and electricity derived from sources such as CO_2emissiefactoren.nl and International Energy Agency (IEA) is used to calculate the emissions of the house. These values can be summed up to calculate the total amount of GHG emissions of our private mortgage portfolio.

10.1.3 Data quality scorecard, assumptions and limitation

In a similar way to sustainable property, we have developed a detailed data quality scorecard for our private mortgages in table 8 below.

Table 8. Data quality scorecard for private mortgages

Data quality (highest to lowest)	Description
1	Actual energy consumption, converted to CO_2eq-emissions using verified emission factors specific to the type of energy consumed
2	Actual energy consumption, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
3	• Estimated energy consumption based on energy performance/energy label and floor area, converted to CO_2eq-emissions using emission factors for energy from undefined energy source • Average, actual energy consumption per postal code regions, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
4	Estimated energy consumption based on energy labels and type of property, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
5	Average energy consumption per type of property in a country, converted to CO_2eq-emissions using emission factors for energy from undefined energy source

Following a collaboration with other financial institutions in the Dutch chapter of PCAF and the Dutch Central Bureau of Statistics in 2019, we are using actual energy consumption data for part of the Dutch mortgage portfolio. This results in a better overall data quality for this sector.

11 Scope 3, Investments - Social: emissions from Health Care – Care for the Elderly

In this chapter, we present the methodology, scope, accounting approach and data quality scoring for our loans and funds' investments in the health care subsector: care for the elderly.

11.1.1 Scope

Within the scope of the current methodology only care for the elderly is included from the health care sector. For other Triodos Bank subsectors within health care too limited data is available to perform GHG accounting. Scope 1 and 2 emissions per care facility for the elderly people is included.

11.1.2 Accounting approach and emission factors

The accounting approach shown below differs from other approaches because of the data availability within this subsector. As Triodos Bank in general doesn't capture square metre data on the properties of the financed care for the elderly, the number of elderly people is used. Where we were able to obtain square metre or energy consumption data for an elderly care facility, we used this as input to derive the GHG emissions.

$$\frac{CO_2eq}{Elderly\ person} \times Total\ number\ of\ elderly\ people \times \frac{Outstanding\ Triodos\ loans\ \&\ investments}{Balance\ sheet\ total} = CO_2eq$$

For The Netherlands, average floor area per elderly person of 75 m^2 is found from the Handreiking Kengetallen Benchmark Zorgvastgoed Bouwkostennota 2017[20] study. As elderly homes are a combination of social housing and overnight facilities, we assume that we can average the emission factor for social housing and overnight facilities to derive the emission factor for care for the elderly (in CO_2eq/m^2). Then, multiplying this by the metres squared per elderly person (75 m^2) leads to CO_2eq emissions per elderly person.

For other countries in Triodos Bank's portfolio, this Dutch emission factor is adjusted based on the difference in average energy consumptions of houses in these countries compared to The Netherlands.

After emissions have been estimated per person in an elderly care facility, these emissions are attributed to Triodos Bank based on the ratio between our outstanding loan and funds' investment and the balance sheet total of the client, recorded in our system.

11.1.3 Data quality scorecard, assumptions and limitations

The following data scoring is used to score and improve data quality on care for elderly over time.

Table 9. Data quality scorecard for care for elderly

Data quality (highest to lowest)	Description
1	• Audited GHG emission data from our clients, in accordance with the GHG Protocol • Actual energy consumption of the care facility, converted to CO_2eq-emissions using verified emission factors specific to the type of energy consumed
2	Actual energy consumption for the care facility, converted to CO_2eq-emissions using emission factors for energy from undefined energy source
3	• Estimated energy consumption based on energy performance/energy label and floor area, converted to CO_2eq-emissions using emission factors for energy from undefined energy source. The total floor area is derived from the number of elderly people in a care facility • Non-audited or non-verified GHG emission data provided by our clients
4	Estimated energy consumption per type of care facility and floor area, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source
5	Average energy consumption for a care facility in a country, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source

20 https://www.zorgkennis.net/downloads/kennisbank/ZK-kennisbank-AcvZ--Bouwkostennota-2017-5277.pdf

12 Scope 3, Investments - Social: emissions from Social Housing

In this chapter, we present the methodology, scope, accounting approach and data quality scoring for our loans and funds' investments in the social housing sector.

12.1.1 Scope

All the subsectors categorised under the social housing sector are within scope. These include:

Table 10. Triodos subsectors for Social housing

Triodos Subsector
Housing associations
Other social housing

12.1.2 Accounting approach and emission factors

Emissions related to the social housing sector can be accounted for by using the number of houses Triodos Bank invests in per country and attributing these emissions to Triodos Bank. The following formula is applied

$$\frac{CO_2eq}{house} \; x \; Total\ number\ of\ houses \; x \; \frac{Outstanding\ Triodos\ loan\ \&\ investments}{Balance\ sheet\ total} = CO_2eq$$

12.1.3 Data quality scorecard, assumptions and limitations

The following data scoring is used to score and improve data quality on social housing over time.

