Finnish National Opera and Ballet
Carbon footprint calculation 2024

Report and results

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16 October 2026



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Summary

The 2024 calculation shows that 99.9% of emissions at the Finnish National Opera and Ballet (FNOB) fall within Scope 3, while emissions from the organisation's own operations are close to zero. This is the result of long-term work to steadily and deliberately reduce our environmental impact.

FNOB's own building and direct operations (Scopes 1 and 2) run on 100% renewable energy backed by Guarantees of Origin, and are virtually emission-free. The remaining technical margin (around 7.7 tonnes, less than 0.1% of the total carbon footprint) is addressed separately through voluntary ecological compensation.

The operational focus of our environmental work has now shifted entirely to reducing emissions across the value chain (Scope 3).

In 2024, Scope 3 emissions totalled around 9,399 tonnes (9,399,084 kg CO_2e). These indirect value chain emissions are more challenging to reduce than those directly controlled by the organisation, but their systematic reduction is closely integrated into our strategy.

Going forward, emissions will be calculated yearly for the highest-emitting categories only. A calculation covering the emissions of the entire organisation will be conducted every three years. The next organisation-wide calculations will cover 2027 and 2030. Each will be carried out in the following year, in 2028 and 2031 respectively.



Basis of the calculation

The calculation is based on the international Greenhouse Gas (GHG) Protocol and follows its Corporate Accounting and Reporting Standard and its Corporate Value Chain Standard. Emissions are divided into three scopes:

Scope 1: Greenhouse gas emissions arising directly from sources owned by the Finnish National Opera and Ballet.

Scope 2: Greenhouse gas emissions from the generation of energy purchased by the Finnish National Opera and Ballet.

Scope 3: Greenhouse gas emissions arising indirectly from the Finnish National Opera and Ballet's operations across its supply and value chains.

The reporting period is 1 January to 31 December 2024. The results are given in carbon dioxide equivalent (CO_2e).

The calculation has been carried out and reported by Jyri Sucksdorff, Environmental Planner at the Finnish National Opera and Ballet.

Eeva Hämeenoja, an expert from SYKLI Environmental School of Finland, and members of FNOB staff have also contributed to the calculation.

Calculation boundaries

The calculation used the financial control approach and covers the period 1 January to 31 December 2024.

This means that the calculation includes all operations under FNOB’s financial control during the given period. In practice, the calculation combined an environmentally extended input-output method with a more detailed analysis of certain operational emissions, based on activity data collected specifically for the calculation. Input data was drawn extensively from FNOB’s information systems and with the help of experts from our various departments.

The calculation covers the premises used by FNOB, including the Opera House (its main building on Töölönlahti Bay), the owned and rented flats used by staff, and the Ilvesvuori storage facility.

Emission factors were sourced from a wide range of databases, listed by category on the following pages. In addition, the Norwegian Green Producers Tool, developed for the creative industries, was trialled to calculate emissions from international audience travel.

Input data / Scope 1 and Scope 2

Scope 1:

Category	Inclusions, exclusions and assumptions	Emission factor source	Emission factor representativeness	Calculation method
Renewable diesel (HVO) for the backup generator	Refrigerants have been replaced since the previous calculation. VOC emissions from pyrotechnics are not included.	Statistics Finland, Fuel Classification 2024	2024, Finland	Fuel emissions calculated on the basis of consumption.

Scope 2:

Category	Inclusions, exclusions and assumptions	Emission factor source	Emission factor representativeness	Calculation method
Purchased electricity	The Opera House uses 100% carbon-neutral electricity backed by Guarantees of Origin.	Statistics Finland, Fuel Classification 2024	2024, Finland	No calculation required.
Purchased heat	The Opera House is heated entirely by carbon-neutral district heating. District heating at the Ilvesvuori storage facility is 97% carbon neutral. Guest flats owned by FNOB, and their average district heating use, are included in this category.	Helen Ltd Specific emissions of district heating 2024 Several publications by Motiva and the construction sector on how new building regulations affect energy efficiency.	2024, Finland	The 3% share at Ilvesvuori was calculated using average district heating data. Emissions from FNOB-owned guest flats were estimated per square metre, using Helen's specific emission factor for district heating and a building-specific consumption estimate based on year of construction.
Purchased district cooling	All district cooling purchased for the Opera House is supplied by Helen Ltd and is carbon neutral.			No calculation required.

