PRACTICE Greenhealth

Greenhouse Gas Reduction Toolkit

Setting a goal and tracking emissions

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BUILT ON GHG PROTOCOL

This guidance has been reviewed for conformance with the GHG Protocol Corporate Accounting and Reporting Standard.

Setting greenhouse gas reduction goals to protect health

OCTOBER 2018

Climate change is the greatest public health threat and opportunity of the 21st century. To reduce the health impacts of climate change, greenhouse gas (GHG) emissions must be reduced, and hospitals have an essential role to play.

Solving health problems always starts with setting a goal. Establishing a clear, ambitious target can motivate staff and help drive strategies for success. To set a GHG reduction goal, hospitals must first undertake a GHG inventory because as the old adage goes, "you can't manage what you don't measure."

Practice Greenhealth developed resources to help hospitals and health systems track GHG emissions and set reduction goals. Here's why:

1. The imperative: Climate change affects health and health care delivery, and hospitals are dealing with the impacts today. Reducing GHG emissions protects the health of patients, employees, and communities.
2. Mission alignment: Health care's carbon footprint is significant, and a hospital cannot simultaneously contribute to climate change and meet its mission to "do no harm."
3. Operational benefits: Reducing GHG emissions leads to cost savings and makes hospitals more resilient in the face of extreme weather events.

Climate change affects health

Climate change is already causing human health impacts, with even greater projected impacts in the future. The World Health Organization (WHO) estimates that "between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhoea, and heat stress."

In a video titled "Climate Change - An Urgent Human Health Issue,"

Kaiser Permanente's CEO Bernard J. Tyson sums up why they have committed to carbon neutrality by 2020: "It's about health."

A recent study in the American Public Health Association Journal projected that "annual GHG emissions associated with health care in the United States would cause 123,000 to 381,000 disability-adjusted life-years in future health damages." (Disability-adjusted life-years can be most easily understood as one lost year of healthy life.)

A Unicef report contends that "air pollution is associated with some of the biggest killers of children, such as pneumonia, which is responsible for the deaths of 920,000 children under 5 years of age every year." New research published in Biological Psychiatry links air pollution exposure during fetal development to brain abnormalities and cognitive impairment. A Massachusetts Institute of Technology study found that air pollution causes 200,000 early deaths each year.

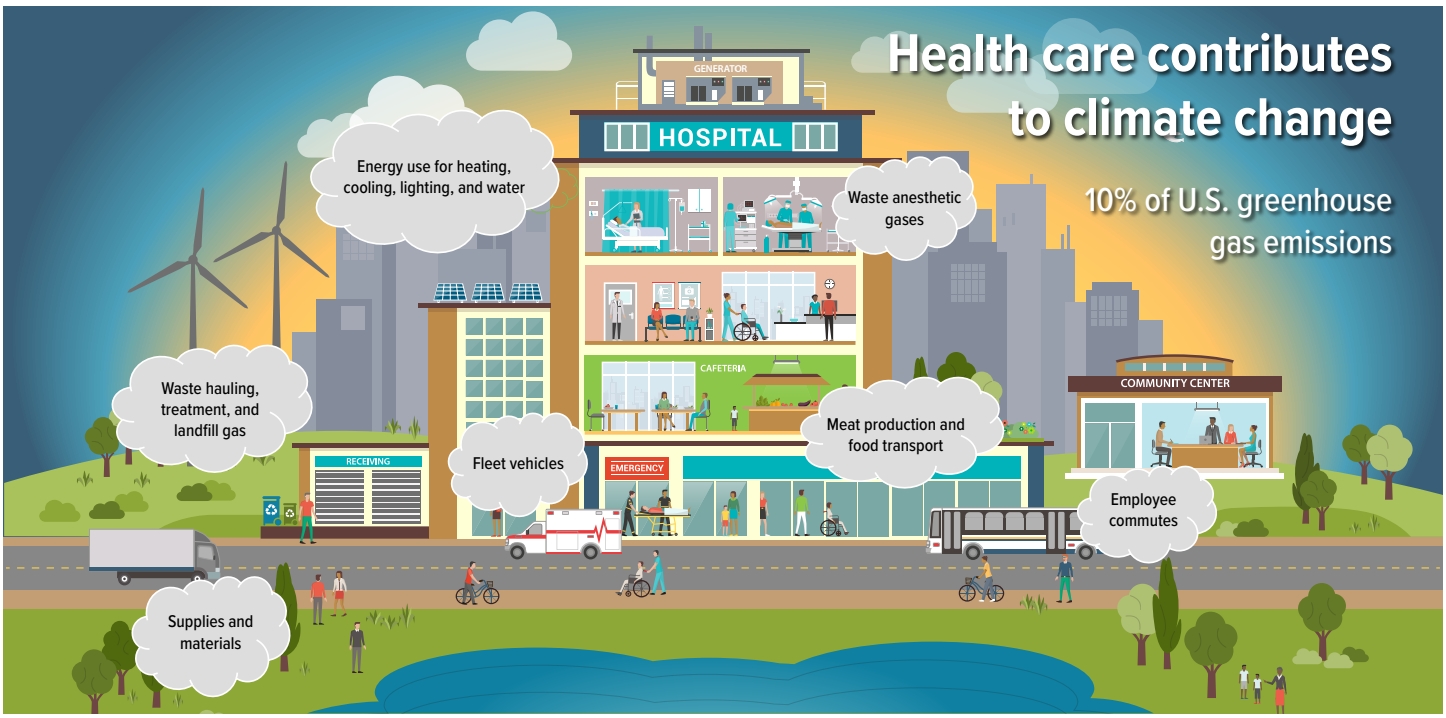
Climate change is also increasing the intensity, duration, and geographic reach of extreme weather events. Hurricane Harvey not only brought immediate health risks with the flooding, but also additional public health risks such as contaminated drinking water, toxic chemical exposure, food insecurity, and a rise in vector-borne diseases. The wildfires show a similar pattern. In addition to the acute impacts hospitals must deal with, an analysis in the Journal of the American Heart Association found smoke exposure from an extensive wildfire season was associated with cardiovascular and cerebrovascular emergency room visits for all adults, particularly for those over age 65.

