Scottish (Managed) Sustainable Health Network (SMaSH)

Report

Scope 3 emissions in the health sector: the case for action

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Preface

When SMaSH – the Scottish (Managed) Sustainable Network – was created, one of the key challenges which we set ourselves was to "get to grips" with how we could reduce "scope 3" greenhouse gas emissions. Our first exploration of the field, reviewed the availability of routine data concerning greenhouse gas emissions and energy use in the Scottish health sector.[a] This concluded that action was needed to improve data quality and completeness. But that begged a question: once we get better data, what sort of things can be done to reduce the scope 3 emissions?

In other words becoming better able to quantify the problem is good; but what about ways of addressing the problems identified?

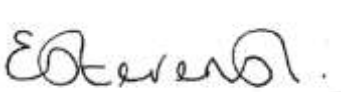
This new SMaSH report is a first step in answering that question. The report looks at the ways in which the health sector in Scotland is already seeking to reduce scope 3 emissions, and provides insight into what more we could be doing.

For those already engaged with this work, we hope you can draw on the contents of the report to help in providing the sort of evidence base that policy and decision makers seek to justify more concerted action. For all those in the public sector – we hope that it can help you think more creatively in planning how to help meet the challenges to the health system which will be the consequence of global warming and its impact on climate.

We are grateful to Joanna Teuton from NHS Health Scotland who undertook this work on behalf of SMaSH, supported by Julie Arnot from the NHS Health Scotland Knowledge Service. We acknowledge that without the professional support and expert advice from National Services Scotland colleagues Kate Dapre, Wendy Rayner, and Caitlyn Hamlett (Health Facilities Scotland) and Paul Hornby (National Procurement) we would have not got very far: to all of them, our thanks.

Now, all that remains is to make it happen.

Phil Mackie
Co-Chair, SMaSH



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[a] See: https://www.scotphn.net/wp-content/uploads/2015/10/2013_03_14-SMaSH-Greenhouse-gas-emission-and-energy-use-in-Scotland_Briefing-paper.pdf

1. Introduction

There is unequivocal evidence that global warming is happening and that this is largely the result of human activity. The resulting climate change is manifested in increased temperatures, changing patterns of precipitation and an increase in extreme weather events.[1] This has wide ranging implications for environmental sustainability and will have an impact on the health and wellbeing of current and future generations.

In Scotland there is already evidence of increased temperatures and annual rainfall.[2] The Climate Change Risk Assessment for Scotland in 2017 indicated that extreme weather events, flooding and sea level rises are potentially the greatest threats to population health and wellbeing both directly and through the impact on health and social care delivery.

The Paris Agreement, signed in December 2015, committed the world to limiting global temperature rise to below 2^{o}c above pre-industrial levels and where possible to take additional measures to limit this to no more than a 1.5^{o}c rise.[3] To achieve this concerted action to reduce greenhouse gas emissions is needed. In Scotland clear and ambitious targets to reduce greenhouse gas (GHG) emissions, known as climate change mitigation, are set by the Scottish Government and plans for meeting targets are published.[b]

Whilst carbon dioxide is the most commonly referred to GHG, others include methane, nitrous oxide, water vapour and ozone. The **Greenhouse Gas (GHG)** Protocol defines GHG emissions and sets the global standard for how to measure, manage, and report GHGs.[4] GHGs are classified as either **Direct GHG emissions**, those which come from sources owned or controlled by the reporting entity, or **Indirect GHG emissions** those which are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. These emissions are further differentiated into 3 scopes (Box 1). These definitions and standards are accepted and used across sectors internationally.

In order to meet the Scottish Climate Change Mitigation targets action is needed across all major sectors as outlined in the draft Scottish Climate Change Plan (2017).[5] Listed public bodies, including most NHS Boards, have a statutory duty under Part 4 of the Climate Change (Scotland) Act 2009[6] to contribute to climate change mitigation as well as adapt to the impacts of a changing climate and act sustainably. In November 2015 secondary legislation under the Climate Change (Scotland) Act 2009 was passed requiring public bodies to report annually on compliance with climate change duties.[7] As part of this report, they must provide information about their corporate GHG emissions - the emissions produced by carrying out their activities or service provision.

[b] Details of Climate Change legislation and policy can we found at http://www.gov.scot/Topics/Environment/climatechange

This should include emissions measured and reported in accordance with Scopes 1 and 2 and, to the extent applicable, selected Scope 3 of the Greenhouse Gas Protocol. Grid electricity – both transmission and distribution losses – are currently required as a minimum for Scope 3 emissions though public bodies are encouraged to include water and sanitation, business travel by car, organisational waste and business travel by public transport (Appendix 1).

Box 1: Classification of GHG Emissions

Scope 1:	All direct GHG emissions (e.g. emissions from combustion in *owned or controlled* boilers, furnaces and vehicles).
Scope 2:	Indirect GHG emissions from consumption of purchased electricity, heat, steam and cooling for own use (energy indirect).
Scope 3:	Other indirect emissions, such as the extraction and production of purchased materials, consumables and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. transmission and distribution losses) not covered in Scope 2, outsourced activities, waste disposal etc. (NB Transport related activity includes official business travel relating to that directly paid for by an organisation. Does not include business travel recharged by contractors.)

Substantial work is underway in the health sector to reduce carbon emissions and significant progress has been made on reducing energy-based emissions and energy consumption (Scope 1 and 2 emissions). Data reported under the HEAT Target (Phase 2) shows that between 2009/10 and 2014/15 NHS Boards achieved a 5.95% reduction in CO_2 emission and a 4.62% reduction in energy consumption.[8] The recent report by the Sustainable Scotland Network (SSN) on Scottish Public Bodies Climate Change Reporting 2015/16 indicated that many of the current initiatives in the health sector are focused on reducing Scope 1 emissions (for example, converting oil fuelled boilers to more efficient gas fuelled boilers) and Scope 2 emissions resulting from electricity consumption (for example, lighting upgrades within estates).[9] There is less reporting of Scope 3 emissions. This is, in part, because of the limited reporting requirements, but also because Scope 3 emissions are less well understood, are more challenging to quantify and monitor, and methodologies to do this are still being developed.

