



Green Bond Reporting 2022/2023

9 October 2023

gkb.ch/greenbond



**Graubündner
Kantonalbank**

Green Bond Reporting by Graubündner Kantonalbank

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1 Executive Summary

The building portfolio is one of the largest sources of emissions and is responsible for around a quarter of greenhouse gases emitted in Switzerland.¹ The typical single-family home contributes substantially to this statistic. Since around two-thirds of residential buildings are still heated using fossil fuels (i.e. gas or oil heating) or directly using electricity², when it is cold large amounts of emissions are generated directly at the building or during the generation of the required electricity. Climate-friendly alternatives such as heat pumps and solar technology account for an ever-growing proportion of installed heating systems. As they are planned and installed in new buildings whenever possible, heat pumps, for example, are already used in one in five buildings. However, their spread in existing buildings is also dependent on renovation cycles, which are measured in decades. As a result, the comprehensive conversion of the Swiss building portfolio will still take some time.

In 2021 and 2022 we launched two green bonds to refinance loans that include both the financing of renewable energy sources and energy efficiency projects in homes. They have the following features:

Borrower	Graubündner Kantonalbank
Issue amount	CHF 100'000'000
Issue	7 December 2021
Expiry	7 December 2029
Coupon	0.10% p.a., payable annually on 7 December, for the first time on 7 December 2022
Listing	SIX Swiss Exchange
Security / ISIN number	114 170 053 / CH1141700539

Borrower	Graubündner Kantonalbank
Issue amount ^{*)}	CHF 200'000'000
Issue	27 May 2022
Expiry	27 May 2030
Coupon	1.30% p.a., payable annually on 27 May, for the first time on 27 May 2023
Listing	SIX Swiss Exchange
Security / ISIN number	118 291 771 / CH1189217719

^{*)} On 9 August 2022, GKB made use of the reopening clause and increased this green bond by CHF 75 million from CHF 125 million to a total of CHF 200 million.

1 Federal Office for the Environment (2022). *Climate: In brief*. Accessed on 01/09/2022 from <https://www.bafu.admin.ch/bafu/en/home/topics/climate/in-brief.html>

2 Federal Statistical Office (2017). *Energy sector*. Accessed on 01/09/2022 from <https://www.bfs.admin.ch/bfs/en/home/statistics/construction-housing/buildings/energy-sector.html>

Reporting period 01/07/ – 30/06/		2022/2023	2021/2022
Hydropower	Volume in CHF million	120.0	147.8
	Number of power plants	10	10
	Allocation from green bond in CHF million	75.0	75.0
Green buildings	Volume in CHF million	280.6	192.8
	Number of buildings	432	305
	Allocation from green bond in CHF million	225.0	150.0
Total green loans	Volume in CHF million	400.7	340.6
	Green bond volume in CHF million	300.0	225.0

Table 1: Allocation from green bonds

The Green Bond Framework serves as the basis for deciding whether a property qualifies for financing from a green bond. This report analyses the mortgage loans approved to date and refinanced from green bonds. The building portfolio analysed consists of 432 owner-occupied homes financed by GKB. To quantify the emissions of an individual property financed, it is compared with a relevant reference property and the expected heating energy requirement derived statistically.

The difference in CO₂ emissions based on the evaluation between residential buildings refinanced with the GKB green bonds and the reference property is estimated at 249t CO_{2e} per year for the reporting period.

In addition to financing particularly climate-friendly buildings, the green bond proceeds are also being used to support hydropower plants which together are expected to generate on average 2'400 GWh of hydroelectricity in the reporting year.³ This represents a reduction of around 55'500 tonnes of CO₂ compared to the Swiss electricity mix. The share of CO₂ emissions attributable to the green bond is 18% or 10'119t CO_{2e}.

Both the hydropower plants and the residential properties were built before the two green bonds were issued. Accordingly, the projects were allocated to the green bonds for refinancing after realisation.

