



Identifying High Greenhouse Gas Intensity Procured Items for the NHS in England

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Sustainable Development Unit

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SUMMARY

The greenhouse gas (GHG) emissions associated with the procurement of goods and services account for a significant proportion of the climate change impact of global health and social care. However, little is known as to which products should be prioritised for investigation and which products offer reduction opportunities, as the most significant contributors to this impact; based on the scale and intensity of their contribution. Pharmaceuticals, which make the largest contribution to total GHG emissions from health and social care procurement, have been investigated separately. A priority list of prescription items for further investigation can be found in a separate report ⁽¹⁾.

This report focuses on identifying the likely priorities amongst those groups of items procured through a focused number of NHS procurement routes. Once these items have been identified, targeted measures can be implemented as a next step.

Data to support this analysis have been sourced from NHS procurement routes. These data describe the items procured through these routes from August 2014 to July 2015 and capture in the region of £1.5 billion of NHS expenditure.

From the dataset obtained, it was possible to screen the data in a number of ways in order to identify the priority group items for further investigation. Expenditure and mass were used as initial indicators, with further refinement based on the GHG intensities of the materials of which the items are constituted.

The following priority group items were identified for action. They are anticipated to account for more than 70% of the overall footprint of the suppliers procured items in terms of expenditures and carbon footprint.

⁽¹⁾ NHS, Identifying High Greenhouse Gas Intensity Prescription Items for NHS in England, published in February 2014

Priority List Identified for Further Investigation (in Alphabetical Order)

Medical devices	Food and catering
Blood sample tubes	Baby feeding products
Catheters, tubing and drains	Beverages
Clinical waste containers	Tableware and light equipment
Clothes, caps, masks & overshoes	Confectionery
CO monitors and spirometers	Food
Crutches, walking sticks and frames	
Disposable incontinence	
Disposable medical holloware	
Bandages, dressings & gauzes	
Drapes	
Electrode gel	
Examination gloves	
Hearing aids	
Medical packs	
Medical pulp products	
Needle-free connection systems	
Patient assessment electronic devices	
Polythene aprons	
Single use surgical instruments	
Syringes & needles	

A route map to explore the reduction opportunities associated with the sourcing of low carbon supplies might include introducing credits in the NHS supplier database to incentivize product manufacturers to investigate and report the environmental footprint of their products. Concurrently, reductions should be made in the way these items are used to reduce wastage and to improve efficiency, without compromising clinical outcomes.

This assessment has been undertaken to provide an initial indication of the most significant contributions of items procured by the NHS to its carbon footprint. It is anticipated that this will be further refined and extended to include large and expensive medical devices and other items not managed through the analysed route. This would allow further analysis of their contribution to the GHG emissions estimated for the health and care sector in England.

Since the Climate Change Act was passed in 2008, the move towards a more sustainable health and care system has been supported by the development of a carbon footprint for the health and care sector in England. The latest update estimates the greenhouse gas (GHG) emissions associated with the health and social care in England to be 26.6 Mt CO_{2e} in 2015 ⁽¹⁾.

GHG emissions embedded in purchased goods and services account for a significant proportion of the climate change impact of global healthcare, representing 15.2 Mt CO_{2e} (57%) of the total footprint of the NHS. Of this, 3.6 MtCO_{2e} (14%) is attributable to pharmaceuticals.

A limitation of this assessment is that the carbon footprint estimate for those goods purchased by the NHS in England does not distinguish between the many thousands of items procured ⁽²⁾ within the different categories. As a result, one cannot identify clearly which of these items make the most significant contributions to the footprint.

For rapid and cost-effective reductions to be achieved, it is necessary to prioritise the top contributors to GHG emissions, to appraise where in the value chain (eg manufacturing, use, disposal, etc.) those emissions principally occur (ie identifying 'hotspots') and to identify reduction opportunities.

This report presents an assessment of goods purchased by hospitals through established procurement routes including medical devices (but excluding large and expensive equipment such as CT scanners), food and catering, manufactured fuels, chemicals and gases and paper products. Pharmaceuticals have been assessed separately and a priority list of prescription items that need to be further investigated can be found in a separate report ⁽³⁾.

⁽¹⁾ Carbon Footprint update for the health and care sector in England 2015, published in January 2016

⁽²⁾ GHG emission contribution is a function of life cycle GHG intensity through manufacture to use and disposal per item multiplied by the number of items purchased

⁽³⁾ NHS, Identifying High Greenhouse Gas Intensity Prescription Items for NHS in England, published in February 2014

2.1 *PROCUREMENT DATA OBTAINED FROM THE NHS*

There are a variety of procurement routes for the NHS: National Framework Agreements; Regional Framework Agreements; and local trust contracts. The benefit of Framework Agreements is to improve the usage of the NHS's national contracts for the purchase and supply of consumables and medical and surgical products. This has been with a view to maximise the efficiencies and savings opportunities for the NHS in UK. In 2015, a total of £9.6 billion was spent on procurement for the whole of the NHS. Much of this was through framework agreements.