2. Aim

This paper outlines the case for taking action to reduce Scope 3 emissions in the health sector. More specifically it aims to:

- raise awareness of Scope 3 GHG emissions in the health sector, in particular those associated with procurement of goods and services;
- outline the principles and benefits of low carbon procurement; and
- highlight approaches used in the health sector to calculate and monitor Scope 3 emissions.

The specific focus of this report is on the procurement of pharmaceuticals and medical devices within the NHS in Scotland. These items are a significant source of Scope 3 emissions in the health sector. Furthermore, the usage level for these products, the associated expenditure, and numbers of staff involved in using them, means that there are potentially additional benefits in terms of cost savings and improved carbon literacy amongst the workforce. A review of the published research, undertaken in 2016, has informed the paper (Appendix 2) and case studies are used to illustrate actions that have been taken within the health sector to understand and reduce Scope 3 GHG emissions associated with procurement of these item groups.

Procurement of medical devices and pharmaceuticals are, however, only two areas where Scope 3 GHG emissions can be reduced and costs saved. Other areas include procurement of non-medical goods and services, cold-chain logistics, patient and visitor travel, and distribution and waste management. The research and ideas from this report also apply to these areas and opportunity for action exists.

3. How do Scope 3 emissions contribute to the Health Service Carbon Footprint?

An organisation's carbon footprint is the total GHG emissions of the organisation and should include all relevant Scope 1, 2 and 3 emissions. The footprint is expressed as tonnes of carbon dioxide equivalent (tCO_2e)[c]. Carbon footprints are helpful in providing an indication of the corporate GHG emissions and importantly the relative contribution of the different Scopes of emissions. This information allows an organisation to review and change the way in which it operates to reduce their footprint. The accuracy of the carbon footprint reported is dependent on the quality of data, the assumptions made and the methodology used to make the calculation.

Organisational carbon footprints for the health sector have been calculated in Scotland[10] England[11 12 13] and the USA[14 15]. Most of the studies use a hybrid approach to calculate the carbon footprint. This approach combines bottom up models (using direct measures of fuel and electricity consumption to calculate Scope 1 and 2 emissions) and top down models (using indirect measures such as expenditure data and extended environmental input-output (EEIO) conversion factors) to calculate Scope 3 emissions. Further information about methods for calculating carbon footprints and the limitations of the methodologies commonly used to calculate NHS carbon footprints are discussed in section 6.

In the course of delivering services, the health sector contributes significant amounts of direct and indirect GHG emissions.[16 17] This includes:

- Scope 1 emissions: generated from gas, oil, coal or other fuels burnt in boilers; emissions from company owned vehicles such as fleet and NHS patient transport services and incinerators owned and operated by the organisation;
- Scope 2 emissions: generated from the consumption of purchased energy such as electricity for use in buildings or other health service assets); and
- Scope 3 emissions: generated in the production of materials used for building and healthcare infrastructure, the procurement of goods and services used in the delivery of health services, patient, visitor and staff travel (where the vehicle is not owned or leased by the health service).

National carbon footprint studies of the health and social care sector in the UK have tended to include emissions generated directly through burning gas, coal and oil and through NHS Fleet travel (Scope 1); electricity and district heat use (Scope 2); and, procurement and patient, visitor and staff travel (Scope 3). Recent estimates of the carbon footprint of the NHS in England and Scotland, reported below, suggest that the

[c] Carbon dioxide equivalent takes into account the emissions from the six major greenhouse gases, including carbon dioxide, methane and nitrous oxide.

health sector contributes about 3% of national GHG emissions. Estimates for 2012 indicated that the NHS, public health and the social care system in England emitted around 32 mega tonnes of carbon dioxide equivalent ($MtCO_2e$).[d] This represented over one third (38%) of public sector emissions (79 $MtCO_2e$) and 3.6% of total consumption emissions (823 $MtCO_2e$) in England for that year[18]. More recent estimates are lower. In 2015 the carbon footprint of the health and care sector in England was estimated to be 26.6 $MtCO_2e$[19], of which 22.8$MtCO_2e$[20] was attributed to the NHS. The reduction in carbon footprint may in part be due to reductions in emission, however, it may also be an artefact of the methodology and revisions made to the calculation method. The estimated emissions for NHS Scotland, based on 2004 data, were 2.63$MtCO_2e$. This represented 3.6% of Scotland's total footprint and 23% of public sector emissions[e] [21].

Evidence from a range of organisations suggests that Scope 3 emissions are often the largest contributor to an organisational carbon footprint.[22] This finding is also reflected in those studies in the health sector which have included elements of all three Scopes of emissions. Scope 3 emissions, particularly from procurement of goods and services, are consistently found to make a substantial contribution to the organisation footprint[23] [24]. Data for the health and care sector in England in 2015 indicated that emissions embedded in goods and services procured by the NHS contributed 15.2$MtCO_2e$, 57% of the health and social care sector carbon foot print. By comparison, travel by patients, visitors and staff as well as business travel contributed 13% (3.5$MtCO_2e$)[f].[25] Carbon footprint calculations of single services or care pathways such as ambulance services[26] [27], renal services[28] [29] [30], surgery[31] [32] and dentistry[33] also suggest that Scope 3 emissions associated with procurement contribute significantly to the overall footprint.

The relatively high contribution of Scope 3 emissions associated with procurement of goods and services to the NHS carbon footprint, would suggest that action to reduce these emissions is an important part of Health Board climate change mitigation strategies.

[d] $MtCO_2$ is the standard international unit of measurement for reporting GHG emissions. A megatonne is a million metric tonnes.

[e] This report is now considered out-of-date and HFS has concerns about the methodology used to determine Scope 3 emissions, especially for the monitoring of trends (many noted by the report itself). However, it remains the only document in the public domain thus far that has attempted to quantify a total carbon footprint for NHS Scotland and remains a useful overview.

[f] Travel represents a combination of Scope 1 and Scope 3 emissions. Where travel is undertaken in vehicles owned or leased by the NHS they are Scope 1 emissions whilst travel undertaken by patients, visitors and staff in their own vehicles is classified as Scope 3.

