

CO₂ Emissions Report 2021

Philippe Jemmely & Werner Halter

Emissions generated by the bluefactory site's general operations amounted to 180 tCO₂ in 2021, representing an increase of 48 tCO₂ over the previous year but still well below pre-pandemic levels. Emissions from mobility constituted 63% of the site's general operations emissions in 2021, having increased with the resumption of activities. The construction of Wood-iD generated 176 tCO₂, or five tCO₂ per year over the life of the components.

Balance sheet scope and quantification

The scope of the CO₂ balance sheet remains unchanged, covering the entire site's operations and grey energy emissions from new construction. Quantification is carried out according to the principles of the Greenhouse Gas Protocol and ISO 14064 to allow year-on-year comparisons.

This is the 7th CO₂ assessment of the bluefactory innovation district based on data covering the whole of 2021. This balance measures total CO₂ emissions generated by the site over the entire year and is part of BFF SA's minimising strategy, making it possible to analyse emissions over the years and measure the impact of implemented projects with a view to reducing emissions. Data come from the individual companies located on the site and from site manager BFF SA. Emissions quantification was calculated based on recognised emission factors, using Climate Services' CO₂ Platform application.

bluefactory CO₂ accounting

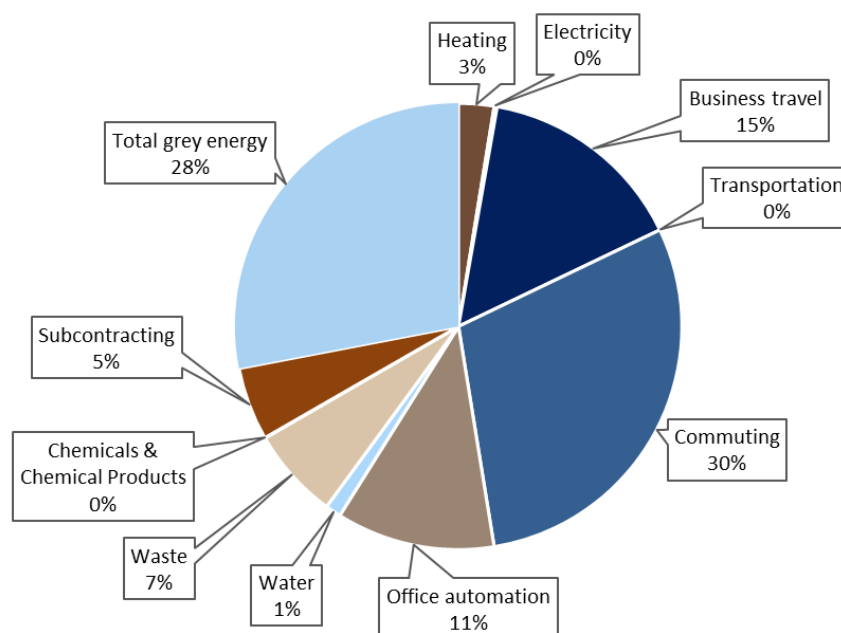
For the year 2021, the site accounted for 250 tCO₂, of which 180 tCO₂ are due to general operations and 70 tCO₂ to grey energy ([Table 1](#)). The five tCO₂ grey energy emissions increase is explained by the construction of Wood-iD. They correspond to the amortisation of grey energy with the reassignment of the Blue Hall, the construction of Wood-iD and the installation of photovoltaic panels. Grey energy accounts for about 30% of emissions in 2021.

Mobility accounts for most of the bluefactory site's carbon footprint with commuting and business travel generating 74 tCO₂ and 38 tCO₂ respectively (or 63% of general operations emissions i.e., total site emissions less grey energy).

It should be noted that the distances travelled for commuting (approximately 1.16 million km) are much greater than those for business trips (approximately 352,000 km), but their CO₂ impact per kilometre is lower. This is explained by the fact that around a third of business travel (123,000 km) is by aeroplane.