Input data / Scope 3

Category	Inclusions, exclusions and assumptions	Emission factor source	Emission factor representativeness	Calculation method
Transport of goods and internal transfers	Includes internal transfers between the Opera House and the Ilvesvuori storage facility. Delivery of individual purchased products is included only through the input-output method based on purchase price.	Statistics Finland, Fuel Classification 2024 Guidelines for estimating emissions from road freight transport in Finland, Traficom 2025 (link in Finnish only)	2024, Finland 2025, Finland	Calculation based on data provided by the transport company.
Fuel- and energy-related activities	Includes rented guest flats and emissions from their district heating, as well as transmission and distribution losses.	Helen Ltd: Specific emissions of district heating 2024 Finnish Energy	2024, Finland	Emissions from FNOB's rented guest flats were estimated per square metre, using the specific emission factor for district heating and a building-specific consumption estimate based on year of construction.
Waste generated in operations	Based on the 2024 waste reports. The following waste streams are itemised: mixed waste, waste for energy recovery, biowaste, metal, glass, plastic, cardboard, paper, WEEE (waste electrical and electronic equipment) and hazardous waste.	Ministry of the Environment / Finnish Environment Institute (Syke), carbon footprint calculators, and Ilmasto-opas.fi (Climateguide.fi)	2024, Finland	Waste-type-specific method.
Use of sold products	Includes streams on FNOB's own Stage24 service, television broadcasts on channels including Yle and Arte, and radio broadcasts on Yle channels. Based on the number of views in 2024 across the various platforms.	Carbon impact of video streaming, Carbon Trust 2021 Quantitative study of the GHG emissions of delivering TV content, LoCaT 2021 BBC White Paper 372, 2020 BBC White Paper 424, 2025	2021, UK 2021, UK 2020, UK 2025, UK	Each stream was assumed to last 2.5 hours on average and to be watched on a 50-inch LED television. Radio broadcasts were split equally between FM and internet radio and calculated on the basis of 2.5 hours of broadcast time.
Employee commuting	Covers staff travel between home and work. Does not include staff visits to the Ilvesvuori storage facility.	VTT LIPASTO Traficom, 2024 Department for Energy Security and Net Zero, UK 2022	2024, Finland 2025, Finland 2022, UK	Employee commuting was estimated on an average basis, using primary data from the HR department and, for staff with parking spaces, a dedicated survey.

Input data / Scope 3

Category	Inclusions, exclusions and assumptions	Emission factor source	Emission factor representativeness	Calculation method
Business travel	Includes international travel, hotels and travel expenses for FNOB staff, visiting artists and other guests. Also includes use of private cars, taxis and hire cars, on a spend basis.	VTT LIPASTO ENVIMAT Flights and hotels: Global Business Travel Report 2024	2024, Finland 2019, Finland 2026, Finland	Emissions from flights and hotels taken directly from the Global Business Travel (GBT) system. All other emissions calculated with ENVIMAT data, using the spend-based input-output method and adjusted for inflation.
Production-related goods and services	Includes production-specific costs such as performing rights, production and artistic services, professional services, purchases of materials and supplies by individual departments, and hire of external venues.	ENVIMAT	2019, Finland	Spend-based input-output calculation, adjusted for inflation
Purchased goods and services	Purchased goods and materials, including long-term purchases and capital investments by the set workshop, costume department, props department, stage, property, production and administration teams, and by performers. Purchased services, including general services, repairs to the building and stage technology, and emissions from financial investments.	ENVIMAT ENVIMAT	2019, Finland 2019, Finland	<u>Purchased goods and materials</u> Spend-based input-output calculation, adjusted for inflation <u>Purchased services</u> Spend-based input-output calculation, adjusted for inflation
Audience travel	Domestic and international audiences, calculated from ticket sales data. For international ticket buyers, journeys assume the nearest commercial airport and a direct flight to Helsinki. Within Finland, modes of travel are based on audience survey data, excluding Åland. Each ticket counts as one return journey.	Green Producers Tool 2026 VTT LIPASTO	2026, Norway 2024, Finland	Distance-based method. All flights calculated with the Green Producers Tool. Domestic visitors calculated on a distance basis. Data taken from the ticket sales system and, statistically, from the 2024 audience surveys.
Upstream leased assets	Emissions from travel by agency staff, and from transporting hired materials and productions.	VTT LIPASTO	2024, Finland	Agency staff travel calculated on a distance basis, using data collected from external suppliers.

