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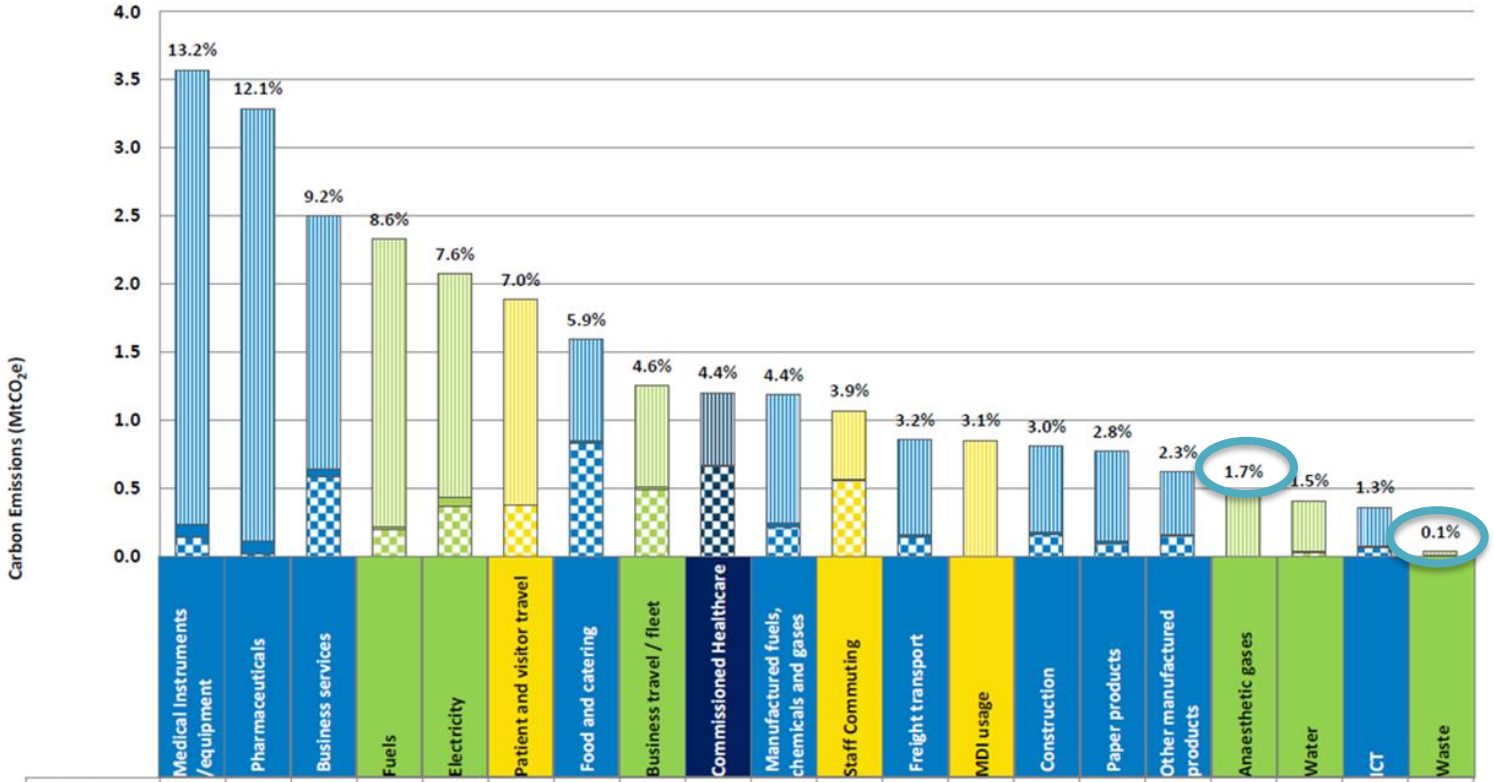
Focus on Sustainability

Cathy Lawson

Immediate past Fellow in Environmentally Sustainable Anaesthesia, Association of Anaesthetists, Centre for Sustainable Healthcare and Newcastle upon Tyne Hospitals