Table 1: bluefactory raw data and CO₂ emissions

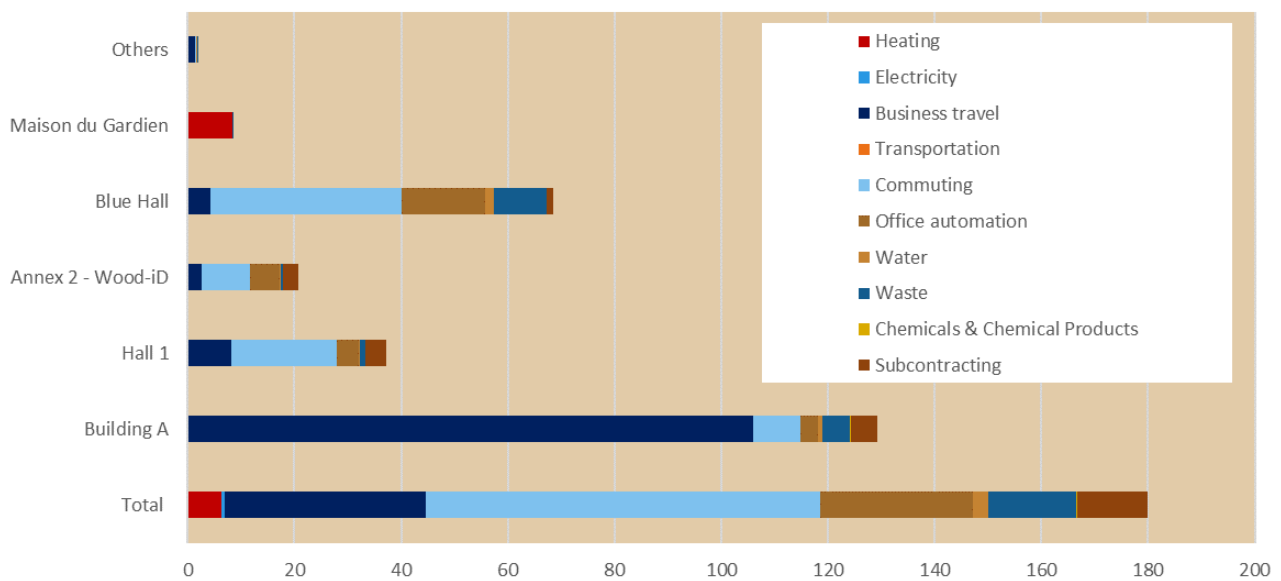
Category	tCO ₂	%
Heating	6	4%
Electricity	1	0%
Business travel	38	21%
Transportation		
Commuting	74	41%
Office automation	29	16%
Water	3	2%
Waste	17	9%
Chemicals & Chemical Products	0	0%
Subcontracting	13	7%
Total	180	
Grey energy photovoltaic	20	29%
Grey energy Blue Hall	45	64%
Grey energy Wood-iD	5	7%
Total grey energy	70	
Total	250	



Emissions per building

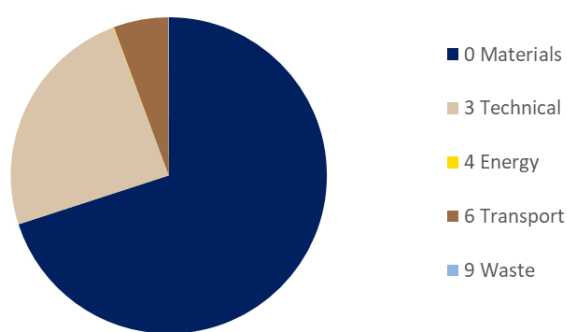
With the exception of the *Maison du Gardien* (Keeper's House), the energy required for site operations is 100% renewable, coming from hydraulic or photovoltaic sources. As a result, CO₂ emissions are less than one tCO₂ for electricity and heating from heat pumps. The *Maison du Gardien*'s fuel consumption was greatly reduced because it was essentially unoccupied during the public health crisis.

Figure 1: CO₂ emissions from individual buildings



Grey energy emissions from the construction of Wood-iD were quantified based on the volumes of the various materials used, the work required on site, and the technical elements. All emission factors come from the database published by the KBOB Coordination Conference of Construction and Building Services of Public Project Owners. The Wood-iD building is temporary, but its construction elements have been designed for multiple reuse and reassembly. Some elements have already been recycled from Annex 2 (demolished in autumn 2021). The service life of each construction element is considered in the CO₂ balance.

Figure 2: Distribution of Wood-iD grey energy emissions



Grey energy emissions from the Wood-iD construction amount to 176 tCO₂ and come mainly from materials (wood and wood-concrete slabs). Emissions from technical elements account for about a quarter of emissions. The construction process requires very little energy input.