It was not possible to obtain the expenditure data for individual NHS trusts.

As a result, the scope of the present study addresses £1.5 billion procured. This is a significant sample and the study will identify some of the major contributors to the overall NHS carbon footprint, as well as providing an indication of other items from the proportion of expenditure not covered by the sample that are likely to make a significant contribution to the footprint.

The dataset includes a large variety of items: from clinical consumables to food and catering products, including stationery and office equipment.

Within the dataset, relevant information associated with each individual item includes the item description, the total quantity purchased (unit) and total expenditure (£).

The data describe over 125,000 individual items supplied into the NHS

2.2 *PRIORITISATION*

2.2.1 *Method*

From an inventory of procured items, it is possible to screen the data in a number of ways to identify the key items with the most significant impact.

Mass and price are often used as indicators of environmental impact and as a mechanism for prioritisation. However, this can present uncertainty, in that there are examples where mass, price and life cycle GHG emissions do not correlate closely. For example, a 100 g thermometer has a carbon footprint 100 times greater than 10 pairs of latex gloves, each glove weighing 5 g.

A list of the top contributors by price is easily determined from the data obtained from the NHS. To develop a priority list based upon total mass of items and GHG estimates, the following method has been used.

1. For each item, a weight range and the main material of which it is made have been estimated.
2. Depending on the estimated weight range, an average weight is then used to calculate the total mass of each item. For example, an 'examination glove' is estimated to be in the range of '<10g' and therefore the total quantity of gloves is multiplied by 5 g to obtain an estimate of the total mass of product.
3. Material categories defined in the study include plastic, metal and paper, but also describe more complex systems like electronics. From these, generic GHG intensities (kg CO₂e/kg material) have been determined through reference to the ecoinvent database ⁽¹⁾ and multiplied by the total mass estimated above to obtain an estimate of CO₂ emissions associated with each item.

2.2.2 *Data handling*

Given the size of the dataset, the following approach has been used to determine the mass of each item.

Where categories of items could easily be identified based on item description (eg description containing the word 'gloves' or 'needles'), it has been assumed all of the items within the category were of the same mass range. This range was determined after checking the actual mass of several products from the category. The mass of products were estimated using:

1. item descriptions from analysed information (eg 'Needle biopsy bone marrow 16g x 70mm (2 3/4 inch)'); and
2. additional information available on these items in the public domain.

Where there were no data available in these sources, but where dimensions were given in the description, this information was used to estimate crudely a weight using the density of the material of which the item was made. In the few cases where none of the methods above could be used, hypotheses based on comparison with similar products within the dataset were used to generate an estimated mass.

This procedure was iterated until every item within the product category was assigned a mass range.

An attempt was made to apply a GHG intensity figure to all of the 125,000 items. In order to do so, a similar approach to that used to determine mass was used to ascertain the main material of which each item was made.

For each of these material categories, a GHG intensity figure was determined using the ecoinvent database (e.g. the GHG intensity for the generic metal

⁽¹⁾ <http://www.ecoinvent.org>

category has been assumed on the basis of the ecoinvent module describing 'Steel, chromium steel 18/8'). Where a good proxy for GHG intensity was not available in ecoinvent, data from relevant literature references were used instead.

Due to the scale and complexity of the dataset, quality checks were made on those individual items identified by the mass and GHG intensity estimates as being most significant within each product category to ensure that their weight and material were categorised appropriately.

3.1 SUPPLIERS CARBON FOOTPRINT BREAKDOWN

Using the categories employed in the Health and Social Care Carbon Footprint 2015 report ⁽¹⁾, as well as an additional 'Office Products' category, the contribution of each category to the carbon footprint of the suppliers is illustrated below, followed by their respective contributions to total expenditures and weight.

Figure 3.1 Suppliers Carbon Footprint by Category of Purchased Good

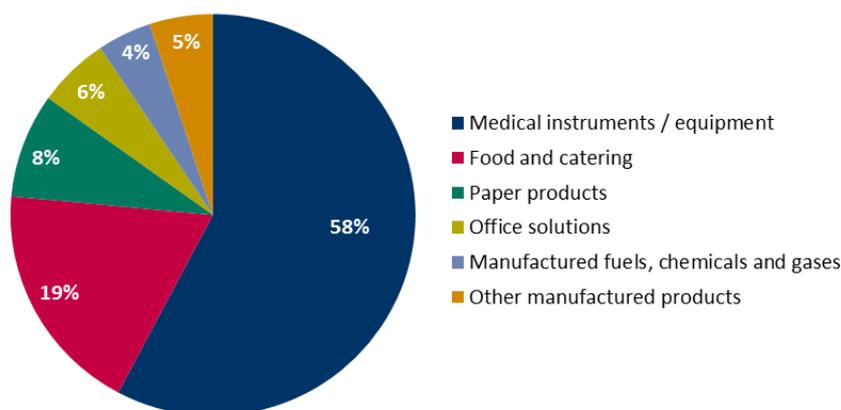


Table 3.1 Suppliers Expenditures, Weight and Carbon Footprint by Category of Purchased Good