³ Average expected generation based on hydrological conditions for an average year

2 Introduction

GKB has been publishing sustainability reports on a regular basis since 2013. In order to improve comparability and transparency, these comply with the reporting standard of the Global Reporting Initiative (GRI). In the 2021 reporting year, the sustainability report was prepared in accordance with the GRI-21 standard. Irrespective of the issue of the green bonds discussed in this report, GKB has been climate-neutral in the area of business ecology since 2015. GKB underpins its efforts and ambitions in the area of sustainability through various memberships and the signing of initiatives such as the UN Principles for Responsible Investment in 2021. Further information can be found in the respective annual and sustainability reports.

After motorised transport, the building portfolio is the second-largest emitter of greenhouse gases. This makes it an important area for applying measures to reduce energy consumption and increase efficiency. As a core competency of GKB, the mortgage business therefore harbours great potential for developing services to promote sustainable construction and renovation. To this end, GKB launched a special service package in 2022 (gkb.ch/greenddeal).

The following report compares the CO₂ emissions of projects financed by green bonds to two defined reference values. In the case of residential construction projects, the CO₂ emissions are compared to a reference property, while the reference value for the hydropower projects is the Swiss electricity mix. The two green bonds do not result in any real reduction in CO₂ emissions, as all the residential properties and hydropower plants would have been financed even without green bonds.

For the purposes of comparison, each of the properties was compared with a reference property. The resulting outcomes reflect the expected energy requirements and assume normal consumer behaviour. This returned a comparable consumption value rather than a figure for actual consumption, which can be strongly influenced by individual user behaviour. In the case of hydropower, a reference scenario is assumed according to which the eligible electricity would have been produced in accordance with the Swiss generation mix. To improve legibility, reported values are rounded, so minor deviations may occur when reconstructing aggregated calculations based on values from text or graphics.

The contractors for this report are the real estate consultancy IAZI (information and training centre for real estate) for residential mortgages (green buildings) and econcept AG for hydropower plants.

3 Data bases and methodology

The methodology and data bases are discussed in the following two sections. The explanations are taken from the individual impact reports of the two companies: IAZI (green buildings) and econcept AG (hydropower).

3.1 Green Buildings (IAZI)

This report is based on a portfolio of 432 properties as at 30 June 2023 financed by GKB in accordance with the guidelines of the Green Bond Framework. The portfolio comprises 209 condominium units and 223 single-family houses (including 6 semi-detached houses).

The geographical distribution of the properties financed with the help of the green mortgage is shown in Figure 1. The properties are mainly located in the home canton of Graubünden (390 out of 432 properties). There are also 13 properties in the Canton of St. Gallen, 12 properties in the Canton of Aargau, 4 properties in the Canton of Bern, 4 properties in the Canton of Schaffhausen, 3 properties in the Canton of Thurgau, 2 apartments in the Canton of Ticino, one detached house and one condominium each in Zurich and one apartment each in the Cantons of Basel and Lucerne.

