Child Health and Wellbeing Network
North East and North Cumbria

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CENTRE for SUSTAINABLE HEALTHCARE
inspire • empower • transform

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Section 3 – Literacy
Sustainable Child Health

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Contents

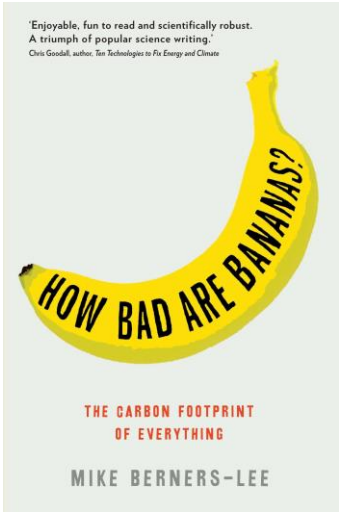
Carbon Literacy

"An awareness of the carbon costs and impacts of everyday activities and the ability and motivation to reduce emissions on an individual, community and organisational basis."

Once we understand the harm greenhouse gas (GHG) emissions cause, we need to identify where our emissions are coming from, so we can plan how to reduce them and track our progress. This is called carbon foot printing.

Carbon Footprint

From a text message to a war, from a Valentine's rose to a flight or even having a child, *How Bad are Bananas?*

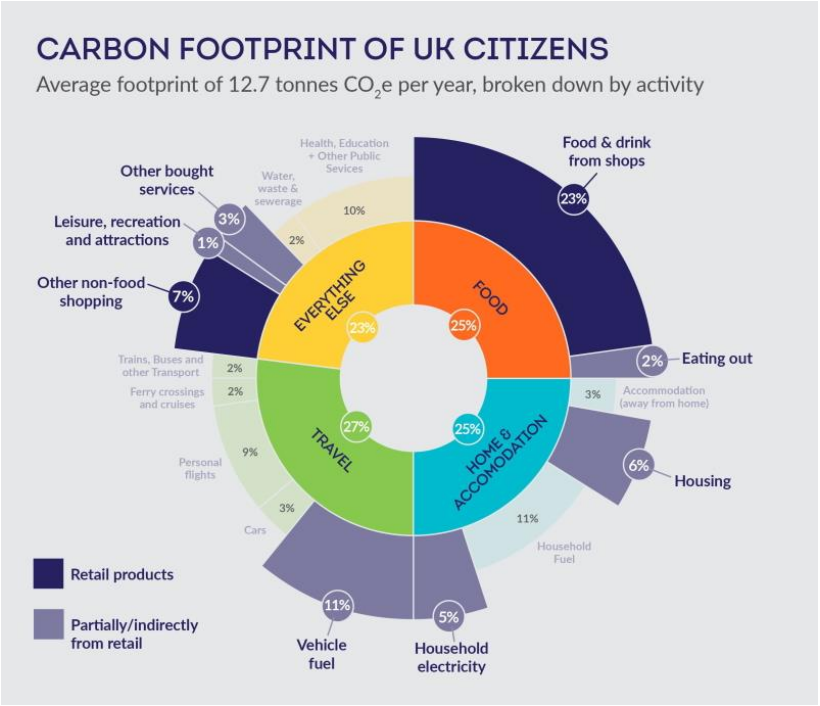


This book explores the answers and gives us the carbon answers we need and provides plenty of revelations. By talking through a hundred or so items, Mike Berners-Lee sets out to give us a *carbon instinct* for the footprint of literally anything we do, buy and think about. He helps us pick our battles by laying out the orders of magnitude. The book ranges from the everyday (foods, books, plastic bags, bikes, flights, baths...) and the global (deforestation, data centres, rice production, the World Cup, volcanoes, ...) Be warned, some of the things you thought you knew about green living may be about to be turned on their head.

Carbon Footprint

Is a way of quantifying the greenhouse gases (GHGs) emitted for a single product, a pathway (including all the resources used), individual or organisation. A carbon footprint facilitates :

- Comparison of products or processes
- Assessment of the impact of changes
- Identification of ‘carbon hotspots’ - areas of high emissions which provide useful targets for reducing environmental impact. Combining this with financial mapping helps find areas where both financial and environmental savings can be made ‘win-wins’.