Twitter: @dr_cathy_lawson
Email: cathy.lawson2@nhs.net

Carbon hotspots in HSC



	Medical instruments /equipment	Pharmaceuticals	Business services	Fuels	Electricity	Patient and visitor travel	Food and catering	Business travel / fleet	Commissioned Healthcare	Manufactured fuels, chemicals and gases	Staff Commuting	Freight transport	MDI usage	Construction	Paper products	Other manufactured products	Anaesthetic gases	Water	ICT	Waste
Total	3.57	3.29	2.50	2.33	2.07	1.89	1.59	1.25	1.20	1.19	1.07	0.86	0.85	0.81	0.77	0.62	0.47	0.40	0.36	0.03
%	13.2%	12.1%	9.2%	8.6%	7.6%	7.0%	5.9%	4.6%	4.4%	4.4%	3.9%	3.2%	3.1%	3.0%	2.8%	2.3%	1.7%	1.5%	1.3%	0.1%
NHS	3.34	3.18	1.86	2.11	1.64	1.51	0.74	0.74	0.53	0.94	0.50	0.70	0.85	0.63	0.66	0.46	0.47	0.37	0.28	0.03
Public Health	0.10	0.09	0.05	0.02	0.06		0.02	0.02	0.02	0.03	0.02	0.02		0.02	0.02	0.01		0.01	0.01	0.00
Social Care	0.14	0.02	0.58	0.20	0.37	0.38	0.83	0.49	0.65	0.22	0.55	0.14		0.16	0.09	0.15		0.03	0.07	0.00

Sustainable development unit. Reducing the use of natural resources in health and social care. 2018 report. Available at https://www.sduhealth.org.uk/documents/Policy%20and%20strategy/20180912_Health_and_Social_Care_NRF_web.pdf

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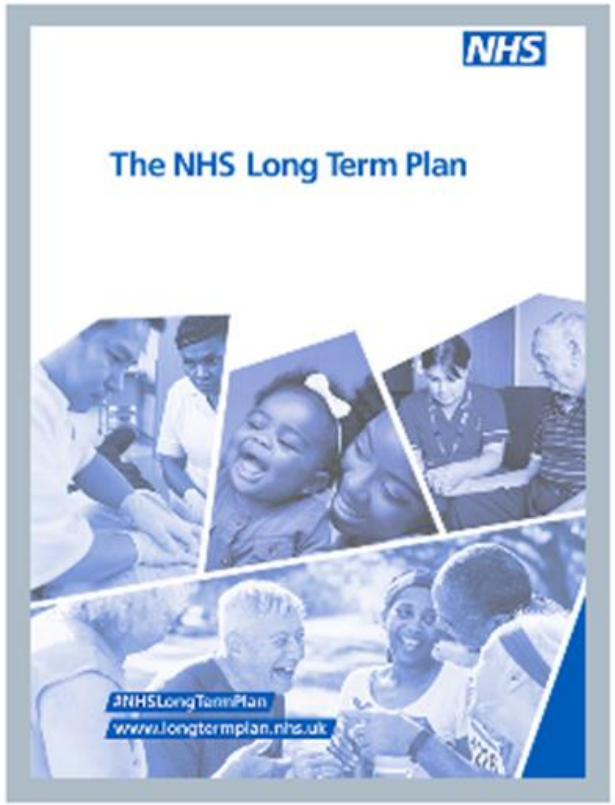
NHS long term plan



17. **The NHS is leading by example in sustainable development and reducing use of natural resource in line with government commitments.** In 2016/17 NHS providers generated nearly 590,000 tonnes of waste. Of this only 15% goes directly to landfill, with 23% of waste recycled[190]. Between 2010 and 2017 the health and care sector reduced water consumption by 21%, equivalent to around 243,000 Olympic swimming pools. The carbon footprint of health and social care has reduced by 19% since 2007, despite a 27% increase in activity. This leaves a significant challenge to deliver the Climate Change Act target of 34% by 2020 and 51% by 2025. A shift to lower carbon inhalers will deliver a reduction of 4%, with a further 2% delivered through transforming anaesthetic practices. Additional progress in reducing waste, water and carbon will be delivered by ensuring all trusts adhere to best practice efficiency standards and adoption of new innovations. Key to this will be delivering improvements, including reductions in single use plastics, throughout the NHS supply chain.

https://www.longtermplan.nhs.uk/online-version/

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2019 GPAS chapters

Sustainability

The authors of the GPAS chapters consider a wide range of evidence and issues when making their recommendations, which describe the requirements for the provision of a high quality anaesthetic service for patients. The issues considered do not pertain to environmental sustainability; however it is acknowledged that this is an important issue. The GPAS Editorial Board therefore recommends that anaesthetic departments aspire to implement the following suggestions.