4. What are the additional benefits of climate change mitigation actions in the health sector?

Climate change mitigation in the health sector has an important role to play in preventing ill-health, improving health outcomes, and reducing costs as well as reducing the carbon footprint. A healthy, pollution free environment is important in preventing ill-health as well as creating and maintaining good health amongst the Scottish population. Considerable work has been and continues to be undertaken by NHS Scotland to create sustainable and healthy environments. However, as the largest employer in Scotland with a significant estate and a budget of over £2bn to procure goods and services, NHS Scotland emits a significant amount of GHGs in delivering services.[34] These GHGs and other environmental pollutants, produced mainly through the burning of fossil fuels, contribute to the national burden of disease both indirectly through their role in climate change and directly through their impacts on health and wellbeing.[35] Reducing the carbon footprint of the NHS will further contribute to work in NHS Scotland to create healthy, pollution free environments which promote better health for the population of Scotland.

Actions to reduce Scope 3 emissions in the health sector can also contribute to financial savings. Research undertaken as part of the NHS sustainability programme in England using Marginal Abatement Cost Curves (MACC)[g] suggests that a range of interventions, including procurement, public health and models of care, can save money and carbon as well as provide health benefits.[36] Procurement is an area of particular interest as it accounts for a significant amount of expenditure in NHS Scotland. In 2015/16 approximately £2.bn, 25% of the total budget, was spent on the procurement of goods.[37]

There is also an emerging body of research examining the carbon cost of different treatment modes and care pathways. For example, a preliminary study modelled the financial and carbon costs of two interventions for gastro oesophageal reflux. Whilst both interventions had similar clinical outcomes they had differential financial and carbon savings over the longer term.[38] The inclusion of environmental sustainability, alongside clinical outcomes and cost, can potentially be used by decisions makers to identify care pathways which maximise cost and carbon saving whilst maintaining clinical outcomes. A more consistent approach to assessing and integrating environmental sustainability into decision making about care pathways is discussed further in section 6.3.

Embedding the principles of climate change mitigation and low carbon procurement in NHS Scotland can help increase awareness of the need to reduce GHG emissions

[g] A marginal abatement cost curve (MACC) is a way of presenting low carbon options as alternatives to business as usual economic activity. It can be used to give a brief overview of potential and costs for low carbon technology across the economy or for a specific sector.

across the workforce. Given the large workforce of the NHS, this has the potential to reinforce sustainable health behaviours amongst significant numbers of people.

5. Procurement hotspots – where can we best focus our efforts?

Identifying goods and services within the health sector which produce high levels of GHG emissions during their life cycle (manufacture, use and disposal) helps inform where action should be focused and where the most significant savings can be made. The available evidence suggests that pharmaceutical products and medical devices account for a large proportion of the NHS carbon footprint. Whilst figures vary from year to year, this finding is relatively consistent over time and across services. Estimates from NHS England in 2012 suggests that pharmaceuticals contributed 4.4MtCO_2e (22%) and medical instruments 2.6MTCO_2e (13%) to total carbon footprint[39]. A later study (2015) estimated that the GHG emissions from procurement in the NHS in England were 13.3MtCO_2e, of which 3.5MtCO_2e (26%) were from pharmaceuticals.[40] A more detailed analysis of 80% of prescription items procured by NHS England in 2011 estimated that 5.9MtCO_2e were generated from these items - approximately 0.55kg/CO_2e/£. When applied to the total budget for prescription items for 2011 this was estimated to be approximately 7.3 MTCO_2e[41].

The relative contribution of pharmaceuticals and medical devices to the carbon footprint varies across services. Analysis of the data from NHS England in 2012 estimated that 79% of the pharmaceutical emissions came from primary care whilst 13% came from the acute services and mental health services respectively. In contrast, 75% of medical devices emissions were from the acute sector.[42] Studies of individual services have shown similar differences. In renal services in Dorset, procurement accounted for about 70% of the carbon footprint, of which pharmaceuticals were 34.71% and medical equipment around 25%.[43] In contrast, a study calculating the carbon footprint of cataract surgery estimated that medical equipment contributed 32.6% to the carbon footprint and pharmaceuticals 18%.[44]

Work, supported by the NHS England Sustainable Development Unit (SDU), is being taken forward in conjunction with health product manufacturers and suppliers to identify and prioritise pharmaceuticals and other procured items which are most GHG intensive. The findings will then inform strategies to reduce GHG emissions in the supply chain of these products. The research prioritised prescription items in a number of ways including cost, quantity of the Active Pharmaceutical Ingredient (API) (often a significant component of the life cycle carbon footprint of pharmaceuticals) and GHG intensity. A priority list of 44 prescription items, including the top 20 items (British National Formulary (BNF) generic names) for cost, quantity of API and GHG estimates was developed. This was refined to the final top 20 items based on aggregating the ranking for cost, quantity and GHG estimates (Appendix 3). This list includes drugs for rheumatic disease and

gout, diabetes, epilepsy, lipid regulation as well as analgesics.[h] [45] Similar research was undertaken to identify and prioritise other high GHG intensity groups of items procured by the NHS.[i] [46] This research drew on data from the NHS National Procurement Framework Route which includes £1.5bn procured items out of a total procurement spend of £9.6bn. Prioritisation was based on the quantity of items purchased, the amount spent on items and the GHG intensity of the primary material used to make the items. Medical devices accounted for most of the expenditure (85%), half of the volume purchased and half of the GHG emissions from the items procured through this route. Many of the items groups which were prioritised were medical devices, however, non-medical devices, such as baby feeding products, beverages and tableware, and lighting equipment, were also prioritised. The list of the top 20 medical item groups includes: medical pulp products; clinical waste containers; crutches, walking sticks and frames; and CO monitors and spirometers. The suggested list of items prioritised for further investigation can be found in appendix 4. The 20 medical item groups accounted for *"30% of procured items in terms of expenditure, over 60% of the carbon footprint associated with medical devices; and 35% of the carbon footprint of items purchased through the procurement framework route"* [47]. The reason for item groups being high GHG intensive varies. For example, many of the single use items which were prioritised are made of single or few materials that are relatively low GHG intensity, however, because of the large quantities purchased and used in the NHS they contribute significantly to the overall carbon footprint[j]. In contrast although fewer electronic medical devices are likely to be purchased, the manufacture of these devices is complex and they are carbon intensive. Other items, such as walking aids, are relatively simple but are often made of high GHG intensive material such as aluminium.