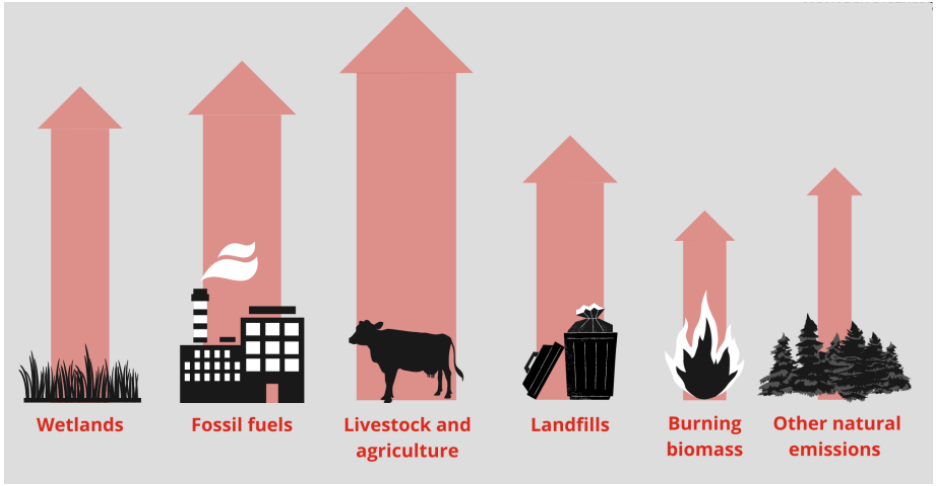


Carbon Footprint

A carbon footprint is expressed as carbon dioxide equivalents (CO_2e) because it includes not just carbon dioxide ($CO_{2)}$, but all the GHGs covered by the Kyoto Protocol. The amount of warming each gas causes depends on its potency and the length of time it stays in the atmosphere – this is called the global warming potential (GWP). The GWP is measured relative to carbon dioxide which has a value of 1. It is always important to check what time period the GWP is measured over. To illustrate this let's look at methane.

Methane

Methane is more than 100 times more potent than CO_2 as it hits the atmosphere but only stays there for about 10-20 years, after which it breaks down to water vapour and CO_2 (both are also GHGs). As the standard for measuring GWP is over 100 years the GWP for methane is often listed as only about 25, but over 20 years it is more than 80. We need to focus on cutting methane rapidly, given the importance of limiting warming in the next decade to avoid crossing climate tipping points. The main sources are agriculture (so what we eat matters a lot!), landfill sites, natural gas and coal mining.



Examples of other Greenhouse Gasses

Examples of other greenhouse gases used in healthcare:

- Hydrofluorocarbons (HFCs) are used as anaesthetic gases (e.g. sevoflurane and desflurane) and in metered dose inhalers for asthma. Some are thousands of times more potent than CO^2.
- Nitrous oxide (another anaesthetic gas often used in labour) is about 120 times more potent than CO^2 over 20 years.

Emissions Scopes

This graphic shows emission scopes for the NHS and how these are divided in to the NHS Carbon Footprint (scope 1 and 2 and some of Scope 3 – target to reach net zero by 2040) and NHS Carbon Footprint Plus (the rest of scope 3 – target to reach net zero by 2045).

Direct Emissions	Indirect Emissions	
SCOPE 1	SCOPE 2	SCOPE 3
Emissions from sources that are owned or controlled by the organisation	Emissions associated with energy used by the organisation the but produced elsewhere.	Emissions associated with products, services the organisation buys and transport in vehicles other than their own fleet
e.g. from using the transport fleet, fuel burned on site, use of anaesthetic gases or inhalers		e.g. - medicines and medical supplies, staff travel (not own fleet) manufacture of fleet vehicles.