Table 11. Data quality scorecard for social housing

Data quality (highest to lowest)	Description
1	• Audited GHG emission data from our clients, in accordance with the GHG Protocol • Actual energy consumption, converted to CO_2eq-emissions using verified emission factors specific to the type of energy consumed
2	Actual energy consumption, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source
3	• Estimated energy consumption based on energy performance/energy label and floor area per type of social house in a country, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source • Non-audited or non-verified GHG emission data provided by our clients
4	Estimated energy consumption per type of social house in a country and floor area, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source
5	Average energy consumption per social house in a country, converted to CO_2eq-emissions using emission factors for energy from an undefined energy source

In a similar way to the private mortgage and sustainable property sectors, the GHG emissions per house are ideally calculated using energy consumption data per client account. When this data is not available, average emission intensity for a typical house in a country can also be used. These figures can be derived by using energy consumption statistics on a country level in the residential sector. However, the data quality will decline. Otherwise, some databases capture emission intensities on a household basis and therefore, provide upfront, figures that can be used towards the equation above.[21] But one has to ensure that the emissions covered in these databases are Scope 1 and 2 of the house, i.e. the energy-related emissions and exclude the emissions related to expenditure of a household (e.g. on food).

21 See World Energy Council 2014, https://wec-indicators.enerdata.net/co2-emissions-per-household.html.

13 Scope 3, Investments – IEB funds: emissions from Listed equity and corporate bonds

Triodos Bank operates several Impact Equity and Bonds funds. These funds contain equity and bond holdings in listed and non-listed companies. In this chapter we present the methodology that has been applied to calculate the emissions from the equity and bond holdings in our funds.

13.1.1 Scope

All listed equities and corporate bonds in subsectors for the IEB funds are within scope:

Table 12. Triodos Bank's subsectors for IEB funds

Triodos Bank's Subsector
Global Equities Impact Fund
Euro Bond Impact Fund
Impact Mixed Funds
Pioneer Impact Fund
Sterling Bond Impact Fund

Sovereign and sub sovereign debts in the Triodos Euro Bond Impact Fund and the Triodos Impact Mixed Funds are included in the GHG methodology as off 2019 based upon the high-level sector approach (see chapter 14). Consistent with PCAF, cash positions can be considered as having zero emissions and are therefore excluded from the PCAF scope determination.

13.1.2 Accounting approach and emission factors

In line with PCAF, Triodos Bank accounts for Scope 1 and 2 emissions of the equity and corporate bond holdings within the funds divided by the total enterprise value of each.

$$\textit{Scope 1}CO_2eq + \textit{Scope 2}CO_2eq \times \frac{\textit{Market value of Triodos equity and debt}}{\textit{Enterprise value}} = CO_2eq$$

Emissions that represent Scope 1 and 2 of a given company can be taken from their reports if available. For large portfolios external data providers are often used such as CDP, Bloomberg Terminal, MSCI, Trucost and ISS-ESG. Triodos Bank has chosen to work with ISS-ESG.

The Scope 1 and 2 emissions of a company in our fund are attributed to Triodos Bank based on the market value of our equity and debt divided by the enterprise value, which is provided by ISS-ESG.
For the part of the equity and bond portfolio that are not covered by ISS-ESG we extrapolate the GHG emissions conform the covered part. These have a data quality score of 5 (high-level sector approach, see chapter 14).

13.1.3 Data quality scorecard, assumptions and limitations

Table 13 below indicates our data quality scoring for the emission calculations for the IEB funds.

Table 13. Data quality scorecard for listed equity via SRI funds

Data quality score (highest to lowest)	Description
1	Audited GHG emission data from the listed companies in our fund, in accordance with the GHG Protocol
2	Non-audited GHG emission data or GHG emission data calculated by Triodos Bank or third-party data provider, based on primary data from the listed company and using verified emission factors specific to the emission source
3	Estimated GHG emissions based on peers of the listed company
4	Emission intensity factors (emissions per million euro invested) per sector from own system or peer financial institutions
5	Extended Environmental Input Output (EEIO) databases (i.e. EXIOBASE or GTAP) that provides sector-level data on emissions per revenue per sector and country

Data providers with standardised frameworks to collect and calculate GHG emissions of listed and non-listed companies are usually the most accessible way to move forward for funds with multiple companies. For funds of an institution like Triodos Bank that invest in emerging markets, data gaps need to be filled in as fewer companies in emerging markets disclose their Scope 1 and 2 emissions.

14 Scope 3, Investments – Other sectors via high-level sector approach

In this chapter we present the methodology, scope, accounting approach and data quality scoring for our loans and funds' investments in all sectors where data was estimated, with limited support.