[h] Prescription data was from the 2011 Prescription Cost Analysis (PCA) and the Hospital Prescribing England data sets and included only NICE approved pharmaceuticals. This accounted for £10.6bn, 80% of the total spend on prescription items in 2011.

[i] The procurement data includes items from 6 categories: medical instruments and equipment; food and catering products; paper products; office solutions; manufactured fuels chemicals and gases; and, other manufactured products.

[j] Not all single use devices (SUDs) are made of low GHG intensity materials. A number of SUDs are metal and have a relatively high carbon impact, in many cases equivalent to the manufacture of a similar re-usable product that it has displaced.

6. How to reduce Scope 3 emissions

"Low carbon procurement is the process whereby an organisation seeks to procure goods, services, works and utilities with a reduced carbon footprint throughout their life cycle and/or leading to the reduction of the overall organisation carbon foot print when considering its direct and indirect emissions" (p60) [47]

Low carbon procurement is an important mechanism for reducing the carbon footprint in the heath sector. It is a core part of the sustainability strand within the Procurement Reform (Scotland) Act 2014 and associated Regulations.[48] [49] The Act includes regulatory requirements to use sustainability measures in procurement and, clear guidance and tools have been developed to assess and address issues of environmental, financial and social sustainability.[50] [51] The NHS National Procurement Interim Strategy[52] includes a commitment to using the sustainability procurement duty tools within the current financial year. However, for policy on low carbon procurement to be translated into practice, it is important that decision makers and those delivering services in the health sector also have an understanding of the carbon cost of products and services they commission and use as well current 'thinking' in terms of carbon management and reporting.[53]

The health sector was one of the first public sector organisations in the UK to embrace low carbon procurement. The SDU programme: Procuring for Carbon Reduction (P4CR)[54] provides guidance and tools for implementing low carbon procurement and examples of good practice are emerging. P4CR highlights the need to develop different strategies in relation to different products and services. These include supply chain management, substitution and innovation, reduce 'in use' emission, and reduced demand.

Working with suppliers to reduce the carbon footprint in the supply chain will potentially bring about the largest reductions in the longer term. However, in order to achieve significant GHG reductions it is important that demand for products and levels of waste are also reduced.

6.1 Supply Chain management

"The scale of public procurement means it's an important potential mechanism available to governments to drive public polices such as the low carbon agenda." (p58) [55]

Environmental sustainability and sustainability more broadly are increasingly important for manufacturers and suppliers. As a consequence they are engaging in initiatives to assess and address environmental issues including monitoring GHG emissions in their supply chains and calculating the carbon footprint of products and services.[56]

NHS Scotland, as a major procurer, can use their ‘buying power’ to indicate their commitment to sustainability and the importance given to the carbon footprint of a product or service in procurement decision making. This can be achieved through:

- incorporating GHG emissions into procurement contracts; and
- working with suppliers to further understand energy use in supply chains and identify where reductions in GHG emissions can be achieved in order to develop less carbon intensive products.

In 2016 NHS Scotland successfully piloted the inclusion of GHG emissions in the competitive tendering process for a medical device (Case Study 1). A review of the pilot suggests that careful guidance is required to ensure that the data provided by suppliers is relevant, accurate and comparable. Guidance on the scope of the assessments required (system boundaries), methodology for calculation (to recognised standards) and third party verification of the calculation process is also important. There are, however, costs associated with this process for the supplier.

Public bodies, including the NHS, must therefore ensure that procurement requirements do not hinder the ability of companies to compete in the market. This is particularly pertinent for Small to Medium Enterprises (SMEs). Carbon footprint information may also be commercially sensitive and care must be taken in how the data is used and shared. The learning from this pilot is currently being used to inform how the carbon footprint of products can be included in further tender evaluation processes in NHS Scotland.

There is potential for the carbon footprint of procured products to be shared with clinicians and other staff to inform decision making. Consideration should therefore also be given to how and what information about the carbon footprint of products can be recorded and how it might be shared effectively.

Case Study 1: Inclusion of GHG emissions in NHS Scotland National Procurement Contract for Single use Sharps Bins

In a recent procurement for single use sharps bins used for the safe disposal of needles and other sharp instruments, the carbon footprint of the products were considered as part of the tender evaluation. The national contract was put in place by NHS Scotland National Procurement in 2016.

Single use sharps bins were identified as having a potentially high carbon footprint. Most of those in use in NHS Scotland comprise of a plastic body and lid, both of which are made using a non-renewable resource and require significant energy in manufacture. The bins were identified as a suitable product to trial carbon evaluation as part of procurement since the production process is relatively straightforward and the bins are typically made of a limited number of materials.

The invitation to tender documents required the bidder to confirm if their product included post-consumer recyclate material (recycled plastic) and indicate the carbon footprint of a number of products in their range. Guidance was provided regarding the scope and system boundary to be used and reference to internationally recognised carbon standards was required. Bidders were scored in relation to the percentage of recycled content and also the carbon footprint. Bidders gained an additional 5% of marks available for an externally verified carbon footprint. The winning bidder provided a product which had a lower carbon footprint and also had the lowest unit financial cost.

Work is also underway in England to support greater collaboration between the NHS and suppliers to 'transition to more sustainable healthcare products and services'. The Coalition for Sustainable Pharmaceuticals and Medical Devices (CSPM) is a consortium of suppliers established by the NHS SDU to promote best practice and develop tools and guidance related to sustainable pharmaceuticals and medical devices. An advisory group is also in place with representation drawn primarily from the health sector. The consortium has developed carbon accounting guidance for pharmaceutical companies[k] and is currently taking forward work to develop a better understanding of the carbon footprint of the pharmaceuticals and medical devices that have been prioritised by the coalition as GHG intensive. The aim of this work is to identify opportunities for carbon reduction in the supply chain. Reduction route maps for significant GHG emitters will include carbon hotspots and reduction opportunities as well as reduction strategies. The GHG emissions of prescriptions items will be re-measured and the list of significant prescription items re-prioritised.