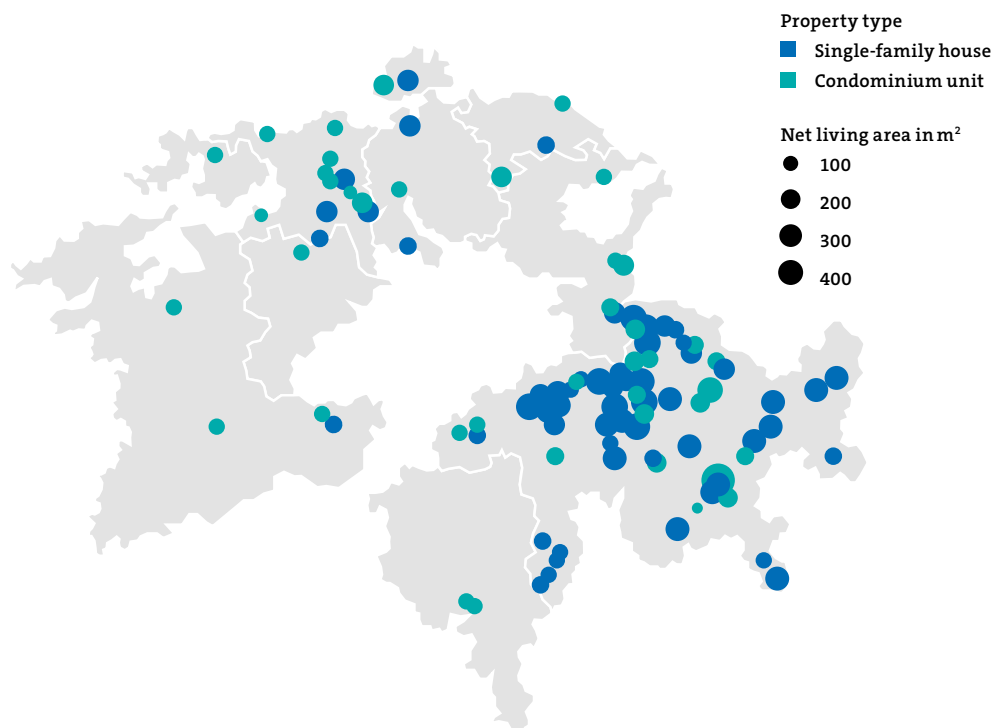


Figure 1: Geographical distribution of properties financed (size of the dot shows net living area)

The average net living area (NLA) per financed property is 144 m².⁴ Figure 2 shows that the condominium units are significantly smaller than the houses. On average, the condominiums have an area of 117 m². By comparison, only the eight smallest single-family homes are below this value. On average, single-family houses have a net living area of 170 m². Taking all the properties together, this results in a total usable area of around 62'359 m².

⁴ For two single-family houses, the missing net living area was approximated from the energy reference area using the standard 1.3 conversion factor.