These substantial impacts are not lost on the health community. An article, Private and Public Sector Responses to Climate Change, in the Journal of the American Medical Association calls the health sector to join cities, states, and businesses in the urgent action needed to address climate change. And there is reason for hope. As the 2015 Lancet stated, "Tackling climate change could be the greatest global health opportunity of the 21st century."

Health care's footprint, mission alignment

Greenhouse gas (GHG) emissions are defined as gases that trap heat in the atmosphere. The most prominent GHG is carbon dioxide (CO2), but methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF3), and sulphur hexafluoride (SF6) also lead to climate change. GHGs are measured in carbon dioxide equivalents (CO2e), the amount of CO2 that has the equivalent global warming impact.

Health care is responsible for nearly 10 percent of U.S. emissions, and of that, hospitals represent more than one-third of those emissions. The footprint of the hospital is vast, ranging from energy consumed to food procured and served to how employees commute to work. In order for hospitals to meet their mission of "do no harm", there must be alignment in every corner of the organization.



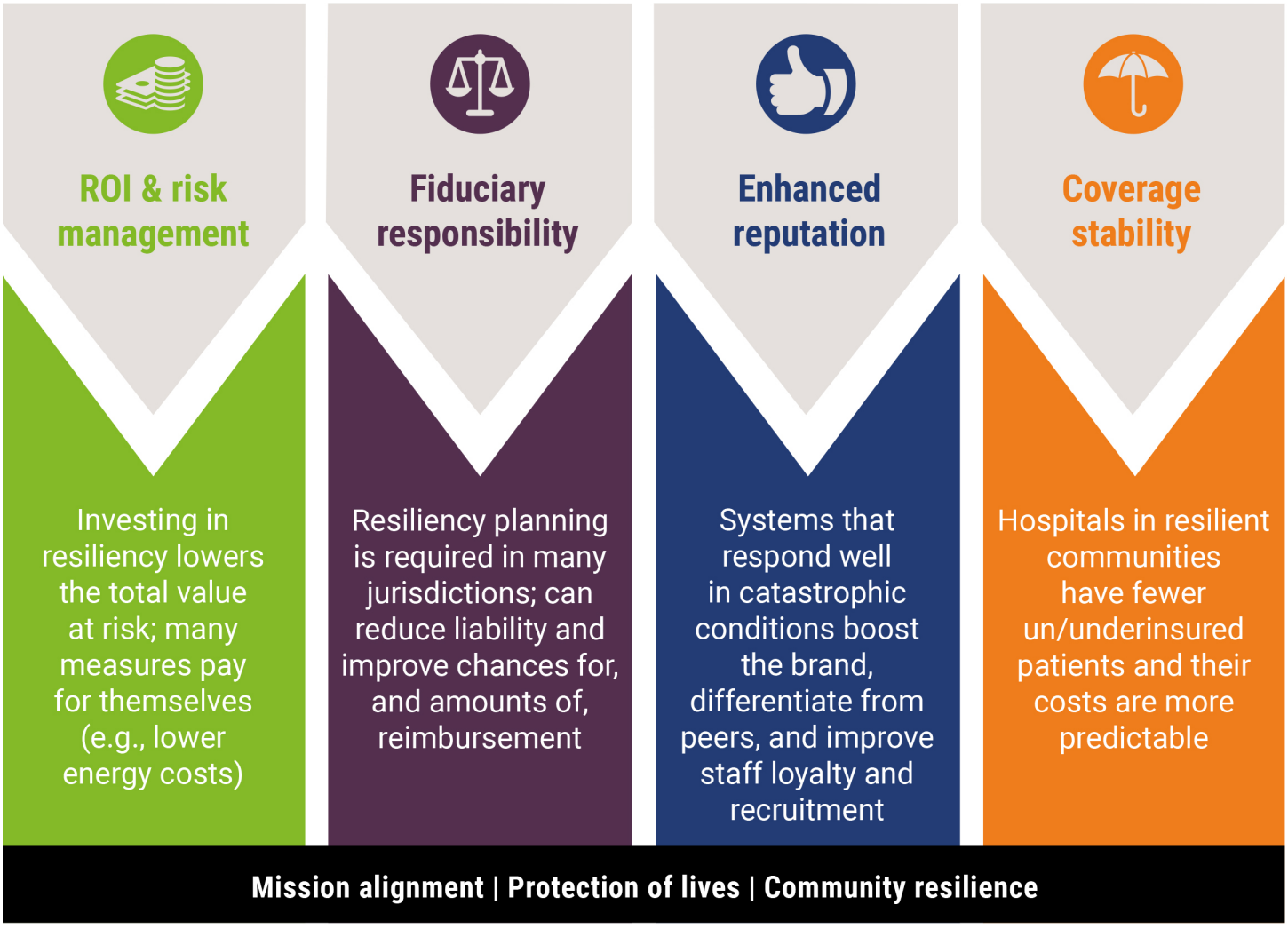
Source: Health Care Without Harm Climate Action Playbook