[k] http://www.sduhealth.org.uk/areas-of-focus/carbon-hotspots/pharmaceuticals.aspx

6.2 Reduce demand (buy less) and waste

"In our existing economy, we 'take, make and dispose'. We take resources from the ground, air and water; we make them into products and structures; then we dispose of them. In a circular economy, systems are designed to make better use of valuable products and materials – changing the way they are produced and managed to have less impact on finite natural resources and create greater economic benefit" (p6).[58]

Reducing demand and waste are important ways of reducing Scope 3 emissions associated with goods and services. Upstream emissions are reduced as a result of lower levels of production and distribution whilst downstream emissions are reduced as less waste requires disposal. This is consistent with *Making things last: A circular economy strategy for Scotland*[57] which outlines Scotland's visions for the circular economy. Due to the high GHG intensity of many of the goods procured in the health sector, further embedding the principles of the circular economy in NHS Scotland will contribute to the reduction of Scope 3 emission as well as potentially contributing to cost savings.

Product substitution, replacing products with ones that produce less GHG emissions during their life cycle, is one approach to demand reduction. The evidence suggests that single use items are a significant contributor to the health sector carbon footprint. As indicated in section 5 this is often because of the large quantities purchased in the NHS.[58] Switching from single use items to durable and re-usable alternatives reduces the number of items produced and has been shown to reduce carbon emissions and waste. For example, a life cycle assessment study compared re-usable sharps containers and disposal boxes in one hospital in the USA. The study found that the annual carbon footprint reduced by 127MtCO_2e and 30.9 tonnes of plastic and 5.0 tonnes of cardboard were diverted from landfill.[59]

There are a number of examples of the use of durable and re-usable alternatives in NHS Scotland and there is potential for further use of this approach. Re-usable products may be made ready for re-use (reprocessed) by either contractors (as in Case Study 2) or by the NHS through the NHS Scotland Sterile Services department. The NHS service reprocesses around 13 million items per annum. Strict controls and standards are in place for reprocessing. When considering the introduction of alternative products it is important that there is dialogue between procurement and clinical teams. This will ensure that devices suitable for re-use are appropriate, that there is capacity in the sterile services system to process them and that opportunities and barriers to introducing re-usable alternatives are considered. In addition to clinical items, there are a large number of non-clinical products used in the healthcare sector including coffee cups, disposable plates and cutlery which may be suitable for substitution.

Current systems of procurement focus on ownership, however, accessing goods as a managed service, where payment is made per use or lease of the items, has also been advocated within the context of circular economy models. The reusable sharps boxes case study (Case Study 2) is a good example of this. When a single use plastic sharps box is purchased, used and disposed of, this process is described as a linear economy model or simplified to 'take, make and dispose'. The re-usable boxes are never owned by the NHS Boards, Boards are charged per use (the cycle of use and return to the supplier for reprocessing). This type of contract (in a similar way to lease arrangements) are described as circular economy models. This is because the product and material flows 'circulate' in the economy, reducing the need to produce more items and the associated waste. NHS Scotland National Procurement has recently put in place a contract for the provision of walking aids which includes a commitment from suppliers to consider circular economy models.

Case Study 2: Introduction of Re-usable Sharps Containers

Reusable sharps boxes are currently being introduced in Scotland for both sharps collection and the collection of single use metal instruments to enable metal recovery. The boxes are in use in a large number of NHS Boards in selected clinical and theatre areas displacing medium/ large single use boxes.

Zero Waste Scotland, using industry estimates of the carbon footprint of re-usable boxes (manufacture, transport, cleaning and disposal) and single use sharps boxes (manufacture, transport and disposal) and procurement data from NHS Scotland, estimated that 20,574 tCO_2e could potentially be saved over a ten year period if all medium and large single use containers were replaced by a re-usable sharps service. The use of the boxes for collection of single use metal instruments (metal recovery) offers additional carbon benefits as the recovery of metal avoids the extraction of raw materials and the refinement and production of clinical grade metals. Using the results of metal recycling trials in NHS Lothian and NHS Tayside, Zero Waste Scotland have estimated that over 50 tonnes of single use metal items year could be recovered across Scotland if NHS Scotland introduced metal recycling services across all its 374 theatres.[60]

Reducing items classified as waste can also have significant carbon benefits; it can reduce waste management requirements (which are often energy intensive processes), ensure that products and materials are kept 'in use' for longer and reduce the quantity procured. This avoids the need to produce new products and consume raw materials and carbon emissions associated with this. Waste reduction is a core requirement of the Scottish Government Circular Economy Strategy: 'Making Things Last'. NHS Boards (like all other organisations) are required to demonstrate a 7% reduction in waste by

2017 and a 15% reduction by 2025 based on a 2011 baseline. The Director's Letter: DL (2017) 03 NHS Scotland Waste Management Action Plan (2016-2020) provides boards with an action plan which identifies the requirements that NHS Boards should have in place.[61]

6.2.1 Reducing Packaging

Packaging is a source of GHG emissions and can account for significant amounts of waste. For example, a recent study identified procurement as the major source of emissions in the cataract pathway. Medical equipment accounted for approximately one third of the emissions attributed to the procurement of goods and services. A lens, weighing less than 1g but with packaging and information weighing 64g, was identified as a potential carbon hotspot in the care pathway. [62]

Reviewing the specifications for goods and services and encouraging minimal packaging or working with suppliers to change the way goods are packed, whilst retaining compliance with packaging legislation, are potential mechanisms to reduce waste and associated carbon emissions (Case Study 3). Collaboration between procurement, health facilities and clinicians is important to ensure financial and clinical as well as carbon benefits are accrued and potential barriers identified and resolved.

Case Study 3: The Introduction of Theatre Kit Packs

One NHS Trust in England worked with Mölnlycke Health Care (a supplier of surgical devices) to create a series of procedure packs which could be used across all theatres. This moved away from individually supplied and wrapped items to 21 specially designed pre-prepared packs containing the core items required for a given procedure. As a result of introducing procedure packs the Trust has almost halved the set up time per operation which has led to its theatres being used more efficiently. The procedure packs also improved consistency for items used during procedures, and has simplified stock management and the reordering process.