NHS Emissions Scope

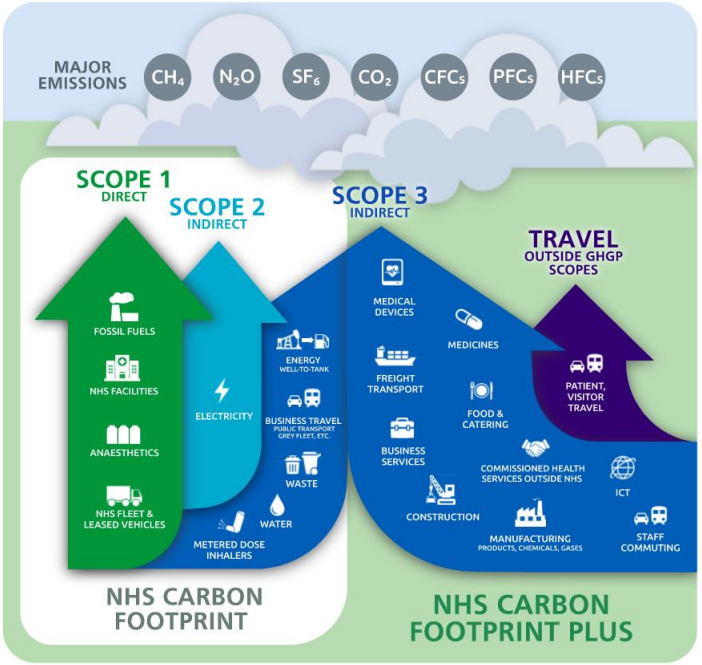
300 million appointments/year!

21 million prescriptions/year!

	Items/processes	Carbon Footprint (kgCO2e)
	Cataract operation	182
	GP in person appointment (including prescribing)	66
	Ventolin Inhaler	25
	Flu vaccine	1.7
	Salbutamol Easyhaler	1
	Omeprazole (1 month supply)	0.45
	Video call	0.20
	Email referral	0.0004

The table shows comparisons between different healthcare activities. Bear in mind that it is not just the carbon footprint of a single activity, but how many times it is repeated that matters. This means that small changes across a frequently occurring activity can produce big impacts if scaled up across services. Click the YouTube video below to find out more:

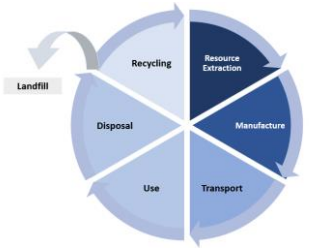
Healthcare Carbon Footprint



Measuring a Carbon Footprint

The quickest and easiest way to create a carbon footprint for an organization or service is to use a top-down approach. This is based on existing data about quantities of energy, water, items etc consumed. Financial data is often the most complete for this purpose. The carbon footprint is generated by multiplying the amount used by the emissions factors for those items or services.

Although less time consuming, this lacks the accuracy required to see progress in some areas where similar products are grouped together, without facility to distinguish lower and higher emissions choices. A good example is pharmaceuticals. Currently, there is a flat emissions factor based on price. Given the huge variation in drug prices, which bear no relationship to the emissions required to manufacture, package, use and dispose of them, this is clearly inaccurate and masks any sustainable changes made, beyond simple reductions in prescribing.



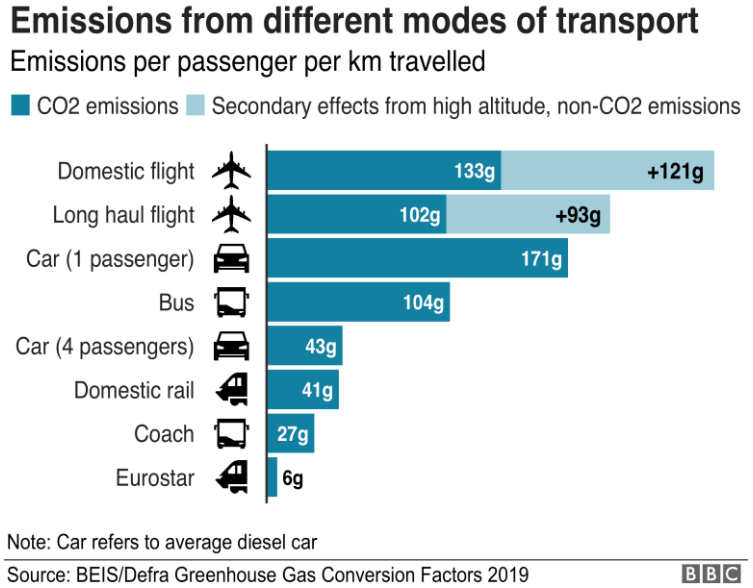
A bottom-up approach requires identifying all resources (materials, energy, transport) used in a particular pathway or to produce an item and applies emissions factors to each of these. For example one item might include bits of metal, plastic, glass etc. A bottom-up approach would involve obtaining the weight of each ingredient, getting emissions factors for the manufacture of each one, then adding manufacture and disposal of the item itself, plus the same for any packaging.