Business case for GHG reduction

There is also a business case for addressing climate risks. The economic losses from extreme weather events in 2017 alone are estimated at more than $300 billion, and health care has suffered billions in uncompensated losses, plus increased costs related to disease, injury, mental health, and lives lost.

The report Safe haven in the storm: Protecting lives and margins with climate-smart health care presents a detailed analysis of the bottom-line damages for hospitals from extreme weather events — suspension or closure of key operations, costs of emergency supplies due to supply chain disruption, and reduced clinical demand and reimbursement rates — as well as the benefits of preparedness, including a positive return on investment and risk management, fiduciary responsibility, enhanced reputation, and coverage stability. The paper demonstrates that preparedness and resilience are intimately tied to mitigation. For example, increasing energy efficiency not only reduces GHG emissions and generates cost savings but also allows a hospital to operate longer in extreme weather events if local utilities are interrupted.

Addressing GHG emissions can also have the added benefit of substantial cost savings. That's why nearly half of Fortune 500 companies have set GHG reduction targets and are reporting $3.7 billion in annual savings. Practice Greenhealth members report an average of more than $1 million in savings from sustainability-related projects, many of which decrease GHG emissions. Participants in the Health Care Climate Challenge have committed to reducing cumulative GHG emissions by 16 million metric tons of CO2e, or the equivalent of a year of carbon emissions from four coal-fired power plants, enough power for 1.7 million homes for a year, and saving $1.7 billion in health costs related to air pollution.



Source: Safe haven in the storm: Protecting lives and margins with climate-smart health care

Conducting a GHG inventory and tracking reductions

Background

The GHG Protocol, the backbone of this section, is a partnership between the World Resources Institute and the World Business Council for Sustainable Development that provides a global standardized framework to measure and manage greenhouse gas (GHG) emissions. It is the most widely accepted and utilized framework — 92 percent of Fortune 500 companies reporting to the Carbon Disclosure Project in 2016 used the GHG Protocol framework.

The GHG Protocol Corporate Standard provides guidance for organizations preparing a greenhouse gas emissions inventory. It covers the accounting and reporting of the seven greenhouse gases covered by the Kyoto Protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF3), and sulphur hexafluoride (SF6). Many organizations begin the inventory to ultimately produce a public report. For information on the required elements for a public report, see chapter nine of the Corporate Standard (Reporting GHG Emissions) and Scope 2 Guidance in chapter seven (Accounting and Reporting Requirements).

The GHG Protocol defines how emissions should be reported:

Direct emissions are from sources owned or controlled by the reporting organization. All direct emissions are reported under Scope 1.

Indirect emissions are a consequence of the activities of the reporting organization, but occur at sources owned or controlled by another company. Indirect emissions are categorized under either Scope 2 or Scope 3.