Emission evolution

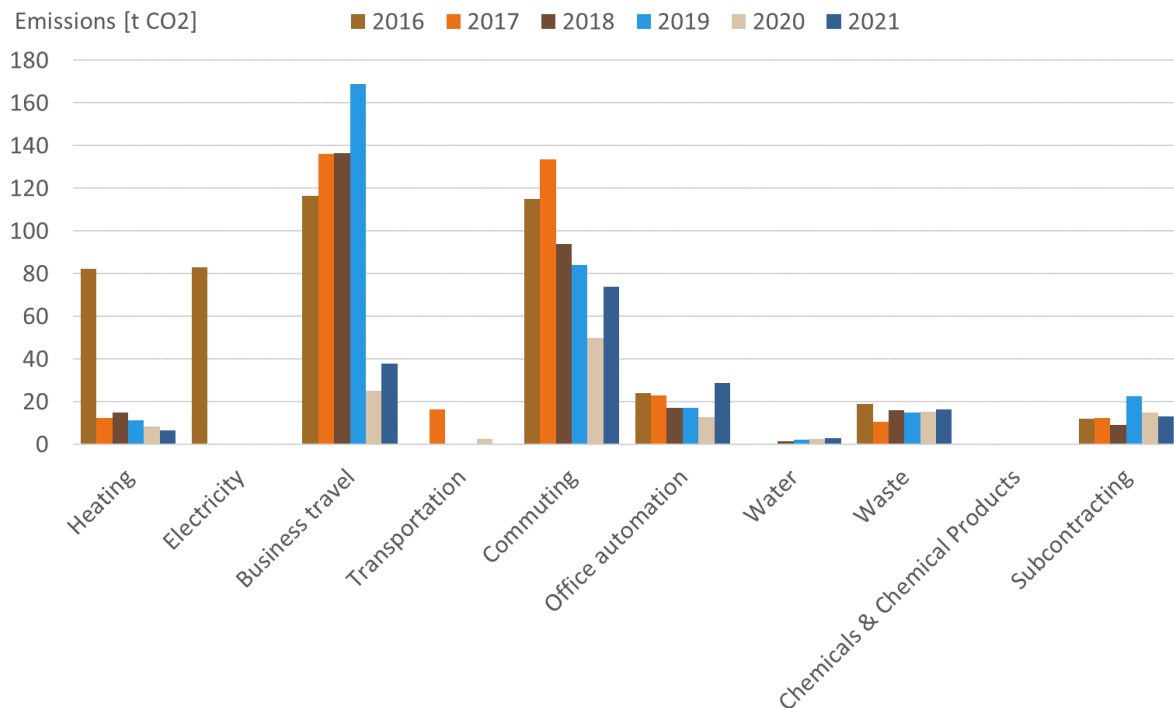
The site's CO₂ emissions increased by 48 tCO₂ after the lockdown was lifted, mainly due to the resumption of mobility (Table 2). Direct heating emissions were reduced by a shutdown of heat production in the *Maison du Gardien* during the first three quarters of 2021. The other emission categories have remained stable or fluctuate depending on the different activities of the entities present on site (office automation for example).

Table 2: Evolution of CO₂ emissions between 2016 and 2021

Catégories	2016 tCO ₂	2017 tCO ₂	2018 tCO ₂	2019 tCO ₂	2020 tCO ₂	2021 tCO ₂	Evolution 2020-2021	Evolution 2016-2021
Heating	82	12	15	11	9	6	-25%	-92%
Electricity	83	0	0	0	1	1	5%	-99%
Business travel	117	136	137	169	25	38	51%	-68%
Transportation	0	16	0	0	2			
Commuting	115	133	94	84	50	74	48%	-36%
Office automation	24	23	17	17	13	29	127%	19%
Water	1	0	2	2	3	3	12%	433%
Waste	19	11	16	15	15	17	7%	-12%
Chemicals & Chemical Products	0	0	0	0	0	0	21%	-28%
Subcontracting	12	12	9	23	15	13	-12%	11%
Total	452	345	290	322	132	180	36%	-60%
Grey energy photovoltaic	20	20	20	20	20	20		
Grey energy Blue Hall	45	45	45	45	45	45		
Grey energy Wood-iD						5		
Total grey energy	64	64	64	64	64	70		
Total	516	409	354	386	196	250	27%	-52%

The number of FTEs increased from 236 to over 260 for the entire site between 2020 and 2021. The total number of employees in 2021 reached over 360. With the resumption of activities, annual emissions per FTE increased from 0.56 tCO₂ to 0.67 tCO₂ (operating emissions only) but for the first time fell below one tCO₂ outside the pandemic period. In the long term, [Figure 3](#) shows a significant decline since 2016 despite an on-site population that has almost doubled.