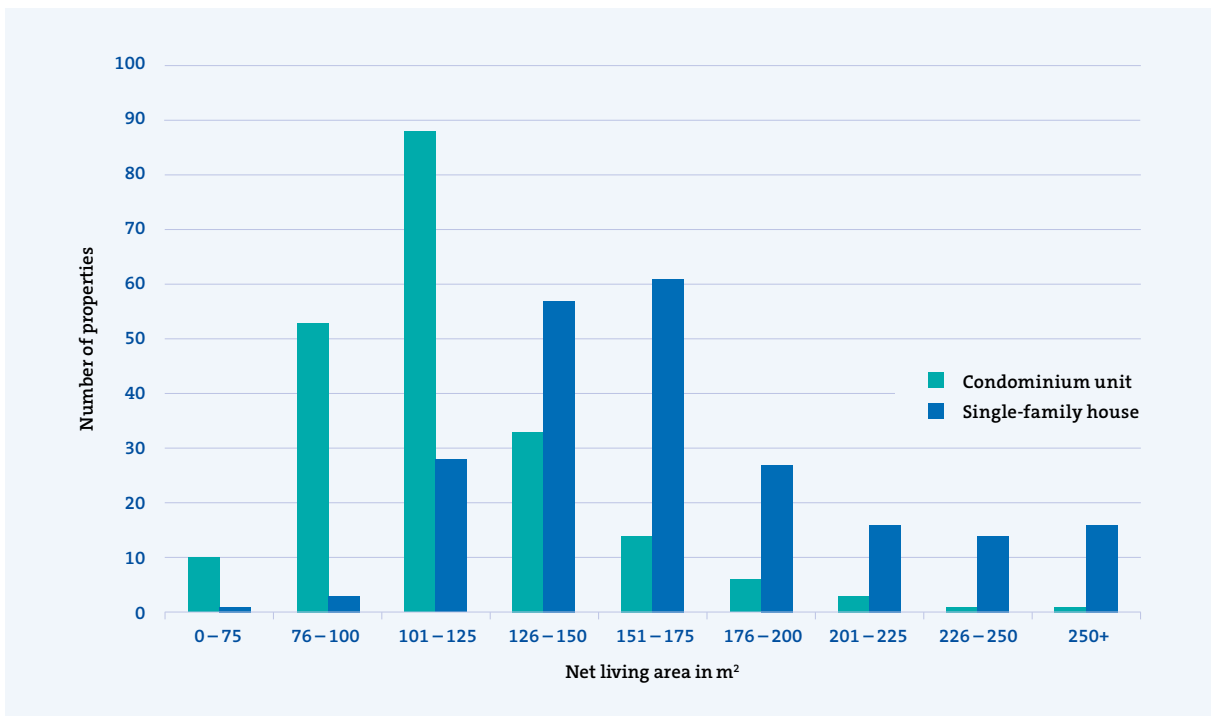


Figure 2: Distribution of net living area by property category

Four different heating systems and energy sources were installed across the entire portfolio of 432 properties (Figure 3). At over 81%, the heat pump is the most common type of heating system by far. 11% of the properties have wood heating, 6% are connected to a district heating system and 1% are heated by a thermal solar system.

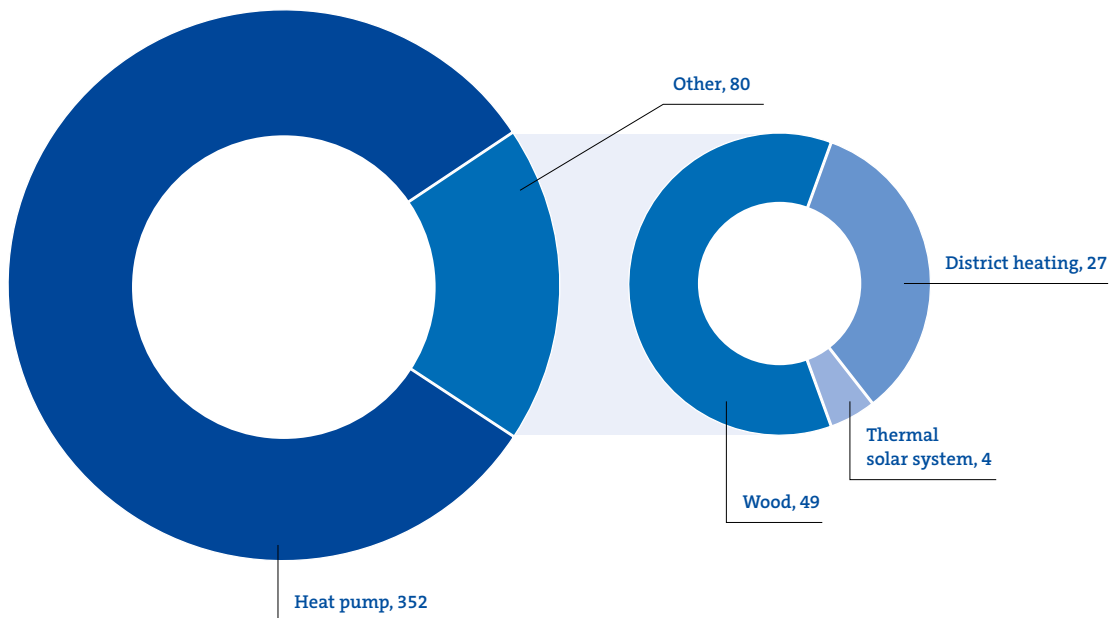


Figure 3: Distribution of heating systems/energy sources

More than two-thirds of the properties (69%) financed by the two green bonds are Minergie-certified. The Minergie label (with no suffix) imposes the least demanding requirements for energy, a Minergie-P label demonstrates that somewhat less energy is used, and the most efficient buildings qualify for the Minergie-A label. Properties that meet additional health and building ecology requirements are given the suffix “ECO”. A breakdown of the properties financed by Minergie category gives the following picture: around 56% of the properties are certified with the Minergie label, 9% are Minergie P and around 2% have a Minergie-A label. The remaining six properties have been given the ECO suffix; five achieved the Minergie-P-ECO label and one property Minergie-ECO.