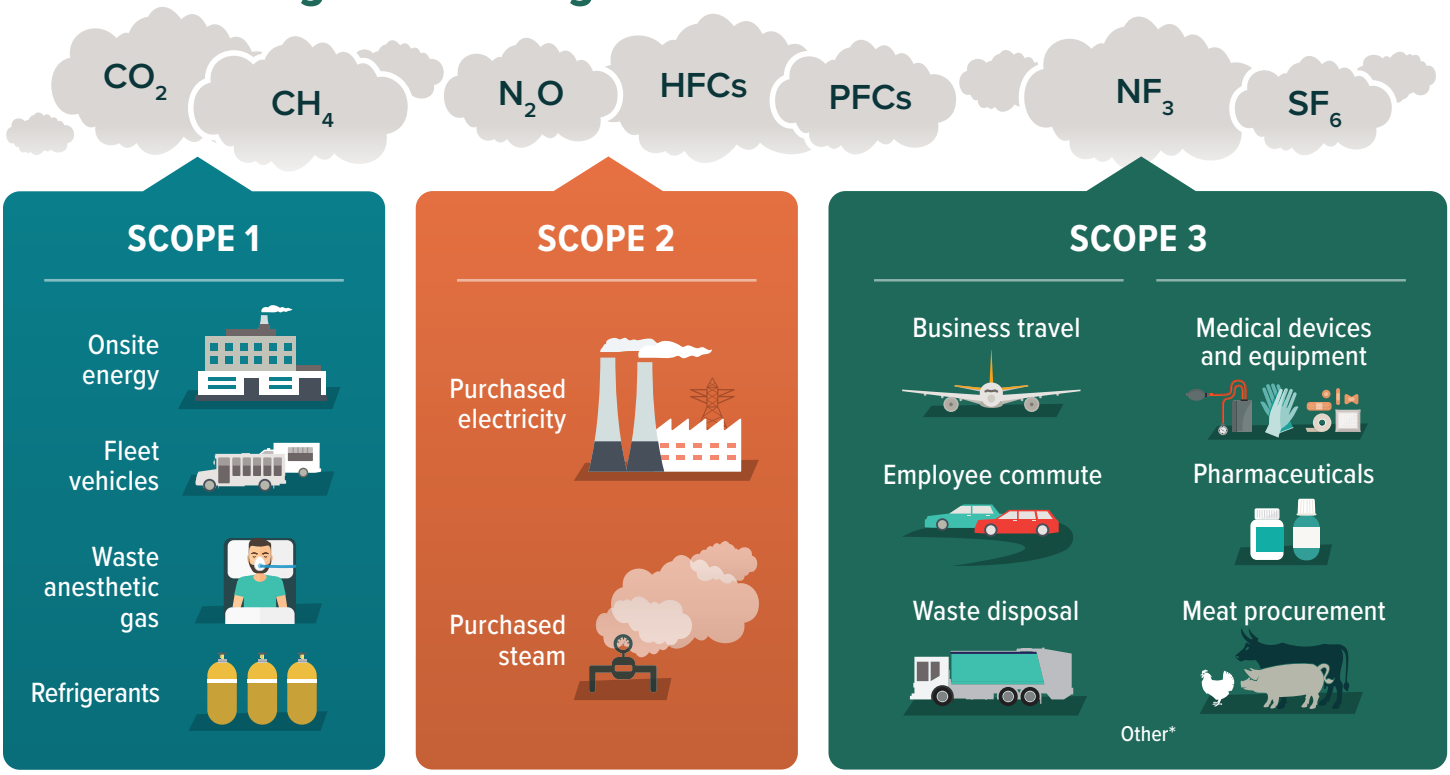
Scope 1: Emissions can include onsite stationary combustion of fossil fuels, mobile combustion of fossil fuels by vehicle fleets, and fugitive emissions, or those caused by intentional or unintentional GHGs released, such as waste anesthetic gas or refrigerant leakage.

Scope 2: Emissions from the consumption of purchased electricity, heat, and steam.

Scope 3: Indirect emissions that are not covered in Scope 2, such as business travel, employee commuting, waste generation, and product transport.

Greenhouse gas emissions won't always fit perfectly into these buckets. For example, if stationary combustion or refrigerant emissions come from a leased site, depending on the type of lease and organizational boundary approach, those may fit under Scope 3 emissions. Continue reading or reference Chapter 4 in the Corporate Standard for more information on drawing organizational boundaries.

Common greenhouse gas emission sources in health care



Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF_3), and sulphur hexafluoride (SF_6)

*Scope 3 other: These are the most common emissions for health care, but there are other relevant categories in Scope 3. To review all 15 categories covered in Scope 3, visit the GHG Protocol Scope 3 Guidance.