14.1.1 Scope

As off 2019 we have extended the PCAF scope to all loans and direct funds' investments. The sectors that are covered via the high-level sector approach are listed in Table 12.

Table 14. Triodos subsectors for high-level sector coverage

Triodos Subsector
Organic food
Environmental technology
Retail non-food
Production
Professional services
Health Care - Other[22]
Social projects
Fair trade
Development cooperation and Inclusive finance
Education
Child care
Arts and culture
Philosophy of Life
Recreation
(Sub) Sovereign debt
Municipality loans
Other

14.1.2 Accounting approach and emission factors

Emissions related to the sectors found in Table 12 can be accounted for by using high-level sector intensity averages of Scope 1 and 2 emissions over revenue (tCO_2e/EUR) in which Triodos Bank invests in per country and multiplying this by the asset turnover ratio (net turnover : total balance sheet). Then, these emissions can be attributed to Triodos Bank. The following formula is applied:

$$\frac{tCO_2eq_{sector}}{Revenue\ (EUR)_{sector}} \times \frac{Revenue\ (EUR)_{sector}}{Balance\ sheet\ total_{sector}} \times \frac{Outstanding\ Triodos\ loan\ \&\ investments}{Balance\ sheet\ total} = CO_2\ eq$$

14.1.3 Data quality scorecard, assumptions and limitations

The following data scoring is used to score and improve data quality on these sectors over time. Note that the scorecard is a general reflection of how data quality should be improved as the sectors vary among properties, investments, and activities. In our 2020 report, all emission data for the clients and sectors that we estimate using the high-level sector intensity averages, are scored with a data quality level of 5. For countries where we do not yet have emission factor data available, we derive a proxy based on the Netherlands.

22 All subsectors within the Health Care sector except for Elderly Care, which is already in scope of PCAF

Table 15. Data quality scorecard for high-level sector coverage

Data quality (highest to lowest)	Description
1	Audited GHG emission data or actual primary energy data, in accordance with the GHG Protocol
2	Other primary data
3	• Averaged data that is peer/(sub) sector-specific • Non-audited or non-verified GHG emission data provided by our clients
4	Proxy data on the basis of region or country
5	Estimated data with very limited support using sector average data from EXIOBASE and BACH financial data base (see Data sources section)

15 Glossary

AFD	Agence Française du Développement
CNG	Climate Neutral Group
CO_2eq	Carbon dioxide equivalent
EEIO	Extended Environmental Input Output
EF	Emission factor
FAO	Food and Agriculture Organisation of the United Nations
GHG	Greenhouse gas
IEA	International Energy Agency
IFI	International Financial Institutions
IFC-CEET	IFC Carbon Emissions Estimation Tool
LEM	Local Environmental Managers
LSU	Live Stock Unit
LTV	Loan-to-Value ratio
PCAF	Partnership Carbon Accounting Financials
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

16 Data sources

Triodos Bank's sector	External Sources
Private Mortgages/ Sustainable property	• NL Emission factors: https://www.co2emissiefactoren.nl/ • NL consumption per building type: https://www.ecn.nl/publicaties/PdfFetch.aspx?nr=ECN-E--15-068 • CBS 2020: gas consumption per energy label and type of dwelling: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83878ned/table?dl=1EA89 • CBS 2019: share of types of Dutch homes: https://www.cbs.nl/nl-nl/nieuws/2016/14/vier-op-de-tien-huishoudens-wonen-in-een-rijtjeshuis • CBS 2019: Comparative difference in electricity consumption between 2012-2017: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83882ned/table?dl=1EA8B • CBS 2019: Data for other properties: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83374NED/table?ts=1562756923408 • Building Energy Labels: https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels-gebouwen/bestaande-bouw/energielabel-utiliteitsgebouwen • EU buildings data base: https://ec.europa.eu/energy/en/eu-buildings-database • German energy efficiency classes: https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Energieeffizient_Bauen/energiesparverordnung_lesefassung_bf.pdf • German data: Energy data from Eurostat database for residential buildings in the EU: https://ec.europa.eu/eurostat/documents/38154/4956229/energy_consumption_households.zip/8a9e09c1-1ff1-4a53-930e-93fb3f81c6a0 • German data: Emission factors for electricity, gas, coal (browncoal briquettes) and oil: https://www.umweltbundesamt.de/themen/co2-emissionen-pro-kilowattstunde-strom-sinken; emission factors for district heating: Enerdata • Spain mortgages: https://www.ree.es/es/estadisticas-del-sistema-electrico-espanol/series-estadisticas/series-estadisticas-nacionales • Spain emission factors: http://unfccc.int/resource/podcast/nir/ES_NIR_UNFCCC_2018.pdf • ECN 2016: http://www.energievastgoed.nl/wp-content/uploads/downloads/2016/01/nieuwe_benchmark_energieverbruik_utiliteit_sipma.pdf • Dutch higher energy label (A plus): https://nl.wikipedia.org/wiki/Energielabel • IEA 2016 World Energy Balances: https://webstore.iea.org/statistics-data?orderby=45&pagenumber=2 • Rijksoverheid: https://www.rijksoverheid.nl/documenten/rapporten/2013/04/11/cijfers-over-wonen-en-bouwen-2013 • IEA (2019). Emission Factors, IEA/OECD 2019 Edition: http://data.iea.org/payment/products/122-emissions-factors-2017-edition.aspx