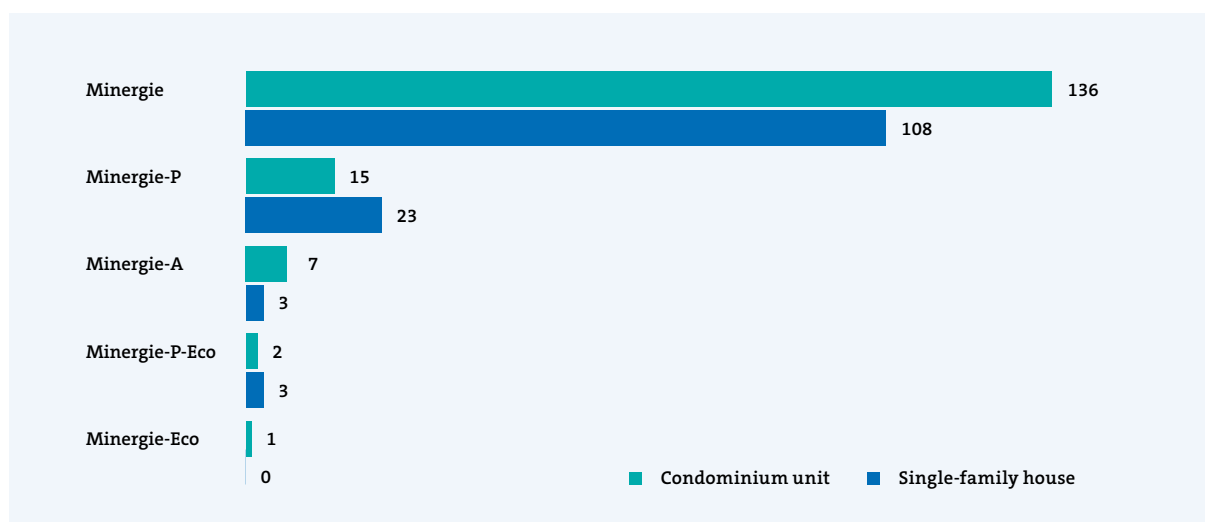


Figure 4: Number of financing operations by Minergie label and property category

The GKB Green Bond Framework defines nine allocation criteria for eligible loans. Accordingly, in addition to energy-efficient new buildings and certificates for entire properties, the measures also include renewing the heating energy source, using renewable energy sources (with a distinction as to whether they cover more or less than 50% of energy requirements), optimising insulation and exterior shells, refurbishing windows, optimising building technology and investing in electrical infrastructure. However, no such refurbishment projects had been financed as of the reporting date.

To determine the CO₂ difference, each property was compared to a case-specific reference property. In the case of new buildings, the expected CO₂ reduction was calculated by comparing it with a representative property of the same type and dimensions for the relevant canton. Specifically, the benchmark property was built in 2015, has a “good” building condition and building quality and uses the energy source mix for the relevant construction period; this is because 2015 is the year for which the most up-to-date information on the cantonal distribution of energy sources is available.

As 298 of the 432 properties in the portfolio of green bonds are Minergie-certified, the methodology described above includes an additional step. The estimated results are compared to the relevant certificate requirements. If the certificate threshold falls below the estimated result, the certificate requirements are adjusted (e.g. maximum total energy requirement of 50 kWh per m² of ERA p. a. for Minergie-P certification for new buildings⁵).

Further measures

In addition to the measures described so far, GKB's Green Bond Framework makes it possible to finance various energy-related modernisation measures involving renewable energy sources, renewable energies, optimising insulation and exterior envelope, refurbishing windows, optimising building technology and electrical infrastructure. However, no such individual measures have been financed to date.

5 Minergie Switzerland (2021). *Product regulations for the MINERGIE®/MINERGIE-P®/ MINERGIE-A® building standards*. Accessed on 01/09/2022 from https://www.minergie.ch/media/201223_produktreglement_minergie_p_a_v2021.1_en.pdf

3.2 Hydropower (econcept AG)

The capital from the green bond is being used to invest in existing hydropower plants in and around the canton of Graubünden. As at 30 June 2023, ten hydropower plants had been allocated to the green bond. The operators receive financial resources (credit) to make investments in the plants to ensure they operate smoothly.

Eligible electricity generation

However, as the green bond only covers part of the plant operator's non-current assets, not all the electricity generated can be attributed to the green bond. Instead, eligible electricity production is determined on the basis of the green bond loan as a share of interest-bearing debt and equity. Generation data comes from the hydropower plant statistics (WASTA) issued by the Swiss Federal Office of Energy m².⁶ The expected average volumes of electricity generated are shown in GWh. Note that this is not the actual but the expected annual generation, which is normally steady over the years.