Source: Practice Greenhealth

Principles of GHG accounting

Relevance	Completeness	Consistency	Transparency	Accuracy
Ensure the GHG inventory appropriately reflects the GHG emissions of the organization and serves the decision-making needs of users — both internal and external to the organization.	Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.	Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors for the reporting period, including since the baseline year.	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.	Ensure the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

Source: GHG Protocol Corporate Standard

Defining organizational boundaries

An organization sets boundaries to determine which facilities and/or operations will be included in its GHG inventory. Two distinct approaches can be used for reporting: equity or control. Using the equity approach, the GHG emissions included in the inventory would be determined by the percentage owned or economic interest. Using the control approach, the emissions included in the GHG accounting would be based on either financial or operational control of the facility or operation. It is important to note that an organization must select a single approach and use that approach consistently throughout its entire inventory. If the organization wholly owns all its operations, its organizational boundary will be the same whichever approach is used.

Approach	Definition	GHG accounting
Equity share	Percent ownership	% owned
Financial control	Directs financial and operating policies to gain economic benefits	If yes: 100% If no: 0% If joint: % owned
Operational control	Authority to introduce and implement operating policies	If yes: 100% If no: 0%

In cases of joint financial control, the accounting simply defaults to the equity share approach. There is no guidance in the Corporate Standard around a percent equity that needs to be owned in order for this equity share approach to be followed. Rather, all joint ventures/partnerships/operations would be accounted for using the equity share approach, regardless of the percent of ownership. The rationale for this is that joint ventures are proportionately consolidated in financial statements (each partner accounts for its proportionate interest in the venture's income, expenses, assets, and liabilities). A company accounts for emissions based on the percentage equity share in that joint venture. For example, if the health system owns 50 percent of a hospital, they would be responsible for reporting 50 percent emissions. There is no recommended limit, so even if a health system only owns 10 percent, they would report 10 percent emissions.

For more information on setting organizational boundaries, see chapter 3 in the Corporate Standard.

Leased asset guidance

Many hospitals and health systems choose to lease a portion of their spaces or even fleet vehicles. The inclusion of these leased assets will depend on the approach the organization has taken for the organizational boundary, as outlined in the below table.

Type of leasing arrangement

Additional information can be found in appendix F of the Corporate Standard

	Finance/capital	Operating
Equity share/ financial control	Lessee has ownership and financial control. Emissions associated with fuel combustion are Scope 1 and with purchased electricity, heating, cooling, and steam are Scope 2.	Lessee does not have ownership or financial control. Emissions associated with fuel combustion and purchased electricity, heating, cooling, and steam are Scope 3.
Operational control	Lessee has operational control. Emissions associated with fuel combustion are Scope 1 and with purchased electricity, heating, cooling, and steam are Scope 2	Lessee has operational control. Emissions associated with fuel combustion are Scope 1 and with purchased electricity, heating, cooling, and steam are Scope 2.

Selecting baseline year and significance threshold

Similar to other areas of sustainability, defining the starting point is critical for measuring progress. Most organizations choose a single year for the baseline, but there is also an option to choose an average emissions number over a set of consecutive years. This should be done to help smooth out unusual fluctuations in greenhouse gas emissions that would make a single year's data unrepresentative of the organization's typical emissions profile. The GHG Protocol Corporate Standard recommends selecting a year with the earliest relevant time with reliable and verifiable data for Scopes 1 and 2, although more recent baseline years are acceptable, especially if an organization has been tracking data for some time. Most companies and governments set baselines no earlier than 1990 because the Kyoto Protocol gave guidance to countries to set goals using 1990 as a baseline, but most organizations have baseline years much more recent than that.

As organizations choose a baseline year, it is important to define a significance threshold. This threshold is the amount of change that will trigger a base year recalculation. The

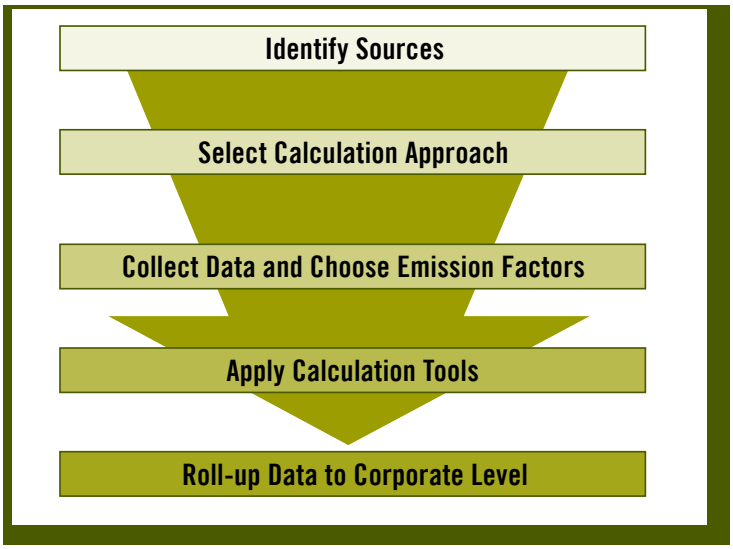
most common reason for a recalculation is large changes in the organizational facility portfolio included in the inventory due to acquisitions or divestments. For example, if a health system acquires three new hospitals that add a significant amount of emissions to its footprint, a baseline year recalculation would be needed so it does not appear that there was a huge jump in emissions for the acquisition year. Additionally, the cumulative effects of multiple smaller changes in organizational assets and inventory methods should also be considered when gauging whether the threshold has been exceeded.