Ethos and coworking – Departments should actively encourage sustainable practice amongst clinicians and support the aims of the Trust or Board's Sustainable Development Management Plan.

Staffing, personnel and education – Anaesthesia departments should have a nominated lead responsible for sustainable anaesthesia and should actively follow advice and guidance from the appropriate national body.

Resource utilisation – For inhalational anaesthesia, low flow anaesthesia should be the default position.

Waste management – Waste streams from the operating room should include; mixed recycling (paper, PET drinks bottles, drinks cans), non-contaminated domestic type waste, microwave or steam treated clinical waste, incinerated waste (including sharps and drug residues), anaesthetic room steel single use items.

Quality improvement – Inherent within the local QI programmes sufficient consideration should be given to the resource implication and the carbon impact of the QI venture.

Research – Departments throughout the country should work collaboratively with industry to define more accurately the carbon footprint of regional and inhalational general anaesthesia, drugs and disposables used in clinical practice. Results should be collated and shared and serve as the basis of future guidance.

Electrical energy use – Departments should actively encourage staff to minimise electrical energy use. Lights should be turned off when rooms and spaces are unused out of hours.

Anaesthesia machines should be placed in low power standby mode when not in use.

Anaesthetic departments should have in place practices to turn off Anaesthetic Gas Scavenging Systems (AGSS) out of hours and safely reactivated as part of the pre use checks prior to the start of the following operation list.

Waste management – The disposal of devices contaminated with drug residue and waste should follow local and national guidelines.

Staffing, personnel and education – Departments should have a number of meetings set aside to address the topic of sustainable anaesthesia within the academic calendar.

Resource utilisation – IT systems should be in place to record and compare trends in drug, inhalational anaesthetic agent and medical gas use.

Anaesthesia departments should support the work of Estates and Facilities departments in their targets for carbon reduction. This may include innovations such as:

1. Installation of energy saving set back processes to minimise energy use running theatre ventilation systems out of hours.
2. Installing low energy lighting, including LEDs, in the clinical and administrative areas.
3. Where appropriate, occupancy sensor activated lighting.

https://www.rcoa.ac.uk/gpas/chapter-1

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Focus on sustainability: Reducing our carbon footprint through inhalational agents

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Anaesthetic Gases

Agent	Atmospheric lifetime (years)	GWP_{100}	MAC value %	1 MAC hour anaesthetic* ($KgCO_2e$)	Distance Travelled/hr (Km/h)
Sevoflurane	1.1	130	2	0.6	2
Isoflurane	3.2	510	1	1.2	4
Desflurane	14	2540	6	33.5	108
Nitrous Oxide	110	310	105	n/a	n/a

Flow rate of 0.5L/min with FiO_2 0.4 and O_2/air carrier gas admixture. Value inclusive of CO_2e for O_2

https://play.google.com/store/apps/details?id=com.sleekwater.anaesthesia&hl=en_GB
https://apps.apple.com/gb/app/anaesthetic-impact-calculator/id1070999985

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Data collection

- Volumes (litres) of liquid volatile agents issued
- Medical gas delivery (N_2O and Entonox)
- Spot check/interrogation of anaesthetic machine logbooks
  - Medical gas use (Air, O_2 and N_2O)
  - Volatile consumption and uptake
  - Total time per case

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Calculating carbon emissions

Agent	Vol/unit (L)	Density (Kg/L)	No. units used	GWP_{100}	$KgCO_2e$
Isoflurane	.250	x 1.496	x	x 510	=
Sevoflurane	.250	x 1.52	x	x 130	=
Desflurane	.240	x 1.456	x	x 2540	=
	Mass (Kg)				
N2O E size	3.4	----------	x	x 298	=
N2O G size	17	----------	x	x 298	=
N2O J size	34	----------	x	x 298	=
Entonox		x 0.58	x	x 298	

Pierce JMT. The environment, the gas bill and the route to sustainable anaesthesia. RCoA Bull 2013;82:39-41. Available at: https://www.rcoa.ac.uk/sites/default/files/documents/2019-09/Bulletin82-Nov2013-Pages39-41.pdf