Emissions in the reference scenario

In the reference scenario, the amount of electricity eligible for the green bond is compared with the Swiss electricity mix⁷. This is suitable because investments are being made in existing hydropower plants and therefore no changes in the Swiss electricity supply are to be expected. According to the life cycle assessment consulting company treeze (2021), the Swiss electricity generation mix emits an average of 0.0296 t CO_{2e} pro MWh. This includes both direct emissions from electricity generation as well as upstream and downstream emissions. This value is used as the emission factor in the reference scenario.⁸

Actual emissions

Compared to alternative generation methods the production of hydropower is climate-friendly, but still causes greenhouse gas emissions. However, these do not occur at the power plant, but are caused by upstream or downstream processes such as building and dismantling the power plant, using auxiliary equipment when operating the plant, transmitting and distributing electricity and any methane emissions from the reservoirs. The amount of these indirect emissions depends on the type of power plant. A distinction is made between run-of-river, storage, pumped-storage and small-scale hydropower plants (treeze, 2021).⁹

6 SFOE (2018). *Hydropower plant statistics*. <https://www.bfe.admin.ch/bfe/de/home/versorgung/statistik-und-geodaten/geoinformation/geodata/water/statistics-of-hydropower-plants.html>. Accessed on 03/08/2023.

7 The Swiss electricity generation mix shows the composition of the electricity generated in Switzerland, regardless of whether the electricity is consumed in Switzerland or exported to other countries (treeze, 2021).

8 treeze (2021). *Umweltbilanz Strommixe Schweiz 2018*. <https://www.bafu.admin.ch/dam/bafu/de/dokumente/klima/fachinformationen/Umweltbilanz-Strommix-Schweiz-2018-v2.01.pdf.download.pdf/Umweltbilanz-Strommix-Schweiz-2018-v2.01.pdf>. Accessed on 03/08/2023.

9 In the case of storage power plants, treeze (2021) also distinguishes between certified and non-certified power plants, which differ in that only the net generation can be stated for certified power plants and therefore any need for pump electricity is not included in the calculations. In this way of monitoring impact, the net generation and the emission factor for non-certified power plants are always used for storage power plants, which results in a conservative calculation of the emission reductions.

The emissions for run-of-river, storage and small-scale hydropower plants are listed below. No pumped-storage power plants are currently supported, which is why no emission factor is listed.

Type of hydropower plant	Unit	Indirect emissions
Run-of-river power plant	t CO ₂ e/MWh	0.0038
Storage hydropower plant	t CO ₂ e/MWh	0.0083
Small-scale hydropower plant	t CO ₂ e/MWh	0.0049

Table 2: Emission factors for types of hydropower plants, subdivided into direct and indirect emissions, source: treeze (2021)

Actual emissions in tonnes of CO₂e can be calculated by multiplying an emission factor for the power plant in question by the eligible electricity production. The sum provides the actual emissions for all 10 power plants.

Emissions reduction

The emission difference can be calculated by subtracting actual emissions from the reference emissions.