Benefits include financial savings of £175,000 (based on staff time savings); carbon savings of 5tCO_2e (as a result of reducing packaging waste by 90% or 2.6 tonnes) though additional carbon reductions may result from tighter stock control and theatre set up.[l]

6.2.2 Reducing medicine waste

As has been noted in section 5, the production of many pharmaceuticals is carbon intensive. Reducing the level of waste associated with those medicines which are

[l] http://trakeo.com/sduhealth/theatre-kits-in-hospitals-reducing-packaging/

prescribed and dispensed, but not used by patients, has been identified as a potential area for action with financial, clinical and carbon benefits.

In Scotland, 16% of the annual running costs of the NHS Scotland in 2015/16 were spent on pharmaceuticals. The largest spend was in the family health service where pharmaceuticals accounted for 40% of the total spend[m]. Estimates from NHS England suggest that approximately £1 in every £25 spent on medicines in the primary and community care sectors ends up as waste as these medicines are not used.[63] Extrapolating from the English findings, the Scottish Government estimated that approximately £30million of medicine are being wasted in Scotland.[64] The authors of the English report also note that there are significant opportunity costs of the health gains forgone because of incorrect or inadequate medicine.[65]

There is no single cause of medicine waste. Some is unavoidable, for example due to a patient's death or changes in their conditions requiring a change in medication. However, waste due to patients simply not taking their prescribed medicines - whether intentionally or accidentally – is avoidable. In this regard the level of health literacy amongst patients regarding the way in which their medicines are to be used, the way in which repeat prescriptions are issued and dispensed, and the lack of adequate support to vulnerable people to take their medicines, either in the community or in institutions, all contribute to a simple over-supply of prescriptions medicines that are not used. It is thought that between 30%-50% of medicine waste can potentially be cost-effectively avoided, that is, would result in cost savings to the health service.[66]

In addition to the potential financial savings, reducing medicine waste is likely to have a double carbon benefit. It will reduce upstream emissions, as a result of lower levels of manufacture and distribution, and reduce downstream emissions as fewer medicines require disposal, a carbon intensive process due to the high temperature incineration needed. The NHS SDU estimates that savings of up to 7,030 tCO_2e and £37.5million can be achieved by 2020 through actions to reduce medicine waste.[67] The NHS SDU has also produced case studies which help illustrate the potential carbon savings.[n]

Reducing medicine waste is a key component of the Scottish Vision and Action Plan for pharmaceutical care Prescription for Excellence.[68] Work in support of this is being taken forward as part of the NHS Scotland Effective Prescribing Programme where work streams associated with prescribing for respiratory disease, diabetes, and updating guidance on polypharmacy (the prescribing of several medicines for people with multiple illness) all have potential to reduce medicines waste. More specifically, NHS Highland

[m] http://www.isdscotland.org/Health-Topics/Finance/Costs/Detailed-Tables/Drugs.asp

[n] https://www.england.nhs.uk/wp-content/uploads/2015/06/pharmaceutical-waste-reduction.pdf

is initiating work on medicines waste which is explicitly considering the potential carbon savings associated with waste reduction.

6.3 Low Carbon Procurement in a clinical context

Pharmaceuticals and medical equipment are procured in the context of clinical services and there is increasing interest in examining the environmental impact and sustainability of care pathways and treatment modes in relation to clinical outcomes.

A small number of studies were identified which compared the GHG emissions and financial costs of different treatment modes with similar outcomes. The findings were then used to consider procurement hotspots and potential actions to reduce the carbon footprint of interventions or treatment regimes whilst maintaining clinical outcomes. These included comparisons of medical and surgical treatment for gastro oesophageal flux and different modes of delivery of maintenance dialysis.[69] [70]
Recently NHS England SDU worked with partners to develop guidance on how to quantifying the sustainability of current and developing care pathways. The Sustainable Care Pathway guidance,[71] based on the GHG protocol standards, builds on earlier work to establish more consistent approaches to calculating and reducing emissions produced in the manufacture of pharmaceuticals and medical devices. It is a useful tool for decision makers to understand sustainability issues within care pathways and enables those making decisions about the delivery of services to take account of sustainability when designing or improving care pathways. Currently GHG emissions, water use and waste generation are included across 6 components of care pathways - GP visits, inpatient care, surgery, patient travel, self-care and emergency department visits. The guidance will be developed further to include other environmental metrics and more components of care pathways. It may be a useful tool to pilot in the Scottish context.

A case study prepared by Novo Nordisk comparing good and poor management of diabetes showed that GHG emissions associated with good care were lower than poor care. Based on 5 million people in UK having type 2 diabetes, the authors estimated annual savings of 720,000tCO_2e. The most significant contributions to emissions were pharmaceutical consumption, blood glucose testing and regular GP visits.[72]

7. Measurement and monitoring

Many public sector organisations in Scotland, including NHS Boards, currently measure and monitor Scope 1 and Scope 2 emissions on a regular basis. However, measuring and reporting Scope 3 emissions is less common. In part this because there are limited mandatory requirements for Scope 3 reporting.

Measuring Scope 3 emissions is challenging and there is no agreed pragmatic approach to monitoring all types of relevant Scope 3 emissions across the public sector. A number of studies in the NHS have included Scope 3 emissions in their baseline carbon footprints. The methods used to calculate these emissions have generally been informed by the GHG protocol guidance.[o] This guidance underpins UK guidance on measuring GHG emissions[73] and PAS 2050 - the Publicly Available Specification for assessing the life cycle GHG emissions of goods and services.[p] The GHG protocol guidance provides detailed information about measuring Scope 3 emissions and describes a range of methods to calculate these emissions. The advantages and disadvantages of the different approaches are also outlined. Supplier-specific and hybrid methods use primary data collected from the supplier whilst average data and spend based methods use secondary data such as industry averages. The methods adopted by a company or organisation will, to some extent, be dependent on what data they are able to feasibly collect from the supplier.

Currently the NHS has limited ability to directly calculate Scope 3 emissions for the products they procure since they are not able to easily collect much of the relevant primary data concerning energy input and output used in extraction of raw materials, production, manufacturing, packaging, and distribution of goods from the manufacturer or supplier. Many NHS studies have therefore used spend based models; multiplying the economic value of procured good and services by Environmentally Extended Input-Output (EEIO) emissions factors to calculate Scope 3 emissions.