Finnish National Opera and Ballet, detailed emissions calculation 2024

Scope 1	**0,026**	**TCO2e**		0,00027 %
		Emission		
	Biodiesel for aggregate	26	kgCO2e	
Scope 2	**7,642**	**TCO2e**		0,081 %
		Emission		
	Owned guest apartments	7457	kgCO2e	0,079 %
	Ilvesvuori warehouse	185	kgCO2e	0,002 %
Scope 3	**9399,084**	**TCO2e**		99,92 %
Audience logistics		Emission		
	Domestic audience	2513807	kgCO2e	26,72 %
	International audience	3342630	kgCO2e	35,53 %
Employee logistics		Emission		
	Emissions of parking permit holders	105101	kgCO2e	1,12 %
	Employee commuting (all)	251042	kgCO2e	2,67 %
	Taito Palvelut agency staff	4910	kgCO2e	0,05 %
Services and purchased goods				
	PURCHASED SERVICES	Emission		
	Catering	25681	kgCO2e	0,27 %
	Security services	72927	kgCO2e	0,78 %
	Marketing	261712	kgCO2e	2,78 %
	Cleaning services	91825	kgCO2e	0,98 %
	Financial administration	59940	kgCO2e	0,64 %
	IT services	67302	kgCO2e	0,72 %
	Occupational healthcare	82299	kgCO2e	0,87 %
	Training	10241	kgCO2e	0,11 %
	Staff expenses	0	kgCO2e	0,00 %
	Co-productions	70792	kgCO2e	0,75 %
	Music performance rights	0	kgCO2e	0,00 %
	Purchased production services	82383	kgCO2e	0,88 %
	Purchased artistic services	31938	kgCO2e	0,34 %
	Recording production	72554	kgCO2e	0,77 %
	Ticket sales commissions	10959	kgCO2e	0,12 %
	Expert and consulting fees	158658	kgCO2e	1,69 %
	Waste and environmental management	33908	kgCO2e	0,36 %
	Electricity	0	kgCO2e	0,00 %
	District cooling	0	kgCO2e	0,00 %
	Equipment and property repair costs	21787	kgCO2e	0,23 %
	Stage technology repair costs	72412	kgCO2e	0,77 %
	Property tools and small equipment	23087	kgCO2e	0,25 %
	Other property costs	1949	kgCO2e	0,02 %
	Rented apartments	11232	kgCO2e	0,12 %
	Stage24 livestreams + YLE	47375	kgCO2e	0,50 %