Category	Total expenditure (Million £)	Percentage of exp.	Total weight (tonnes)	Weight percentage	Total GHG estimate (tonnes CO ₂ e)	GHG percentage
Medical instruments / equipment	1,288	85%	110,290	54%	300,512	58%
Food and catering	48	3%	26,332	13%	97,492	19%
Paper products	48	3%	39,748	19%	43,723	8%
Office products	36	2%	6,324	3%	29,854	6%
Manufactured fuels, chemicals and gases ⁽²⁾	57	4%	9,508	5%	22,538	4%
Other manufactured products	45	3%	11,673	6%	26,289	5%

Medical devices are by far the most significant items associated with the suppliers procurement in terms of cost, volume and GHG impact. This

⁽¹⁾ Health and Social Care procurement carbon footprint results include the following categories: 'Pharmaceuticals'; 'Medical Instruments /equipment'; 'Business services'; 'Food and catering'; 'Freight transport'; 'Paper products'; 'Manufactured fuels, chemicals and gases'; 'Construction'; 'Other manufactured products'; 'Waste products and recycling'; 'Information and communication technologies'; and 'Water and sanitation'. Some categories are not represented in the expenditure data we assessed.

⁽²⁾ Includes only chemicals for items procured through the data assessed (no fuels, nor gases)

category represents 85% of total expenditures and more than 50% in terms of mass and GHG emissions. Food and catering products are the second largest category contributing to the carbon footprint, with 19% of GHG emissions and only 3% of sales. Paper products come third, although they account for 19% of total weight. The remaining 15% of GHG emissions are shared between the three other categories, together representing less than 10% in terms of sales volume and 15% in terms of weight.

These results show that mass, price and life cycle GHG emissions do not correlate and that prioritisation using mass or price only should be undertaken with caution.

3.2 *TOP CONTRIBUTORS*

3.2.1 *Medical instruments and equipment*

Given the importance of the contribution of medical devices to the carbon footprint, this report focuses on the analysis and identification of the top contributors in this category.

The top 20 medical instruments and equipment identified are presented in the following table. Together, these 20 item groups in the assessed sample represent: 30% of items procured in terms of expenditures; over 60% of the carbon footprint associated with medical devices; and 35% of the carbon footprint of items purchased through the framework procurement route.

Table 3.2 *Top 20 Contributors - Medical Instruments and Equipment (In Alphabetical Order)*

Item groups	
Blood sample tubes	
Catheters, tubing and drains	
Clinical waste containers	
Clothes, caps, masks & overshoes	
Disposable incontinence	
Disposable medical holloware	
Bandages, dressings & gauzes	
Drapes	
Electrode gel	Single-use devices
Examination gloves	
Medical packs	
Medical pulp products	
Needle free connection systems	
Polythene aprons	
Single use surgical instruments	
Syringes & needles	
CO monitors and spirometers	
Crutches, walking sticks and frames	Products made of carbon intensive material
Hearing aids	
Patient assessment electronic devices	

The significant majority of the items in this list are single-use devices. Most are made of a single or few materials that have low GHG intensities such as plastic or metal, as opposed to composite electronic devices. However, the large quantities of these products required in hospitals explain why they appear in this priority list.

Electronic devices such as thermometers and CO monitors that are commonly used in hospitals and that have a carbon-intensive production process also appear in the priority list above.

Crutches, walking sticks and frames are reusable, but are mainly made of aluminium, a light metal with a high GHG intensity. The use of recycled aluminium, which uses less natural resources and chemicals and requires less energy during manufacturing, has been assessed in the sensitivity analyses part of this report.

Interestingly, no implantable devices made of titanium or other material that might be expected to have a high carbon intensity appear to be a major contributor, as the masses involved are low compared to the products listed above.

3.2.2 *Non-medical items*

A list of the most carbon-intensive non-medical items commonly used in hospitals has been developed. This group of items represents less than 15% of total expenditures studied but accounts for nearly 40% of the total carbon footprint.