However, not every change will trigger a base year recalculation; changes involving updated methodology, improvements in data accuracy, and organic growth or decline do not require a base year recalculation. Organic growth and decline would include changes in patient volumes, patient mix, services provided, and the opening or closure of operating units that are owned or controlled by the organization. Chapter five of the Corporate Standard provides more information on setting base years and re-calculating base year inventories.

Calculating GHG emissions

After the baseline year and inventory boundaries have been selected, organizations calculate the baseline greenhouse gas emissions for Scopes 1-3. The GHG Protocol Corporate Standard suggests breaking this process into five steps: identify sources that will be captured in the inventory (see table below), select a calculation approach, collect data and choose emissions factors, apply calculation tools where applicable, and combine it into the overall inventory.

Steps in identifying and calculating GHG emissions



Source: GHG Protocol Corporate Standard

Significance threshold example

In 2015, Cleveland Clinic acquired Akron General Health, a two-hospital system with three wellness centers, which triggered a base year recalculation to account for the increase in the GHG baseline. Since Cleveland Clinic has an absolute target to be carbon neutral by 2027 for Scopes 1 and 2 there has to be a way to account for significant structural changes that will impact their ability to meet the goal.

Practice Greenhealth is recommending a full Scope 1 and 2 baseline, with a limited Scope 3 baseline. To review the full 15 categories covered in Scope 3, review the section on Scope 3 below.

Scope 1 emissions	Scope 2 emissions	Scope 3 emissions
Stationary combustion	Purchased electricity	Business travel
Mobile combustion (fleet vehicles)	Purchased heating	Employee commuting
Fugitive emissions (waste anesthetic gas or refrigerant leakage)	Purchased cooling	Meat procurement
	Purchased steam	Waste generation

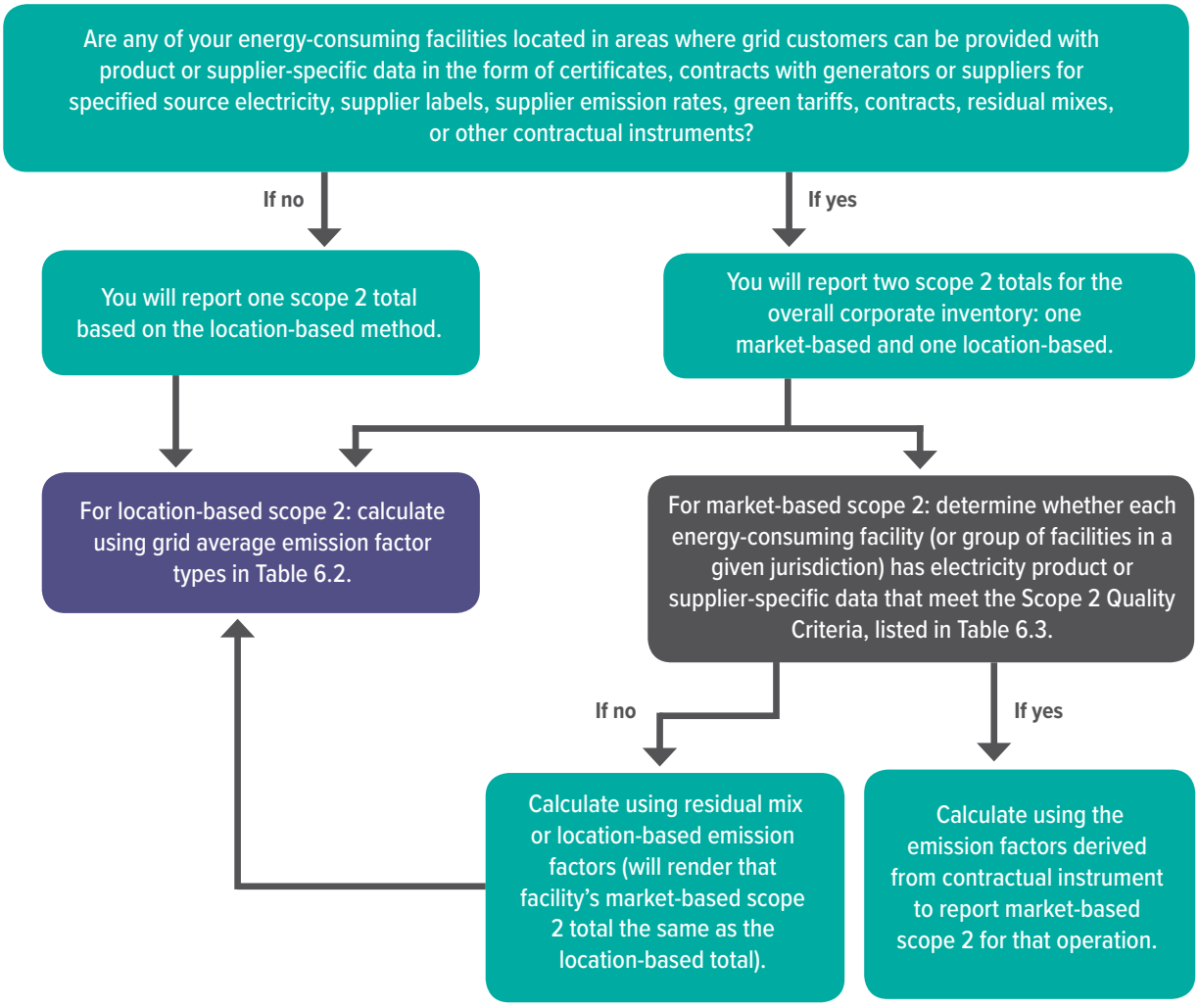
It is important to clarify that these emissions won't always fit neatly into these buckets. For example, if stationary combustion and refrigerant emissions come from a leased site, depending on the type of lease and organizational boundary approach, those may fit under Scope 3 emissions.