Total emissions: 9,406.75 t CO_2e

Scope 1: 26 kg CO_2e

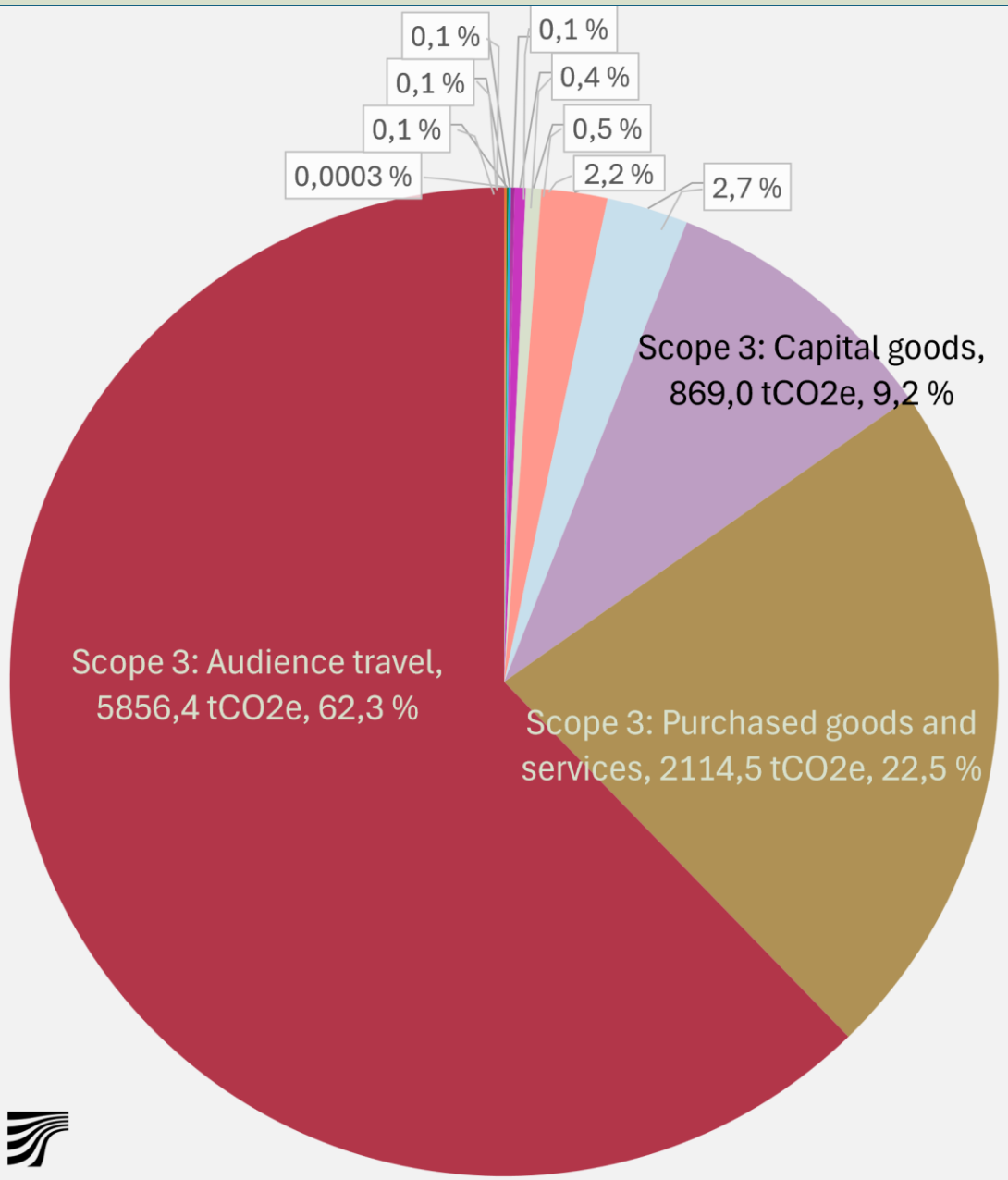
Scope 2: 7,642 kg CO_2e

Scope 3: 9,399,084 kg CO_2e

Scope 3	**INVESTMENTS**	Emission		
	Security / Access control	60873	kgCO2e	0,65 %
	Stage / Property (renovation)	428386	kgCO2e	4,55 %
	Stage / Infrastructure	32500	kgCO2e	0,35 %
	Stage / Lighting	71880	kgCO2e	0,76 %
	Stage / Sound	11397	kgCO2e	0,12 %
	Costume department / Garment racks	59499	kgCO2e	0,63 %
	Scenery workshop	10345	kgCO2e	0,11 %
	Marketing	104646	kgCO2e	1,11 %
	Orchestra	67516	kgCO2e	0,72 %
	Logistics	5575	kgCO2e	0,06 %
	Property / Real estate	16413	kgCO2e	0,17 %
	INVESTMENT ACTIVITIES (EVLI)	Emission		
	Asset management portfolio 1487601	72250	kgCO2e	0,77 %
	Asset management portfolio 1520337	80650	kgCO2e	0,86 %