4 Results

4.1 Impact analysis of green buildings

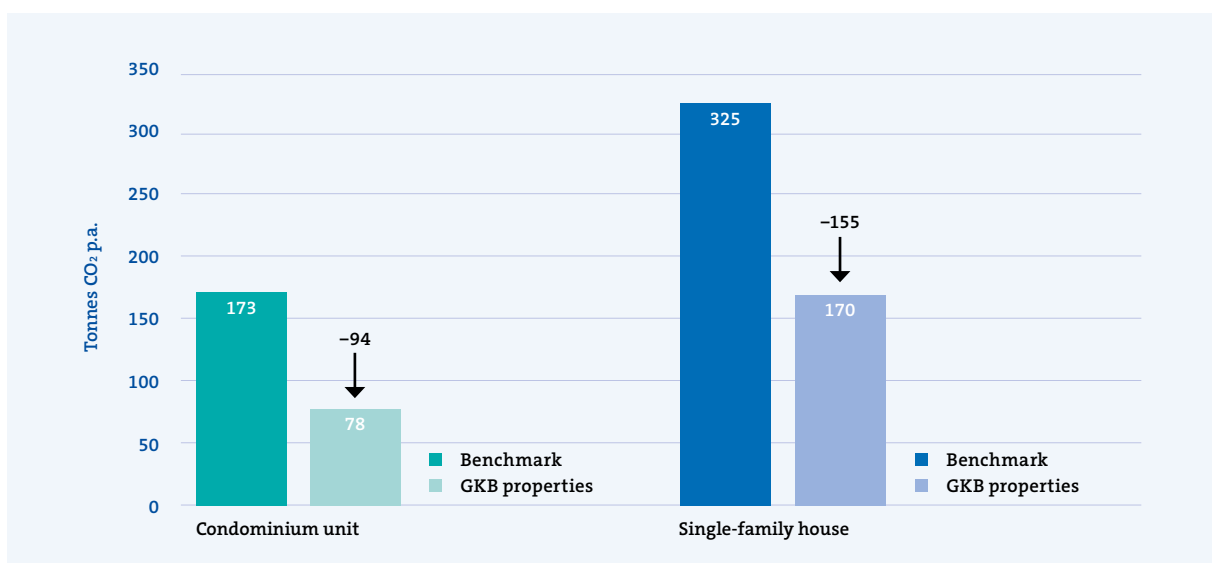
The results of the impact analysis with regard to green buildings are explained below. The values determined are a statistical estimate of the energy requirements for heating and hot water, plus the annual CO₂ emissions resulting directly from typical operations. This evaluation does not take into account “grey energy” used during the construction or manufacture of building materials and technical equipment, nor does it take into account user-specific consumption behaviour.

New buildings

The 432 buildings that were examined were considered for reasons of methodology to be new buildings and compared to benchmark properties built in 2015. In line with this year of construction, the construction quality and condition of the reference property were assumed to be “good”. Otherwise, the benchmark property has the same features as the new build property. Overall, the estimate of the sub-portfolio’s 209 condominium units results in annual CO₂ emissions of around 78 tonnes of CO₂ equivalent, equal to average emissions of 2.5 kg per m² ERA p.a. This compares with the benchmark properties’ comparative value of a total of 173 tonnes or 5.6 kg CO₂e per m² ERA p.a. The estimate for the 223 single-family homes amounts to around 170 tonnes or 2.9 kg CO₂e per m² ERA p.a., which contrasts with the benchmark properties’ comparative value of just over 325 tonnes or 5.6 kg CO₂e per m² ERA p.a.

Overall result

The difference in annual CO₂ emissions between the properties financed and the reference properties across the entire portfolio is around 249 t CO₂e per year. The calculations show annual CO₂ emissions of 249 tonnes for the residential portfolio financed with the proceeds from the GKB green bonds. The emissions for the benchmark properties amount to 498 t CO₂e per year. The following chart shows the difference in CO₂ emissions, broken down by condominium apartments and single-family homes.



4.2 Impact analysis of hydropower

The results of the hydropower financing are explained below. The proceeds from the green bond are used to support power plants with an expected average annual generation of a net 2'400 GWh of hydroelectricity, which, as expected, led to a reduction in greenhouse gases of around 55'500 t CO_{2e} compared to the Swiss electricity mix. As at 30 June 2023, the share attributable to the green bond is 17% for net generation (415 GWh) and 18% for emission reductions (10'119 t CO_{2e}).