Information Sources

In practice most organisations use a top-down approach, with some bottom-up data where this exists for specific items. You can sometimes get this from the manufacturer, from searching the literature or asking on one of our networks. Useful sources include:

Travel:

- Journey emissions comparisons: GOV.UK – gives comparisons of different modes of transport / distance.
- Health Outcomes of Travel Tool - coverts distance to emission and QALYs.



Information Sources

Healthcare activity:

- Sustainable Healthcare Pathways Calculator - gives the average carbon footprint for different healthcare activities e.g. GP or outpatient appointment.

General practice (and any small business e.g. a dental or vet practice)

- Carbon Calculator (gpcarbon.org) – free online tool for measuring the non-clinical aspects of a general practice

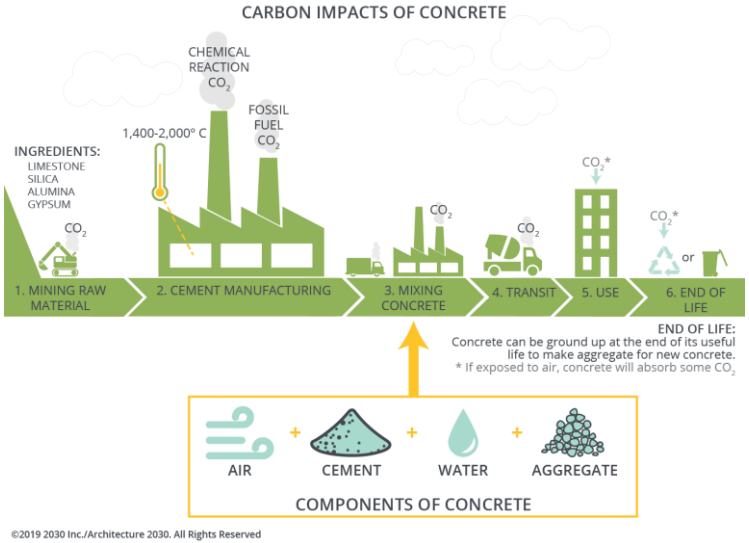
Information Sources

Materials

- The BEIS database - this is best for energy, transport and water. It contains a limited number of materials.
- The ICE database – developed by the University of Bath and Circular Ecology this is useful for finding materials (e.g. constituents of a medical device) for bottom-up measurement.

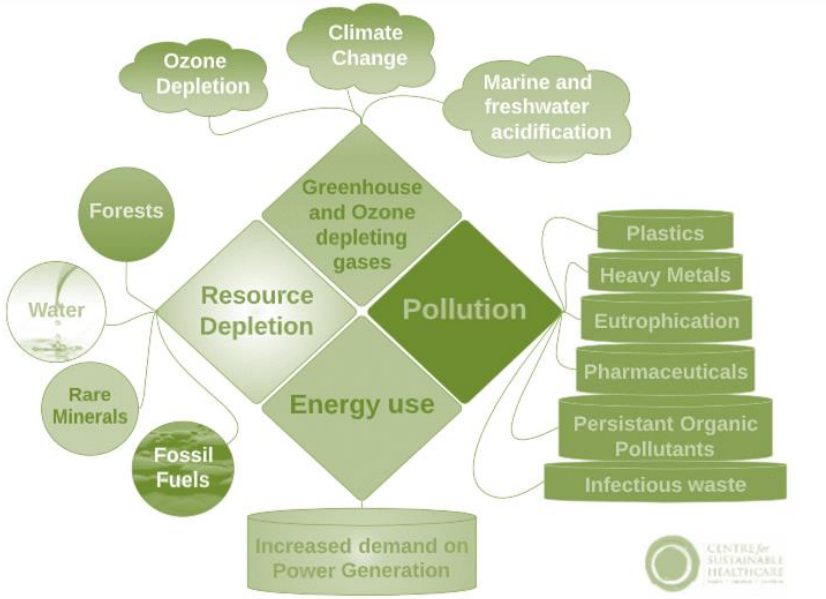
Once you have the GHG emission factors the carbon footprint can be estimated as below:

To find out more about how to calculate a carbon footprint see the resources at https://www.susqi.org, consider booking on to the CSH Carbon Foot printing course.



Wider Environmental Impacts

The range of environmental impacts of consumption and waste, goes far beyond greenhouse gas emissions as the graphic below shows



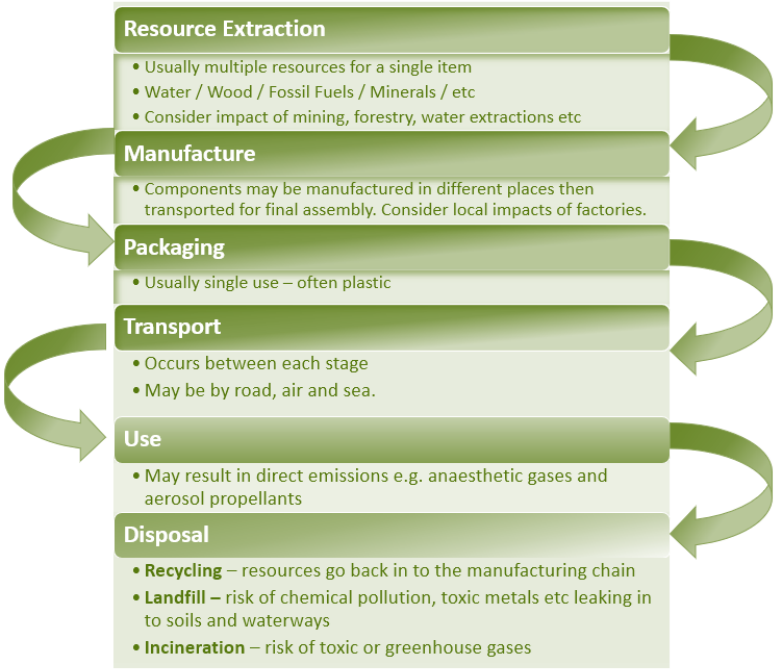
Resources:

- Toxic Pollutants from Plastic Waste- A Review
- Heavy Metals Toxicity and the Environment - PMC (nih.gov)
- What Is Eutrophication? Causes, Effects, and More (theearthproject.com)
- The problem of pharmaceutical pollution - EEB - The European Environmental Bureau
- Persistent Organic Pollutants: A Global Issue, A Global Response | US EPA
- Environmental Health (Everything You Need To Know) – HSEWatch
- Acidification - an overview | ScienceDirect Topics

Wider Environmental Impacts

Looking at all these factors is a complex task and hence more likely to be used in academic research than a local project. A commonly used and standardized approach to lifecycle methodology is ReCiPe 2016.

The principles of Life Cycle Assessment (LCA)

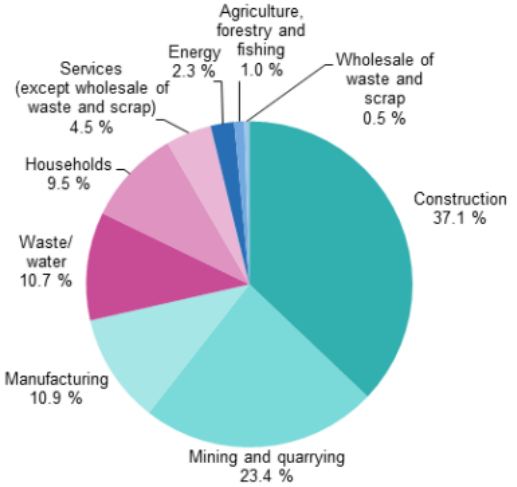


Other Commonly Used Metrics for Environmental Impact

Achieving sustainability

To achieve the level of change, at the pace required, good information is needed about the environmental impact of different care pathways, so that we can make informed decisions on service configuration based on the triple bottom line. This requires high quality assessments to be shared to increase the bank of activities and items that we know the 'carbon cost' of. The integration of carbon footprint or life cycle analysis into health technology appraisal is being considered by NICE and would be a welcome development.