Scope 3	**PURCHASED GOODS AND EXPENSES**	Emission		
	Workwear	30608	kgCO2e	0,33 %
	Domestic business travel expenses	13151	kgCO2e	0,14 %
	Domestic flights GBT 2024*	2160	kgCO2e	0,02 %
	Domestic accommodation expenses	3062	kgCO2e	0,03 %
	Domestic hotels GBT 2024*	6083	kgCO2e	0,06 %
	International business travel expenses	8546	kgCO2e	0,09 %
	International flights GBT 2024*	111522	kgCO2e	1,19 %
	International accommodation expenses	13288	kgCO2e	0,14 %
	International hotels GBT 2024*	3776	kgCO2e	0,04 %
	Guest travel (fringe benefits)	29344	kgCO2e	0,31 %
	Guest accommodation (fringe benefits)	6250	kgCO2e	0,07 %
	Taxi expenses	3023	kgCO2e	0,03 %
	Kilometre allowances	2488	kgCO2e	0,03 %
	Instrument and equipment allowances	74956	kgCO2e	0,80 %
	Costume materials	42082	kgCO2e	0,45 %
	Ballet shoes	22977	kgCO2e	0,24 %
	Set and scenery materials	97980	kgCO2e	1,04 %
	Sound recording and audio supplies	67359	kgCO2e	0,72 %
	Video recording expenses and supplies	63331	kgCO2e	0,67 %
	Lighting expenses and supplies	48777	kgCO2e	0,52 %
	Hair and make-up supplies	25106	kgCO2e	0,27 %
	Purchased compositions and librettos	2713	kgCO2e	0,03 %
	Transport and freight	7966	kgCO2e	0,08 %
	Rehearsal space rentals	3035	kgCO2e	0,03 %
	Technical supplies and small equipment	142645	kgCO2e	1,52 %
	Prop supplies	6025	kgCO2e	0,06 %
	Musical instruments and accessories	28994	kgCO2e	0,31 %
	Sheet music purchases and rentals	13051	kgCO2e	0,14 %
	Other production expenses	40735	kgCO2e	0,43 %
	Magazines and professional literature	1284	kgCO2e	0,01 %
	Postal services	2612	kgCO2e	0,03 %
	Telephone and telecommunications expenses	9067	kgCO2e	0,10 %
	Office and other supplies	3614	kgCO2e	0,04 %
	Copying and printing expenses	1112	kgCO2e	0,01 %
	Office equipment rental, maintenance and repair	1638	kgCO2e	0,02 %
	Insurance premiums	5473	kgCO2e	0,06 %
	Membership fees	6771	kgCO2e	0,07 %
	Other operating expenses	1200	kgCO2e	0,01 %