The GHG Protocol indicates that carbon footprints calculated using less specific data (such as expenditure data and EEIO emission factors) are useful as they provide an overview of consumption based GHG emissions, identify potential hotspots, and can be useful in informing action to reduce emissions. However, due to their reliance on less specific data they provide an estimate rather than represent an accurate method of carbon accounting. This is not generally regarded as an appropriate approach for monitoring emissions over time. Furthermore, as expertise in carbon accounting has developed, methods and EEIO data has also changed. This has led to variations in the total emissions reported as noted previously. Further limitations of this approach are outlined in box 2.

[o] http://www.ghgprotocol.org/
[p] See https://www.bsigroup.com/en-GB/about-bsi/uk-national-standards-body/BIS-Exploring-new-areas-with-government-funding/projects/Sustainability/

Box 2: Environmentally-Extended Input Output (EEIO) Models

EEIO models estimate energy use and/or GHG emissions resulting from the production and upstream supply chain activities of different sectors and products within an economy. The resulting EEIO emissions factors can be used to estimate GHG emissions for a given industry or product category. EEIO data are particularly useful in screening emission sources when prioritizing data collection efforts. EEIO models are derived by allocating national GHG emissions to groups of finished products based on economic flows between industry sectors. EEIO models vary in the number of sectors and products included and how often they are updated. EEIO data are often comprehensive, but the level of granularity is relatively low compared to other sources of data:

- Advantage: Comprehensive coverage of entire economy; Simplicity of method and application; Time/cost savings as data requirements less onerous;

- Disadvantage: Broader sector averages do not represent unique process and products especially for non-homogenous sector; assumes linear attribution between monetary and environmental flow provides only indicative results; lacks specificity and accuracy; difficult in relation to monitoring reductions; sometimes database limited geographically (GHG Protocol Standards).[74] [75]

The ambition to move beyond the use of expenditure data to more accurate primary or secondary activity data to calculate Scope 3 emission in the NHS is noted in the research literature. Such data would enable more accurate monitoring over time. The recent research commissioned by the NHS SDU to identifying priority prescription and procurement items in the NHS is one example of a bottom up approach to calculating emissions in the health sector which is less dependent on spend data. These studies used quantity and mass activity data as well as generic GHG intensity data about the primary material, or active pharmaceutical agent in the case of pharmaceuticals, to prioritise high GHG intensive products. This approach could be considered by NHS Scotland procurement services for priority items. Year on year calculations of the carbon burden of agreed priority items would allow trend data to be collected. Further collaboration between colleagues in the health sector, procurement and carbon accounting within Scotland and across the UK would be helpful in exploring this option.

The increasing use of carbon footprints in procurement tenders provides a further opportunity for monitoring Scope 3 emissions. Manufacturers are increasingly using life cycle assessment methods, such as those outlined in the GHG protocol, to consider energy use of products across the supply chain and for their organisation as a whole. The recent development of the carbon footprint guidance for pharmaceuticals and

medical devices, based on the GHG protocol standards, paves the way for more consistent measurement of emissions for many of the products used in the health sector. There is potential for information about the carbon footprint of procured goods to be used to monitor Scope 3 emissions at an NHS Board level based on quantities purchased.

It is likely that approaches to measuring and monitoring Scope 3 emissions will be incremental as the relevant data and expertise develop. In the interim, there is encouraging evidence to suggest that the actions outlined in section 6 are likely to contribute to reductions in Scope 3 GHG emissions. NHS Boards are therefore encouraged to draw on the available information and resources to incorporate actions to reduce Scope 3 emissions in their climate mitigation strategies and to report these actions and any associated monitoring through the ‘additional reporting section’ of the Public Bodies Climate Change Duties Report. This will allow learning and good practice to be shared across NHS Boards and the broader public sector and help inform initiatives to develop reporting and monitoring systems.

8. Suggested Actions

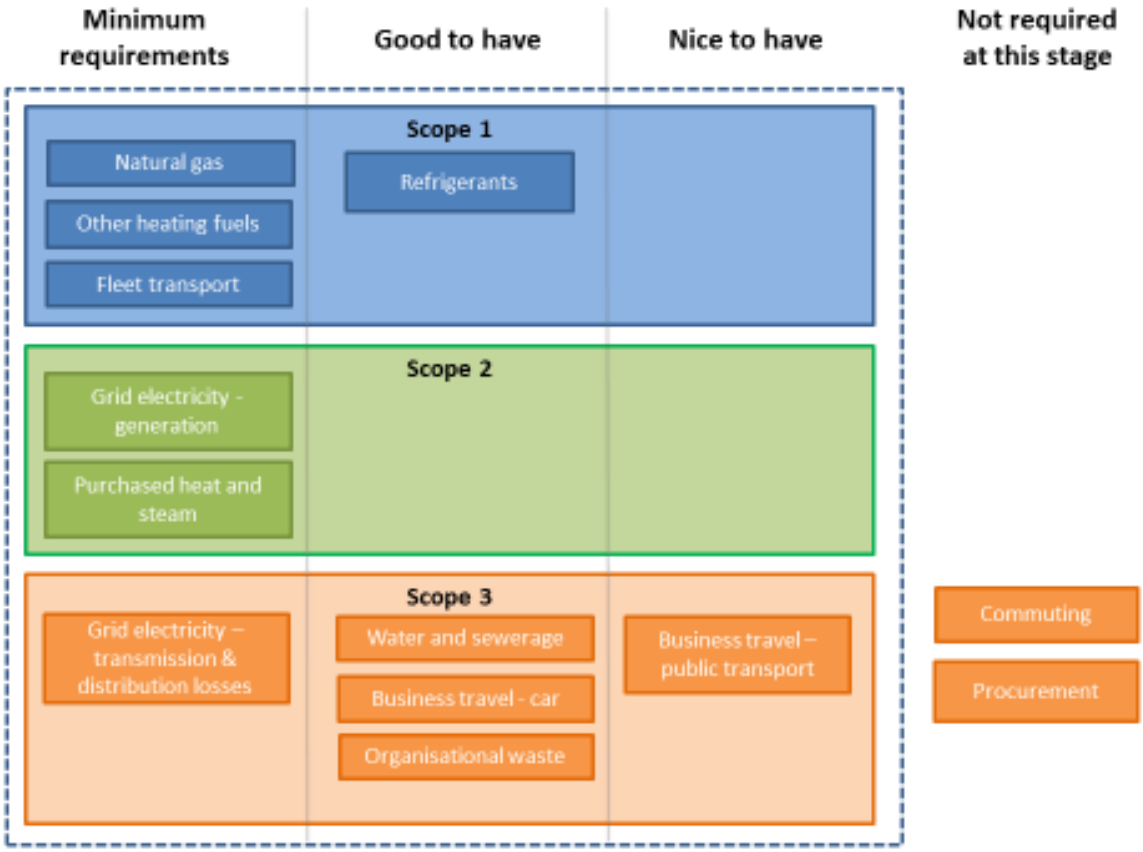
In order to help meet Scottish Government GHG emissions targets and to support a healthy and sustainable environment, the Health Sector (alongside other public and private organisations and the wider community) need to build on current carbon mitigation strategies.