Organic farming	• FAO Database: http://www.fao.org/faostat/en/#data • FAO definition of emission intensities: http://fenixservices.fao.org/faostat/static/documents/GA/GA_e.pdf • Knudsen et al. (2011): https://www.semanticscholar.org/paper/Environmental-assessment-of-organic-juice-imported-Knudsen-Almeida/2f97b923aabc8532ad17caeedc4bed23c2cfcc53 • DEFRA 2005: http://library.uniteddiversity.coop/Food/DEFRA_Food_Miles_Report.pdf • Carlsson (1997): https://rosap.ntl.bts.gov/view/dot/4919 • FAO (2011) http://www.fao.org/fileadmin/templates/organicag/pdf/11_12_2_RTOACC_23_webfiles.pdf • EUROSTAT LSU Coefficients: https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Livestock_unit_(LSU) • Aguilera, E., Guzmán, G., & Alonso, A. (2015). Greenhouse gas emissions from conventional and organic cropping systems in Spain. I. Herbaceous crops. Agronomy for Sustainable Development, 35(2), 713-724: https://link.springer.com/article/10.1007/s13593-014-0267-9 • FAO Forestry paper (2010), Impact of the global forest industry on atmospheric greenhouse gas, Paper 159: http://www.fao.org/docrep/012/i1580e/i1580e00.pdf • DEFRA UK 2019: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/865769/structure-jun2019final-uk-22jan20-rev_v2.pdf • DeStatis (2019): https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Field-Crops-Grassland/Tables/arable_land_after_the_main_groups_and_crops.html;jsessionid=DAC2B107155FA37DF19EE69E3F585652.internet8742 • DeStatis (2019): https://www.destatis.de/EN/FactsFigures/EconomicSectors/AgricultureForestryFisheries/FruitVegetablesHorticulture/Tables/2_4AreasQuantitiesHarvested.html • DeStatis (2019): https://www.destatis.de/EN/FactsFigures/EconomicSectors/AgricultureForestryFisheries/LandUse/Tables/Tables_Areas.html • FAO report (2002), Organic agriculture, environment, and food security. FAO UN, Rome./Differences in conventional and organic: http://www.fao.org/docrep/005/y4137e/y4137e02b.htm#TopOfPage • From FAO report (2011)/Horticulture - Halberg et al. (2006): http://orgprints.org/13085/1/13085.pdf • From FAO report (2011)/Fruit- Knudsen et al. (2011): https://link.springer.com/article/10.1007/s13165-011-0014-3 • Swedish Environmental Protection Agency (2012), Land management meeting several environmental objectives, Stockholm: https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6505-8.pdf • Statistics Netherlands (CBS): https://opendata.cbs.nl/statline/#/CBS/en/dataset/80783eng/table?ts=1541504784938 • MacLeod, M., Hasan, M., Robb, D. & Mamum-Ur-Rashid, M. (2020). Quantifying greenhouse gas emissions from global aquaculture. Nature, Sci Rep 10 (11679)

Renewable energy	• CO_2 intensity factors for fossil fuel generation 2017: https://webstore.iea.org/co2-emissions-from-fuel-combustion • IFI Operating Margin data for CO_2 emission per country, PCAF database: https://db.carbonaccountingfinancials.com/ • Source IEA (2019). World energy balances. Calculated based on the methodology outlined in the report International comparison of fossil power efficiency • DEFRA 2018 (UK government): https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018 • CBS Netherlands Emission intensities: https://www.cbs.nl/nl-nl/achtergrond/2018/04/rendementen-en-co2-emissie-elektriciteitsproductie-2016
Forestry and nature development	• USAID AFOLU Carbon Calculator: http://afolucarbon.org/dashboard/ • AFOLU Tool manual from USAID: http://afolucarbon.org/static/documents/AFOLU-C-Calculator-Series_AR.pdf • FAO Forestry paper (2010), Impact of the global forest industry on atmospheric greenhouse gas, Paper 159: http://www.fao.org/docrep/012/i1580e/i1580e00.pdf • Swedish Environmental Protection Agency (2012), Land management meeting several environmental objectives, Stockholm: https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6505-8.pdf
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