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Calculating volatile efficiency ratios

- Volumes of liquid anaesthetic agent
- Semi-closed breathing systems
- Consumption per case Vs uptake by patient
- Audit standards previously described
  - <3 for procedures less than an hour
  - <2 for procedures over an hour

Laws D. The volatile consumption: uptake ratio as a measure of the efficiency of a semi-closed circle breathing system usage. Anaesthesia 2011;66:749. Available at: https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2044.2011.06797.x

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Interventions to reduce emissions and enhance efficiency

- Educate staff
- Reduce and remove blue gases
- Advocate use of low flow anaesthesia
- Target high use areas
- Engage in discussions with anaesthetic machine suppliers
- Meet with budget holders and strike agreement for retaining savings made within departmental budget
- Explore perceived and actual barriers to use of alternative anaesthetic techniques

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Focus on sustainability: Are you wasting your waste?

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Waste segregation – best practice

- Operating theatre waste streams
  - Mixed recycling
  - Non contaminated domestic waste
  - Microwave/steam treated clinical waste
  - Incinerated waste including drug residues
  - Anaesthetic room steel single use items

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Data collection

- Current waste practices
- Different waste stream use
  - Weight of bags/time period
  - Disposal costs
- Spot check: appropriate segregation?
- Number and location of waste receptacles
- Survey healthcare professionals knowledge of correct waste disposal techniques

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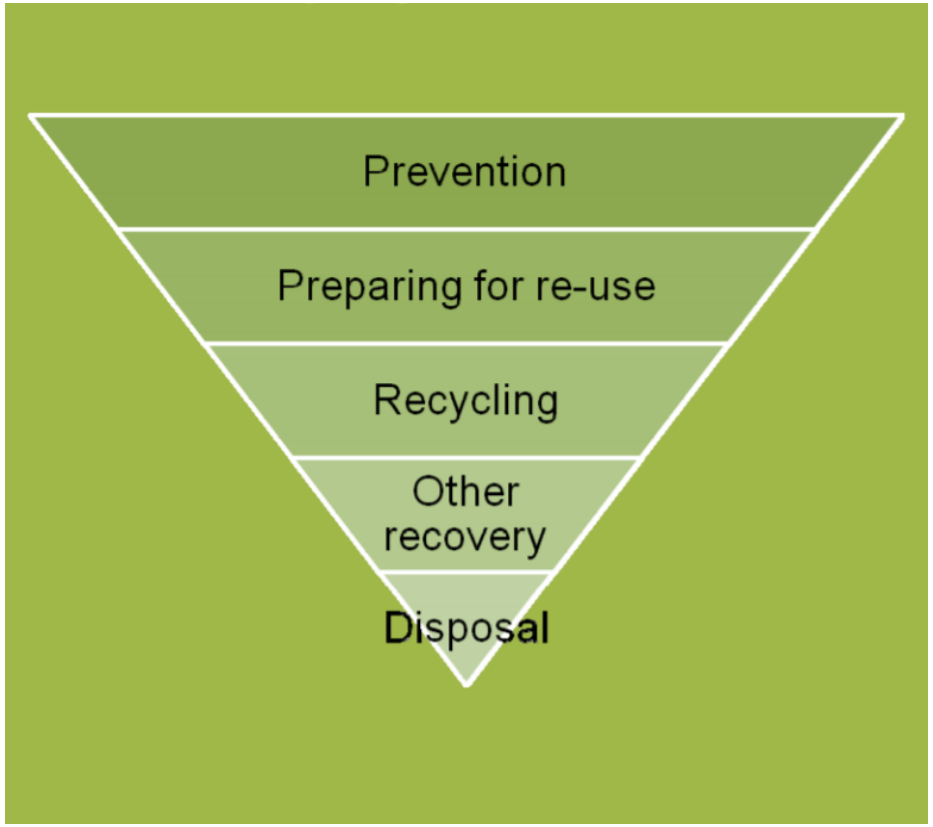
The 6 R's



- Refuse
- Reduce
- Reuse
- Recycle
- Recovery
- Rethink (disposal)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf

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Thanks for listening

Twitter: @dr_cathy_lawson

Email: cathy.lawson2@nhs.net

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