

Carbon footprint analysis of electricity, gas and water consumption before and after an educational intervention at a dermatology centre in the UK

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Dear Editor, There is a paucity of literature on the carbon footprint for delivering dermatology services. Silva *et al.*,¹ in 2025, provided the first literature on the proportional contribution to the carbon footprint from Greenhouse Gas Protocol (GHGP) scopes 1, 2 and 3 in outpatient dermatology practices in the USA (2.5%, 46.3% and 51.1%, respectively). These baseline data will facilitate the evaluation of sustainable healthcare initiatives, in absolute terms, in decarbonizing dermatology services. However, there is a genuine need for country-specific data, as there are wide variations in healthcare systems and practices across the world.

We share our UK single-centre carbon footprint data falling under GHGP scope 2 (purchased energy, including electricity and gas) plus water consumption on a per-patient encounter basis and the potential impact of an educational package on utility consumption. This project was independently assessed by our trust's audit and clinical effectiveness department and formally registered as a quality improvement project. Our dermatology facility is a detached building of two floors with 141 m² of clinical area surrounded by green spaces, using natural gas central heating with no solar panels, no electric car charging facility, single-glazed windows and an energy rating of 68/grade C [rating is from A* (best) to G (worst)]. We monitored the gas, electricity and water analogue meter readings 1 month before (October 2024) and 1 month after (November 2024) delivery of an educational package (delivered at the end of October 2024) and recorded the corresponding total number of face-to-face patient appointment slots available at this facility from our electronic appointment system during the intervening period.

The educational package consisted of a self-directed 5-min Microsoft PowerPoint (Microsoft Corp., Redmond, WA, USA) presentation outlining basic energy- and water-saving sustainability information directly relevant to dermatology practices, such as turning off lights and computers when not in use, turning off gas central heating on Sundays when the facility is always closed and appropriate use of alcohol gel for hand disinfection instead of

soap and water, as per recommendations from the British Society for Dermatological Surgery sustainability guidance.^{2,3} Electricity, gas and water consumption in October 2024 and consumption per patient appointment are shown in Table 1. Following the educational intervention, the per-patient appointment percentage changes were a 29.8% reduction for electricity, 35.3% reduction for water and 72.2% increase in gas (Table 1). The utility results were then used and multiplied by the carbon emission factors to calculate the carbon saving as a result of the implementation of the educational package.

The overall carbon saving over the 1-month period was 382.38 kg carbon dioxide equivalent; for a breakdown for each utility (Table 1). The financial saving for electricity, gas and water as a result of the implementation of the education package was £401.85 over the 1-month period (Table 2). Our findings showed that our educational intervention could reduce electricity and water consumption in the dermatology facility, although the longer-term outcome has not been evaluated. The increase in gas consumption after the educational intervention is potentially attributable to an increase in the use of gas central heating over wintertime, as the average temperature was cooler in November 2024 (maximum 10.60 °C, minimum 4.18 °C) compared with October 2024 (maximum 14.88 °C, minimum 7.35 °C).⁵

Our methodology did not capture only utility consumption generated from face-to-face clinical activities but also utility consumption attributable to the preparation, administration, cleaning and building maintenance necessary to run a dermatology service. However, this is a single-centre study; the sample size is low and does not enable the determination of the statistical significance of the differences in the data. Data on the number and proportion of different types of clinics and the number of full-time equivalent staff worked during the two comparison periods were not available. Our utility consumption will differ from other dermatology facilities with different energy efficiency ratings and facilities offering different services (e.g. laser units, Mohs micrographic surgery and teledermatology).

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Table 1 Utility consumption and carbon footprint before (October 2024) and after (November 2024) presentation of the educational package

Utility use	Meter reading		Utility saving following educational package	Carbon footprint reduction following educational package (kgCO ₂ e)	Utility consumption per patient appointment per utility		Difference of utility consumption per patient appointment, October, November (%)
	October	November			October	November	
Electricity (kWh)	4672	3200	1472	405.12 ^a	3.47	2.44	29.8 ^a
Water (m ³)	23.2	14.5	8.7	2.62 ^a	0.017	0.011m ³	35.3 ^a
Gas (kWh)	175	294	119 ^b	25.36 ^b	0.13	0.22	72.2 ^b
Total saving (£)				382.38			

For the periods October and November 2024, there were 1346 and 1313 patient appointments available, respectively. Electricity carbon conversion factor from kWh (kilowatt hours) to kilograms of carbon dioxide equivalent (kgCO₂e) = 0.20705; water carbon conversion factor from m³ to kgCO₂e = 0.15311 and gas carbon conversion factor from kWh to kgCO₂e = 0.20264.^aSaving, ^bIncrease.

Table 2 Overall financial saving for each of the utilities before (October 2024) and after (November 2024) presentation of the educational package

Utilities usage	October cost	November cost	Financial savings
Electricity	1268.08	878	390.08
Water	44.48	27.95	16.85
Gas	16.48	21.24	-4.76
Total saving			401.85

Data are presented as pounds sterling (£).

To the best of our knowledge, we have provided the first UK data on utility consumption in relation to the delivery of face-to-face dermatology services in a suburban area of the UK. Following this pilot study, we intend to organize a national-level study to provide further insight into the utility consumption usage in dermatology across the UK. Future studies could explore seasonal variation and service provider variation in utility consumption to help identify carbon hot spots.

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Advisory Board of *Clinical and Experimental Dermatology*, chair of the British Association of Dermatologists sustainability sub-committee and honorary treasurer of the British Association of Dermatologists, and a member of the European Academy of Dermatology and Venereology Climate Task Force. R.G. declares no conflicts of interest. Opinions expressed in this manuscript are solely our own and do not represent the views or opinions of our employers and affiliated professional and academic bodies.

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References

- Silva GS, Waegel A, Kepner J *et al.* Carbon footprint analysis of an outpatient dermatology practice at an academic medical center. *JAMA Dermatol* 2025; **161**:191–7.
- Ali F; BSDS Sustainability Subgroup Collaborative; Wernham A, Abbott R. Environmental sustainability in dermatological surgery. Part 1: reducing carbon intensity. *Clin Exp Dermatol* 2025; **50**:503–11.
- Ali F; BSDS Sustainability Subgroup Collaborative; Wernham A, Abbott R. Environmental sustainability in dermatological surgery. Part 2: reducing activity and future ecological strategies. *Clin Exp Dermatol* 2025; **50**:512–19.
- Department for Energy Security and Net Zero. Greenhouse gas reporting: conversion factors 2024. Available at: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024> (last accessed 20 July 2025).
- Meteorological Office. Climate and climate change. Historic station data. Location specific long-term averages – Wellsbourne, Warwickshire. Available at: <https://www.metoffice.gov.uk/research/climate/maps-and-data/historic-station-data> (last accessed 20 July 2025).