Following are details about how to choose source data, the different calculation approaches, data collection and choosing emissions factor, and if available, calculation tools.

Measurement: Energy

Scope 1 includes direct emissions from energy from stationary combustion, which are sources that combust fuel such as a natural gas water heater. Scope 2 includes indirect emissions from purchased energy. The GHG Protocol Scope 2 Guidance provides two reporting and calculation approaches for Scope 2 energy: market- or location-based. To determine which method to utilize, follow the GHG Protocol's decision tree:

Determining which accounting methods to use for scope 2



Source: GHG Protocol Scope 2 Guidance

The majority of hospitals will use the "location-based" method. Eighty percent of Practice Greenhealth award applicants are utilizing ENERGY STAR Portfolio Manager to manage all energy data, and this tool has the capability to calculate GHG emissions from energy use, for both Scope 1 emissions and Scope 2 emissions using the location-based approach. The Portfolio Manager technical reference guide reviews how emissions are calculated. For hospitals utilizing this tool to track energy use, follow this guidance document to create a custom greenhouse gas emissions report covering energy-related emissions. Total emissions is the primary metric, measured in metric tons of carbon dioxide equivalent or MTCO2e, and quantifies the majority of GHGs associated with buildings. An important note is that the Corporate Standard and Scope 2 Guidance require that the emissions of different GHGs be reported separately in units of each gas before converting to carbon dioxide equivalent total emissions. Portfolio Manager will also provide emissions data by type:

- Direct emissions (Scope 1): Emissions from fuel that is directly burned at the hospital campus buildings. Example: Natural gas that may be combusted for heat.
- Indirect emissions (Scope 2): Emissions associated with energy purchased from a utility. Example: Emissions associated with the generation of electricity or district steam.

Hospitals not using ENERGY STAR Portfolio Manager can follow this guidance to calculate direct GHG emissions from energy use, and then add information to the Practice Greenhealth GHG Inventory Tool to track:

1. For Scope 1 direct emissions related to energy from stationary combustion, collect information by type and amount of fuel. This data can often be obtained directly from the utility company that supplies the fuel. All billed or metered site energy consumption for each fuel needs to be converted from native units to MBtu. Fuels that are delivered, billed, or measured in mass or volume units (i.e., cubic feet, tons, gallons) are converted to energy using standard heat content factors. The EPA GHG Inventory Guidance on Direct Emissions from Stationary Combustion Sources provides heat content factors and equations for conversion.*
2. Total site energy for each fuel is multiplied by emission factors depending on the type and the global warming potential of each emission, and then converted and totaled to carbon equivalents.
3. Scope 1 direct emissions are added together across all fuels (e.g., oil, gas, etc.), and then added to Scope 2 indirect emissions totals.