FNOB emission distribution 2024



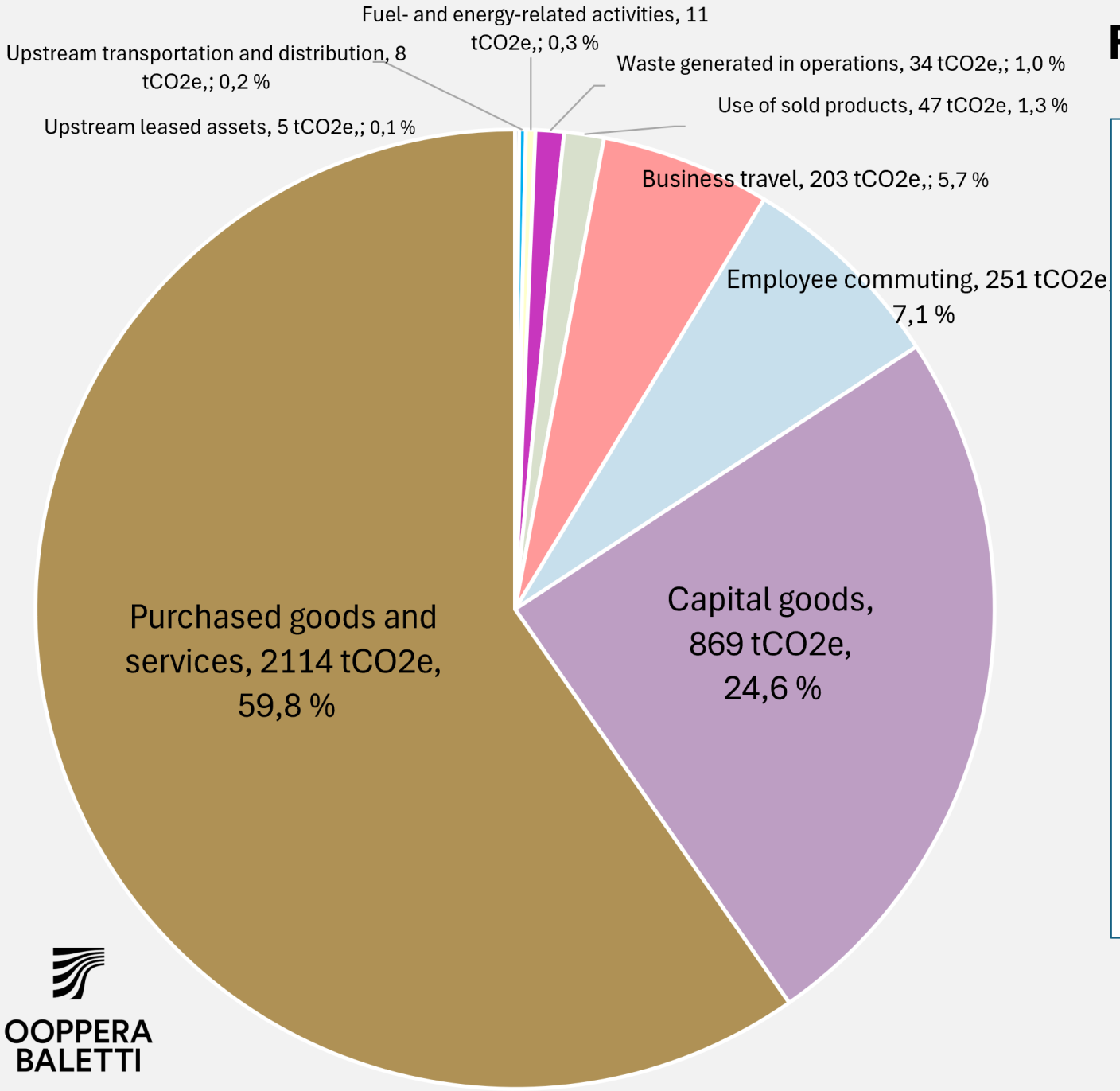
- Scope 1: Direct emissions, 0,03 tCO2e, 0,0003 %
- Scope 2: Purchased energy, 7,6 tCO2e, 0,1 %
- Scope 3: Upstream leased assets, 4,9 tCO2e, 0,1 %
- Scope 3: Upstream transportation and distribution, 8,0 tCO2e, 0,1 %
- Scope 3: Fuel- and energy-related activities, 11,2 tCO2e, 0,1 %
- Scope 3: Waste generated in operations, 33,9 tCO2e, 0,4 %
- Scope 3: Use of sold products, 47,4 tCO2e, 0,5 %
- Scope 3: Business travel, 202,7 tCO2e, 2,2 %
- Scope 3: Employee commuting, 251,0 tCO2e. 2,7 %
- Scope 3: Capital goods, 869,0 tCO2e, 9,2 %
- Scope 3: Purchased goods and services, 2114,5 tCO2e, 22,5 %
- Scope 3: Audience travel, 5856,4 tCO2e, 62,3 %

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FNOB emission distribution 2024

with audience travel excluded



- Upstream leased assets, 5 tCO2e,
- Upstream transportation and distribution, 8 tCO2e,
- Fuel- and energy-related activities, 11 tCO2e,
- Waste generated in operations, 34 tCO2e,
- Use of sold products, 47 tCO2e,
- Business travel, 203 tCO2e,
- Employee commuting, 251 tCO2e,
- Capital goods, 869 tCO2e,
- Purchased goods and services, 2114 tCO2e,

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Largest emission sources

Category	Emissions, t CO_2e	%	Notes
Audience travel, international	3,343	36%	3,982 international visitors. Flying, especially on long-haul routes, is emissions-intensive.
Audience travel, domestic	2,514	27%	257,669 visitors. Travel that relies on fossil fuels quickly adds up to substantial emissions.
Capital investments	869	9%	Stage refurbishment, marketing, lighting equipment, orchestra, costume department, etc.
Purchased goods and services / Electronic equipment	855	9%	NB: Some of this is also capital investment. Stage refurbishment, airport display screen, video, sound, lighting, technical supplies, etc.
Purchased goods and services / Marketing	366	4%	Marketing purchases and capital investments
Purchased goods and services / Professional services	159	1.7%	Professional services and their emissions.
Employee commuting	251	2.7%	Staff travel between home and work

Emissions intensity in 2024

In 2024, the Finnish National Opera and Ballet had a total of 261,561 in-person visitors.

This puts emissions per visitor at around 36 kg CO_2e.

When audience outreach, streams and radio broadcasts are counted along with performances, FNOB reached a total of around 700,000 audience engagements in 2024.

