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**Project:** Obvion CO<sub>2</sub> emission dwellings **Datum:** 13 April 2022

**Subject:** CO<sub>2</sub>-emission Green Storm 2022, final pool **Status:** Final

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As requested by Obvion, DWA compared the CO<sub>2</sub>-emission of a specific, energy-efficient group of dwellings (in this document indicated as Obvion) to that of a comparable group of dwellings with an average energy-efficiency (indicated as Reference). In this document the results are shown.

### Methodology

Within this study the CO<sub>2</sub>-emission of 1.919 dwellings, as selected by Obvion, was determined using the energy consumption of these dwellings. The real energy use of dwellings is based on the WoOn2018<sup>1</sup> study. The theoretical energy use is based on the real use and the ratio between the theoretical and real energy use from the WoOn2012<sup>2</sup> study. In this study, the theoretical energy consumption of Dutch dwellings was determined using the energy index methodology.

#### *CO<sub>2</sub>-emissions - natural gas*

The CO<sub>2</sub>-emission of Dutch natural gas is 1,78 kg/m<sup>3</sup>.

#### *CO<sub>2</sub>-emissions - electricity*

Values for carbon intensity, in kg per produced kWh of electricity, vary depending on assumptions made in the calculation method. In this assessment, an emission of 427 g/kWh<sup>3</sup> was used.

#### *Gas consumption*

The gas consumption strongly depends on the energy label of dwellings. In table 1 the average gas consumption is shown. The real gas consumption is based on the WoOn2018 survey; the theoretical gas consumption is based on the ratio between the real and theoretical gas consumption as determined from the WoOn2012 survey.

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<sup>1</sup> WoOn2018, "Monitor Energiebesparing gebouwde omgeving". <https://www.omgevingsweb.nl/nieuws/monitor-energiebesparing-gebouwde-omgeving-2018/#:~:text=Uit%20de%20Monitor%20energiebesparing%20gebouwde,te%20halen%2C%20is%20niet%20zichtbaar>.

<sup>2</sup> WoOn2012, results presented in "Benchmarkonderzoek duurzaamheid rijksmonumentale woonhuizen", 2015. This document can be found at <https://docplayer.nl/10415005-Benchmarkonderzoek-duurzaamheid-rijksmonumentale-woonhuizen.html>

<sup>3</sup> Based on the use of a mix of sustainable and non-sustainable electricity, based on co2emissiefactoren.nl

Table 1 Average gas consumption<sup>1</sup>

Energy label	Real gas consumption (m <sup>3</sup> /year)	Theoretical gas consumption (m <sup>3</sup> /year)
A	1.193	1.186
B	1.153 <sup>4</sup>	1.301
C	1.337	1.610
D	1.453	1.934
E	1.556	2.504
F	1.589	2.949
G	1.537	3.843

From table 1 it was found that the theoretical gas consumption is not a good indication of the real gas consumption. Therefore, the real gas consumption was primarily used in this survey.

#### Electricity consumption

As proved by ECN and others<sup>5</sup> there is hardly any correlation between the consumption of electricity and the energy label. At most 19% of the electricity consumption is attributed to the building; over 80% is attributed to the number and behaviour of the residents and their household equipment. Therefore, in this survey an average consumption of 2.760<sup>6</sup> kWh was assumed for all dwellings.

#### Group composition

In table 2 some relevant parameters of the groups are shown. The parameters show that the pool of Obvion has less condominiums than the reference. Furthermore, the pool of dwellings of Obvion has significantly younger buildings.

Table 2 Composition of the groups

	Obvion	Reference
Number of dwellings	1.919	1.919
Percentage condominium	19,4%	35,6%
Average building year	2002	1965 <sup>7</sup>

Figure 1 shows the distribution of the energy labels of Obvion and the reference group. The reference group is based on a label distribution according to the Dutch average (mix of provisional and definitive labels). This label distribution of the reference group is based on the Calcasa survey, Q1 2021<sup>8</sup>. It is clear that the percentage of A-labels is much higher in the pool of Obvion.

<sup>4</sup> The average real gasconsumption of B-dwellings is slightly lower than the average consumption of A-label dwellings. The consumption depends on the size of the dwelling, the number of people that live in the dwelling et cetera.