Figure 3: Emission evolution between 2016-2021



Detail by entity

A total of 48 entities were identified for this assessment. These are all the companies, learning establishments, research centres and clusters, together with the majority of the associations present on the bluefactory site, as well as BFF SA which manages all common areas. Emissions per entity range from less than one tCO₂ to almost 30 tCO₂ for the largest entities. In 2020, emissions amounted to 19 tCO₂ for the most impactful company.

Optimisation measures

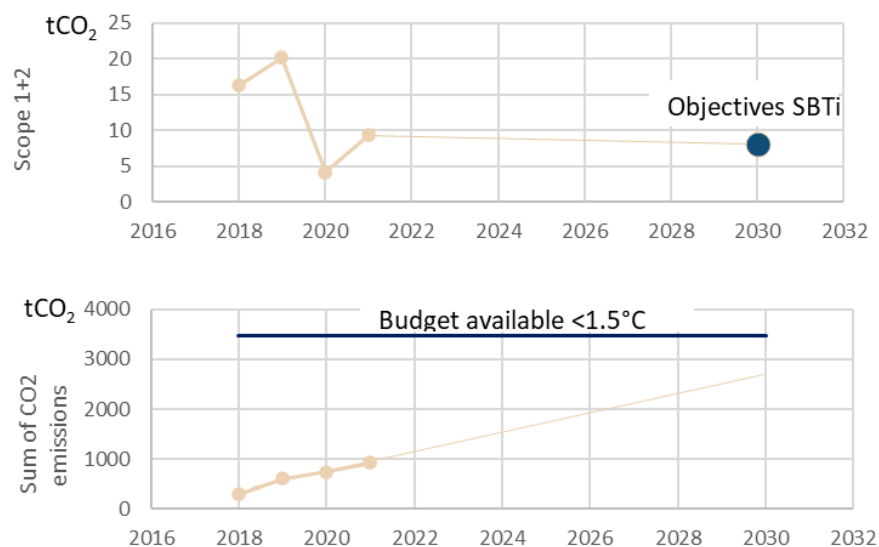
As of 2022, BFF SA, in collaboration with Climate Services and the University of Engineering and Architecture of Fribourg (HEIA-FR), is implementing measure E.2.5 of the Cantonal Climate Plan "Support for the net carbon zero approach of an exemplary district".

The aim is to capitalise on the bluefactory district development to create and test a methodology and systemic planning tools that will support project owners in defining carbon footprint on a neighbourhood scale, allowing them to understand the CO₂ and financial impacts of their construction choices.

Objectives

The Confederation has set a clear target of net zero CO₂ emissions by 2050, in line with the international objectives of the Paris Agreement on Climate Change. This objective implies an overall CO₂ budget that must not be exceeded. The Science Based Target initiative (SBTi) proposes that to meet this budget, SMEs should halve their 2018 levels of Greenhouse Gas Protocol Scope 1 and 2 emissions. For the entire bluefactory site, this target amounts to eight tCO₂ (Figure 4). Taking into account all emissions and global emission targets according to the IPCC (adopted by the SBTi for large companies), cumulative emissions from the site's operations should not exceed 3478 tCO₂ from 2018 to 2050 (Figure 4).

Figure 4: Scope 1 and 2 reduction targets according to SBTi, and available CO₂ budget according to IPCC data



The use of renewable energies for heat production and company vehicles makes the objective set by SBTi on Scopes 1 and 2 easily achievable.

Regarding compliance with the overall budget, significant efforts must be made if the CO₂ budget is not to be already exceeded by 2032. The document "New CO₂ objectives" put in place by BFF SA in 2020 shows that the electrification of the car fleet will have a positive impact on scope 3 of the district's balance sheet. However, since this will not yet have had the expected effect in 2032, it will be a question of on-site companies taking measures to limit the risk of budget overruns. These goals are always set in absolute values and are therefore not adjusted for the expected growth in the number of people on the site.