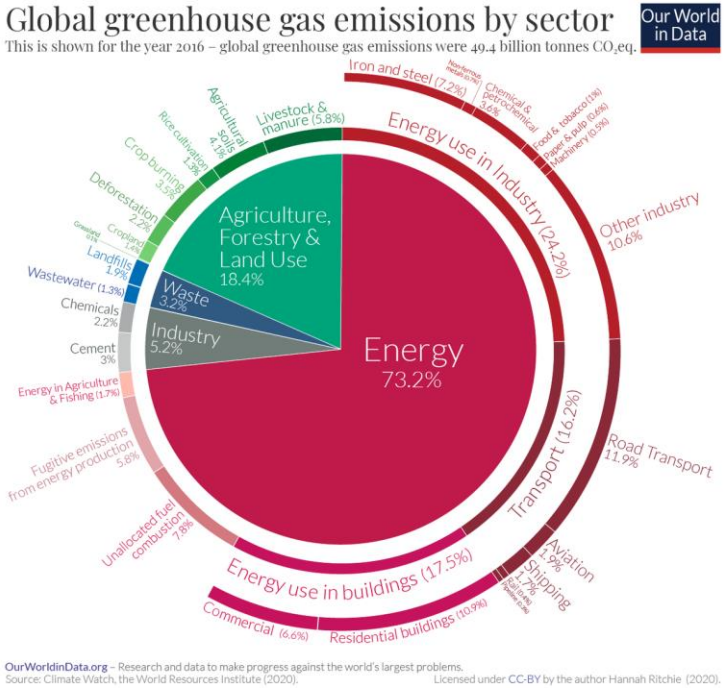
Waste generation by economic activities and households, EU, 2020
(% share of total waste)



Source: Eurostat (online data code: env_wasgen) eurostat

Commonly Used Metrics for Environmental Impact

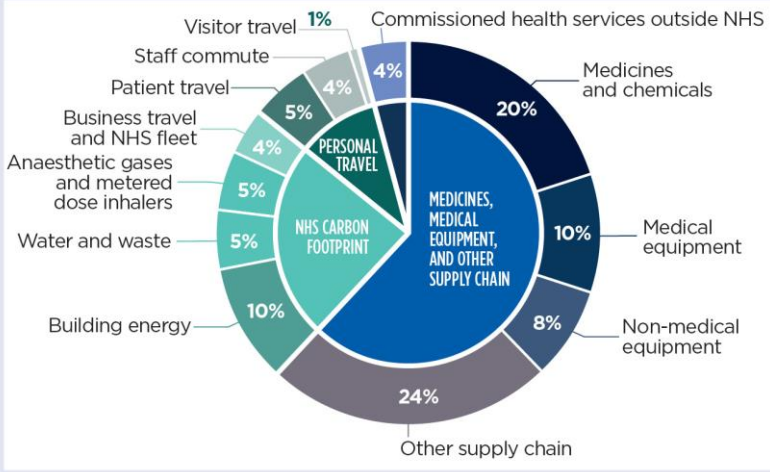
- Waste tonnage per type
- Air quality measurement
- Water usage
- Concentration of pollutants in water



Examples of Lifecycle Assessment in Medicine & Dentistry

- Human health benefit and burden of the schizophrenia health care pathway in Belgium: paliperidone palmitate long-acting injections (nih.gov)
- Incorporating sustainability into assessment of oral health interventions.
- Combining evidence-based healthcare with environmental sustainability: using the toothbrush as a model
- Environmental impact of PPE

Fig 1. **Source of carbon emissions**



Source: NHS England and NHS Improvement (2020)