Measured against this wider reach, emissions per audience engagement were 13.43 kg CO_2e.



References

- **American Express Global Business Travel (Amex GBT).** (2024). *Global Business Travel Report 2024*.
- **BBC.** (2020). *White Paper 372. Environmental impact of TV distribution platforms' electricity consumption using behavioural data.* Available at: https://downloads.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP372.pdf
- **BBC.** (2025). *White Paper 424. Streaming and broadcast: closing the energy gap.* Available at: https://downloads.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP424.pdf
- **Carbon Trust.** (2021). *Carbon impact of video streaming.* Available at: https://www.carbontrust.com/en-eu/our-work-and-impact/guides-reports-and-tools/carbon-impact-of-video-streaming
- **Department for Energy Security and Net Zero (UK).** (2022). *Greenhouse gas reporting: conversion factors 2022.* Available at: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
- **Finnish Energy** (Energiateollisuus ry). (n.d.). Sähkön ja kaukolämmön päästökertoimet [Emission factors for electricity and district heating]. Available at: https://energia.fi
- **Finnish Environment Institute (Syke).** (n.d.). *ENVIMAT model (Environment and Macroeconomic modelling)*.
- **Finnish Environment Institute (Syke) and Ministry of the Environment.** (n.d.). *Hiilijalanjälkilaskurit [Carbon footprint calculators].*
- **Finnish National Opera and Ballet.** (2026). *Suomen kansallisoopperan ja -baletin päästövähennyspolku 2030* [Finnish National Opera and Ballet emissions reduction pathway to 2030].
- **Finnish Transport and Communications Agency Traficom.** (2023). *Tieliikenteen ajoneuvokanta- ja päästöennusteen päivitys 2023 [Road vehicle fleet and emissions forecast: 2023 update].* Available in Finnish at: Tieliikenne_PaastoPaivitys_2023.pdf
- **Finnish Transport and Communications Agency Traficom.** (2025). *Liikennekäytössä olevat ajoneuvot ajoneuvoluokittain ja käyttövoimittain 2007–2025 [Vehicles in use by vehicle category and power source, 2007–2025].* Available in Finnish at: Liikennekaytossa-olevat-ajoneuvot-kayttovoimittain-aikasarja.xlsx
- **Finnish Transport and Communications Agency Traficom.** (2025). *Päästölaskentaohjeistus tieliikenteen kuljetusten päästöjen arvioimiseksi Suomessa* [Guidelines for estimating emissions from road freight transport in Finland]. Available in Finnish at: Päästölaskentaohjeistus tieliikenteen kuljetusten päästöjen arvioimiseksi Suomessa | Traficom
- **Green Producers Club.** (2026). *Green Producers Tool*. Available at: https://www.greenproducers.club
- **Helen Ltd.** (2024). *Specific emissions of district heating.* Available at: Specific emissions of energy | Helen
- **Ilmasto-opas.fi** (Climateguide.fi). (n.d.). *Ilmastonmuutos ja päästöt* [Climate change and emissions]. Available in Finnish at: https://www.ilmasto-opas.fi
- **LCA Consulting.** (2020). *Suomen kansallisoopperan ja -baletin päästöraportti 2019* [Finnish National Opera and Ballet emissions report 2019].
- **The LoCaT Project.** (2021). *Quantitative study of the GHG emissions of delivering TV content*. Available at: Quantitative study of the GHG emissions of delivering TV content
- **Motiva Ltd.** (2024). *Kiinteistön energiakatselmuksen toteutus- ja raportointiohjeet* [Guidelines for conducting and reporting building energy audits]. Available in Finnish at: Kiinteistökatselmuksen toteutus- ja raportointiohjeet
- **Statistics Finland.** (2024). *Polttoaineluokitus 2024* [Fuel classification 2024]. Available in Finnish at: https://stat.fi/fi/tilastot/tietoa-teemoittain/kasvihuonekaasuinventaario/polttoaineluokitus
- **VTT Technical Research Centre of Finland.** (n.d.). *LIPASTO: Liikenteen pakokaasupäästöjen ja energiankulutuksen laskentajärjestelmä* [Calculation system for traffic exhaust emissions and energy consumption]. Available in Finnish at: http://lipasto.vtt.fi
- **World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD).** (2004). *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*. Available at: https://ghgprotocol.org/corporate-standard



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