Table 3.3 *Top Contributors – Non-medical Items (in Alphabetical Order)*

Food and catering	Paper products	Office products	Manufactured fuels, chemicals and gases	Other manufactured products
Baby feeding products	Paper	Binders, files, folders	Cleaning chemicals	Mops
Beverages	Paper hygiene products	Cartridges & toners	Hand hygiene products	Personal care products
Tableware and light equipment		Office electronics	Instrument disinfectants	Pillow and mattress covers
Confectionery		Paper clips & treasury tags	Pharmacy products	Wipes
Food		Staples		

Food and catering

Food and catering represents 19% of the GHG emissions associated with procurement studied, although it accounts for only 3% of the total sales volume. This category comprises food, responsible for nearly 70% of GHG emissions from this category, including confectionery (~10%) and beverages (~10%), as well as catering products, tableware and light equipment such as kettles, etc (~15%).

Paper products

For this category, two item groups can be distinguished: paper hygiene products such as couch roll or towel hand paper; and paper sheets for office use. Paper hygiene products contribute to procurement-related GHG emissions to a much larger extent than office paper, mainly because of the large quantities of products required for hygiene and infection prevention.

Office products

Items under the office solutions category are highly varied. The top contributors in this group are office electronics such as shredders or calculators, cartridges and toners, which are all GHG-intensive to produce and represent nearly half of the carbon footprint of this category. Stationery items which are used in large quantities, such as files and folders also make a significant contribution to supply chain emissions investigated.

Manufactured fuels, chemicals and gases

In this category, the products analysed consist of cleaning chemicals, instrument disinfectant or hand hygiene products, which are used in large quantities to control infection.

Other manufactured products

This category includes various items: from pillow and mattress covers to personal care products such as razors, toothbrushes, etc for patients, as well as mops, wipes and other domestic management items, once again used in large quantities.

3.3 SENSITIVITY OF RESULTS

Additional analyses were conducted to investigate whether the top contributors identified in the previous sections would become less significant, or if other heretofore unidentified items would appear in the priority list, if uncertain GHG intensity estimates were challenged.

In the case of very specific materials such as dental alloys, bone substitute and ceramic used for implantable devices (eg femoral head), no GHG intensity values have been found in the literature. For the purposes of the study, ERM has assumed that these materials have a GHG intensity similar to titanium alloy. This hypothesis seems to be acceptable for a preliminary screening, as the GHG intensity of dental alloys would have to be 5 times higher before this group becomes significant. For implantable devices, GHG estimates would have to even higher still before these devices start to appear on the priority list.

To the contrary, using only recycled aluminium, which reduces the use of natural resources and chemicals and requires less energy to manufacture than

primary aluminium, thus reducing GHG intensity by four, would not see crutches and similar items removed from the top 20 medical instruments and equipment items.

Although the order of the GHG impact list may change as a result of variation to the GHG emission factor estimates used, it is likely that the top contributors identified above broadly cover the most significant item groups procured through the routes assessed.

The purpose of this report was to prioritise item groups from amongst the thousands of items procured through a number of routes assessed. This will facilitate further investigation into those which make the most significant contribution to the supply chain carbon footprint of the NHS and help identify opportunities for GHG reduction. The top item groups identified for action are listed in the following table.

Table 4.1 *Suggested Priority List Identified for Further Investigation (in Alphabetical Order)*

Medical devices	Food and catering
Blood sample tubes	Baby feeding products
Catheters, tubing and drains	Beverages
Clinical waste containers	Tableware and light equipment
Clothes, caps, masks & overshoes	Confectionery
CO monitors and spirometers	Food
Crutches, walking sticks and frames	
Disposable incontinence	
Disposable medical holloware	
Bandages, dressings & gauzes	
Drapes	
Electrode gel	
Examination gloves	
Hearing aids	
Medical packs	
Medical pulp products	
Needlefree connection systems	
Patient assessment electronic devices	
Polythene aprons	
Single use surgical instruments	
Syringes & needles	

ERM recommends that this priority list is used to investigate inefficiency in the use of these items (eg spoilage prior to use by date, spoilage because of packaging sizes, poor labelling, etc) and to assess whether it is possible to reduce the quantity of product purchased without compromising clinical outcomes.

Concurrently, sourcing of low carbon alternatives should be promoted. This could be achieved by introducing credits in the NHS supplier database to incentivize product manufacturers to investigate and report the environmental footprints of their products, similar to the Environmental Product Declarations (EPD) used for building products under the LEED certification scheme ⁽¹⁾.

⁽¹⁾ <http://leed.usgbc.org/leed.html>

Finally, we recommend that the scope of the study is further refined and extended to include large and expensive medical devices such as scanners and those items not procured through the routes we assessed. This will lead to a more fully representative characterisation of NHS England procurement-related GHG emissions and allow efficient reduction measures to be identified more efficiently.