Impact monitoring 2022/23		Net generation in GWh	Emissions in t CO _{2e}		
			Reference scenario	Actual	Reduction
Total		2'400	71'042	15'509	55'533
Attributable share	abs.	415	12'273	2'154	10'119
Attributable share	in %	17%	17%	14%	18%

Table 3: Net generation and associated emissions and emission reductions from hydropower plants supported by the green bond in 2022/23

5 Appendix

5.1 Abbreviations

FOEN	Federal Office for the Environment
CO ₂ e	CO ₂ equivalent
ERA	energy reference area
SFH	single-family houses
GKB	Graubündner Kantonalbank
GR	Global Reporting Initiative
GWR	Register of Buildings and Dwellings
IAZI	Information and Training Centre for Real Estate AG
kWh	kilowatt-hour
MFH	multi-family houses
NLA	net living area
p.a.	per annum (per year)
STWE	condominium apartments
t	tonnes

5.2 Brief portrait of IAZI AG

Over the past 25 years, IAZI, the information and training centre for real estate has evolved into a leading consulting and IT company for the Swiss financial and real estate sector. Thanks to its overarching competencies in the fields of property valuation and sustainability auditing, data analysis and IT development, IAZI successfully operates as a service provider at the interface between the financial and real estate markets. IAZI is therefore very familiar with the diverse challenges faced by these sectors.

IAZI's most important services include hedonic valuation models for real estate, which are currently used by the majority of Swiss banks as part of the financing process. Based on a broad customer base, around 30'000 changes of ownership are incorporated into the IAZI data pool every year. The statistical models based on this data are also used in many other applications along the entire property value chain.

Another core competency is portfolio management and benchmarking services. IAZI analyses property data from the largest institutional investors such as insurance companies, pension funds, banks and investment funds, thus maintaining Switzerland's largest and most detailed data pool of direct real estate investments. Based on this database, IAZI develops and operates modern and efficient tools for administering, managing and monitoring real estate portfolios in close cooperation with institutional market players, thus supporting them in the digitalisation of their activities. An accurate understanding of the capital markets and real estate portfolios of the relevant players is therefore an essential prerequisite for IAZI's successful business activities.

An additional field of activity comprises a variety of property-specific services such as appraisal reports and on-site inspections. The IAZI experts inspect and analyse thousands of properties throughout Switzerland every year. Thanks to this activity, the company not only has comprehensive knowledge of the overall markets, but also in-depth knowledge of property-specific factors in the fields of construction and architecture, building technology and energy management. Based on this expertise and its insight into large property portfolios, IAZI has been successfully conducting analyses on the topics of energy consumption, emissions and sustainability for several years. IAZI's range of services is supplemented by the preparation of local and regional market and location analyses as well as investment planning.

Since IAZI was founded in 1994, the company has maintained customer relationships in all regions of Switzerland as well as in Germany and Austria. The company is headquartered in Zurich Oerlikon, with another branch located in Lausanne. In total, the IAZI team consists of around 110 real estate, statistics, finance and IT specialists. Their knowledge and experience are not only in demand among customers, but are also passed on at various national and international training institutions (universities and universities of applied sciences, Swiss Finance Institute, SVIT, AZEK and others). Thanks to the teaching activities of various employees, IAZI is in constant contact with academic and educational institutions.

5.3 Brief portrait of econcept AG

Research/consulting/evaluation

econcept AG is a nationally and internationally active research and consulting company. With application-oriented research, science-based consultancy and evaluations, it develops well-founded documents to serve as a basis for decisions and supports its broadly diversified customer base from the public sector, institutions, organisations and companies in the structuring of their strategic processes and projects. The expertise of econcept AG lies in the fields of economy, location development, mobility, energy and sustainable construction, climate protection and adaptation, education/research/innovation and social security.

Interdisciplinary and solution-oriented

The interdisciplinary expertise of econcept aims to find holistic answers to complex questions. It recognises the challenges of societal change and works in a solution-oriented and methodically sound manner. It provides its services alone or with partners from a network of outstanding national and international experts.

Quality

econcept AG strives for the highest quality, which is ensured by means of established internal project-related processes. This contributes to continuous development. Its evaluations are based on SEVAL and other internationally recognised standards.

For more information, please visit: www.econcept.ch

5.4 External audit

External audit Ernst & Young AG (EY) has performed an assurance of the German version (original version) of the Green Bond Report. The respective assurance statement is attached to the German version. This English version is a translation of the original version and has not been reviewed by EY.

The information marked on the allocation of funds for 2022/2023 indicates where EY performed limited assurance procedures on in the German version. However, as indicated above, no assurance is provided on the English version.