<sup>5</sup> 'Energietrends in Nederland', 2014 van ECN, Energie-Nederland en Netbeheer Nederland, [https://www.netbeheernederland.nl/\\_upload/Files/Energietrends\\_2014\\_140.pdf](https://www.netbeheernederland.nl/_upload/Files/Energietrends_2014_140.pdf)

<sup>6</sup> Centraal Bureau voor de Statistiek (CBS), 2020, <https://opendata.cbs.nl/statline/#/CBS/nl/navigatieScherm/thema>

<sup>7</sup> Compendium voor de Leefomgeving, Rijksoverheid, 2018, <https://www.clo.nl/onderwerpen>

<sup>8</sup> See <https://www.calcasa.nl/nieuws/2021-q1-wox-kwartaalbericht-vergroening-nederlandse-woningmarkt-heeft-nog-lange-weg-te-gaan>

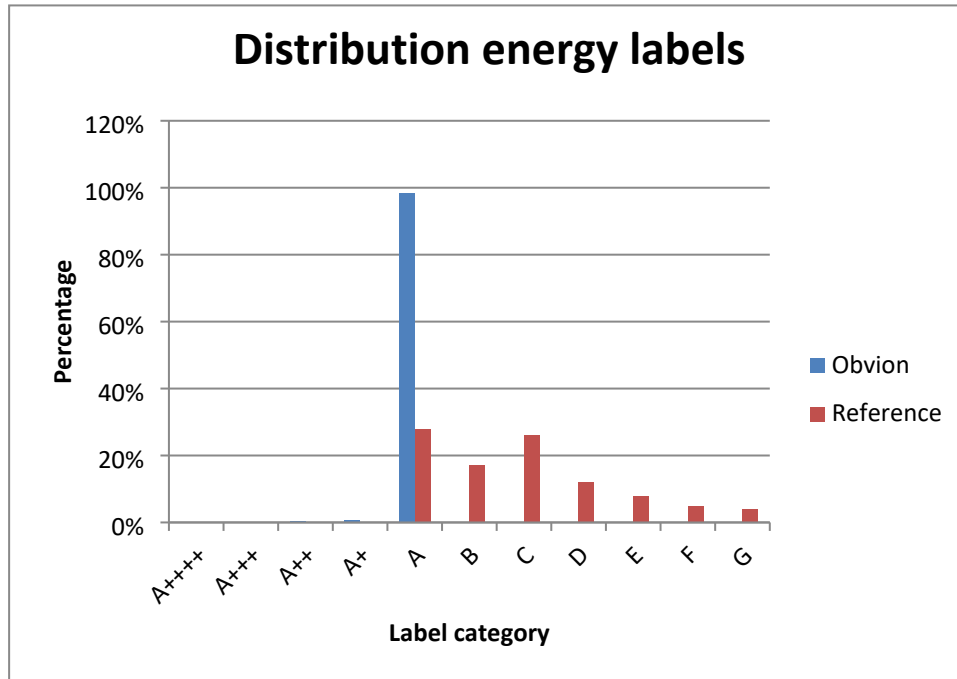


Figure 1 Distribution of energy labels for both groups

### CO<sub>2</sub>-emission

Table 3 shows the CO<sub>2</sub>-emissions of both groups, based on the real energy consumption. It is found that the difference in the CO<sub>2</sub>-emissions is 6%. The difference in emissions, based on the theoretical energy consumption (table 4) is 22%. This is caused by the fact that the real gas consumption depends less on the energy label than the theoretical gas consumption.

Table 3 CO<sub>2</sub>-emissions, based on the real energy consumption

		Obvion	Reference
Average gas consumption	m <sup>3</sup> /year/dwelling	1.193	1.317
Average electricity consumption	kWh/year/dwelling	2.760	2.760
Average CO <sub>2</sub> -emission	kg/year/dwelling	3.302	3.524
Total CO <sub>2</sub> -emissions	ton/year	6.337	6.762
Difference in CO <sub>2</sub> -emission	ton/year	425	
Difference in CO <sub>2</sub> -emission	%	6%	

In table 4 the CO<sub>2</sub>-emissions of both groups are shown, based on the theoretical energy consumption. The results show that the absolute difference in the CO<sub>2</sub>-emissions in this case is over a factor four more than when they are based on the real energy consumption.

Table 4 CO<sub>2</sub>-emissions, based on the theoretical energy consumption

		Obvion	Reference
Average gas consumption	m <sup>3</sup> /year/dwelling	1.186	1.705
Average electricity consumption	kWh/year/dwelling	2.760	2.760
Average CO <sub>2</sub> -emission	kg/year/dwelling	3.289	4.214
Total CO <sub>2</sub> -emissions	ton/year	6.312	8.086
Difference in CO <sub>2</sub> -emission	ton/year	1.774	
Difference in CO <sub>2</sub> -emission	%	22%	

### Conclusion

From this study the following conclusions are determined.

- The number of A-label (including A<sup>+</sup> and better) dwellings of Obvion is much higher (100%) than in the reference (about 28%). This is **very high** compared to the reference pool.
- Based on the real energy consumption, the pool of dwellings of Obvion has a CO<sub>2</sub>-emission that is 425 tons per year less in comparison to the reference, which is a difference of 6%. This is based on **conservative assumptions**.
- Based on the theoretical energy consumption, the pool of dwellings of Obvion has a CO<sub>2</sub>-emission that is 1.774 tons per year less, which is an **improvement of 22%** in comparison to the reference.