The evidence suggests that Scope 3 GHG emissions are substantial and that low carbon procurement and waste reduction can help reduce these emissions whilst maintaining financial and clinical outcomes. Multiple strategies are needed to achieve this:

- integrating GHG emissions in procurement contracts;
- working with suppliers, including through the CSPM, to understand and reduce supply chain emissions;
- providing opportunities for greater collaboration between clinicians, sustainability managers and procurement leads to identity potential carbon hotspots in care pathways and opportunities for carbon mitigation strategies including piloting the sustainable care pathways guidance;
- embedding the principles of the circular economy more firmly in NHS Boards and identifying opportunities to reduce demand, introduce alternative products and reduce waste;
- reporting action to reduce Scope 3 emissions through low carbon procurement in the Public Bodies Climate Change Duties Report; and
- building collaboration between carbon accounting experts, clinicians and procurement staff in order to develop and implement realistic approaches to measuring and monitoring Scope 3 GHG emissions both at a procurement and clinical level.

Appendix 1: Tool for Identifying the Scope of Emissions

The diagram below shows all the sources reported by the NHS, with emission sources colour-coded with the most likely Scope:



Source: NSS Health Facilities Scotland. (2017, July). NHS guidance for completing annual Public Bodies Climate Change Duties reporting. Retrieved from http://www.hfs.scot.nhs.uk/publications/1502097979-V1%20Climate%20change%20reporting%20guidance.pdf

Appendix 2: Method

This paper is based on a review of the published and grey literature on measuring and reducing Scope 3 emissions within the NHS. A literature search was undertaken using key terms relating to scope 3, carbon accounting, management and procurement.

A variety of health related databases were searched and a wide range of websites were reviewed for relevant material. Articles were screened against key criteria for relevance and consolidated for inclusion within the report. Further details are available on request.

The paper was developed in conjunction with an advisory group comprising of members of SMaSH. The full membership of the group can be found in Appendix 6.

Appendix 3: Categories of Scope 3 Emissions

1. Purchased Goods and Services
2. Capital Goods
3. Fuel- and Energy-Related Activities Not Included in Scope 1 or Scope 2
4. Upstream Transportation and Distribution
5. Waste Generated in Operations
6. Business Travel
7. Employee Commuting
8. Upstream Leased Assets
9. Downstream Transportation and Distribution
10. Processing of Sold Products
11. Use of Sold Products
12. End-of-Life Treatment of Sold Products
13. Downstream Leased Assets
14. Franchises
15. Investments

Source: Greenhouse Gas Protocol. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard*. World Resources Institute & World Business Council for Sustainable Development: 2013 http://www.ghgprotocol.org/standards/scope-3-standard

Appendix 4: Top 20 Priority List Identified for Further Investigation (in Alphabetical Order)

BNF Chemical Name	Associated BNF Section Name
Adalimumab	Drugs used in Rheumatic Disease and Gout
Amoxicillin	Antibacterial drugs
Atorvastatin	Lipid-regulating drugs
Beclometasone Dipropionate	Corticosteroids (Respiratory)
Budesonide	Corticosteroids (Respiratory)
Co-codamol (Codeine Phosphate/Paracetamol)	Analgesics
Co-dydramol (Dihydrocodeine/Paracetamol?)	Analgesics
Enteral Nutrition	Oral Nutrition
Etanercept	Drugs used in Rheumatic Disease and Gout
Fluticasone Propionate (Inh)	Corticosteroids (Respiratory)
Gabapentin	Antiepileptics
Ibuprofen	Soft tissue disorders and topical pain relief
Metformin Hydrochloride	Drugs used in diabetes
Naproxen	Drugs used in Rheumatic Disease and Gout
Paracetamol	Analgesics
Salbutamol	Bronchodilators
Simvastatin	Lipid regulating drugs
Sodium Valproate	Antiepileptics
Sulfasalazine	Chronic bowel disorders
Tiotropium	Bronchodilators

Source: Penny T, Collins M. Identifying high greenhouse gas intensity prescription items for NHS in England: Final Report February 2014. Sustainable Development Unit

Appendix 5: 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 and overshoes	Confectionary
CO Monitors and spirometers	Food
Crutches, walking sticks and frames	
Disposable incontinence	
Disposable medical hollowware	
Bandages, dressings and gauzes	
Drapes	
Electrode gel	
Examinations gloves	
Hearing aids	
Medical packs	
Medical pulp products	
Needle free connection systems	
Patient assessment electronic devices	
Polythene aprons	
Single use surgical instruments	
Syringes & needles	

Source: Kaddouh S, Penny T, Collins M. *Identifying High Greenhouse Gas Intensity Procured Items for the NHS in England.* Sustainable Development Unity; 2017

Appendix 6: Advisory Group

Phil Mackie (Chair)	ScotPHN/Co-chair of SMaSH
Julie Arnot	NHS Health Scotland Knowledge Services
Ann Conacher	ScotPHN
Kate Dapré	NHS National Services Scotland/Heath Facilities Scotland
Caitlin Hamlett	NHS National Services Scotland/Health Facilities Scotland
Paul Hornby	NHS National Services Scotland/ National Procurement
Wendy Rayner	NHS National Services Scotland/Health Facilities Scotland
Jane Parkinson	NHS Health Scotland/ ScotPHO
Alan Speedie	SEPA (until 31 March 2017)
Emily Stevenson	NHS Tayside / Co-chair of SMaSH

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