Hospitals not using ENERGY STAR Portfolio Manager can follow this guidance to calculate indirect GHG emissions from energy use, and then add information to the Practice Greenhealth GHG Inventory Tool to track:

1. For Scope 2 indirect emissions related to purchased electricity, collect information on the amount of electricity purchased. The EPA GHG Inventory Guidance on Indirect Emissions from Purchased Electricity provides the possible sources of data and equations for conversions.*
2. Determine emissions factors. The EPA GHG Inventory Guidance on Indirect Emissions from Purchased Electricity provides guidance on using a direct line emissions factor, a regional emissions factor such as the EPA's eGrid tables, or a national average such as the International Energy Agency national electricity emissions factor.*
3. Calculate the totals using the equation listed in the EPA GHG Inventory Guidance on Indirect Emissions from Purchased Electricity to gather Scope 2 indirect emissions totals.*

For hospitals that answered "yes" at the end of the GHG Protocol design tree in this section and will need to provide both location- and market-based inventories, the GHG Protocol Scope 2 Guidance offers additional resources on the market-based approach. In the location-based method, most hospitals will apply the grid-average emission factors (e.g. the eGrid factors) to all of their electricity usage from all sources. In the market-based method, most hospitals will apply supplier-specific emission factors if these are available from the utility or residual mix factors to all of their electricity usage from all sources. These do not get totaled together, but rather reported separately. To learn more about these methodologies, see the addendum for examples on how to apply the location and market-based methodologies and the table on page 22 for a general overview.

It is important to note that all instruments (renewable energy certificates, power purchase agreements) must meet the quality criteria in the Scope 2 guidance before they can be applied to a market-based total. Otherwise, if an instrument does not meet the criteria, a grid-average emission factor or residual factor should be used to calculate the associated emissions profile that is included in the market-based approach.

*At the time of publication, the EPA emission factors include the global warming potential values from the Intergovernmental Panel on Climate Change fourth assessment report.

Measurement: Fleet vehicles

Practice Greenhealth's Transportation Get Started Guide reviews how to determine baseline year GHG emissions from mobile fuel combustion for all vehicles in the organization's fleet. Conduct or work with business partners to review the inventory of hospital fleet vehicles and identify how many meet the green vehicle criteria. (See the Practice Greenhealth Transportation Toolkit definitions.) Use fleet vehicle logs to track annual volume of mobile fuel combustion, and use the fleet vehicle goal resources to convert fuel combustion into Scope 1 or 3 greenhouse gas emissions.

1. Itemize the vehicles in the hospital's fleet by model year, vehicle type, and fuel type. Vehicle types include passenger cars, light-duty trucks (vans, pickup trucks, SUVs), medium-duty trucks, heavy trucks, buses, and helicopters. Fuel types vary by vehicle type.
2. Starting with the model year, indicate the number of vehicles of each vehicle type that use each fuel type.
3. For each model year and vehicle type, indicate the total fuel used and the total vehicle miles traveled by these vehicles.
4. Utilize the GHG Protocol conversion factors to translate units of fuel used per set of vehicles into emissions from CO2, CH4, and N2O. Note: The GHG Protocol's GHG Emissions Transport Calculator is a tool to assist with these calculations.
5. Convert kg to metrics tons of CO2 (multiply kg of CO2 by 0.001) to get metric tons of CO2 per vehicle type.
6. Sum the metric tons of CO2 for all vehicle types to get total metric tons of CO2 for all vehicles in the hospital's fleet.
7. Utilize conversion factors to translate units of fuel per model year/vehicle type into grams of methane (CH4) and nitrous oxide (N20) per vehicle mile traveled.
8. Multiply total grams of CH4 by 25 (CO2 equivalency factor for methane according to the IPCC 4th assessment) to get grams of CO2e, and then multiply by 0.01 to get metric tons of CO2e.
9. Multiply total grams of N20 by 298 (CO2 equivalency factor for nitrous oxide according to the IPCC 4th assessment) to get grams of CO2e and then multiply by 0.01 to get metric tons of CO2e.
10. Sum the metric tons of CO2e from methane, nitrous oxide, and CO2 for all vehicle types to get total metric tons of CO2e for all vehicles in hospital's fleet. If a fleet has biogenic CO2 emissions from the combustion of biomass, they should be reported within the inventory but separate from the scopes. For example, biogenic emissions from the ethanol component of an E85 blend would need to be reported separately from the fossil fuel emissions from the gasoline component.

Measurement: Anesthetic gases

Establishing a baseline for anesthetic gases is an important step toward understanding a health care facility's impact and tracking progress toward reducing that impact.

The most common gases used for anesthetic and analgesic purposes in the U.S. are sevoflurane, isoflurane, desflurane, and nitrous oxide. Currently, the method to estimate impact of these gases is to use the volume of each gas purchased. Purchasing varies across facilities.

- Work with the anesthesia department, medical gas vendor, or clinical engineering to obtain the total nitrous oxide (pounds) purchased annually.
- Work with the anesthesia department or the pharmacy to obtain the purchase volume for sevoflurane, isoflurane, and desflurane purchased annually.

Establishing a baseline for anesthetic gases is an important step toward understanding a health care facility's impact and tracking progress toward reducing that impact.

There are a few options for calculating MTCO2e for anesthetic gas. The Practice Greenhealth awards application has a calculator built into the Greening the OR section, a formula is built into the Practice Greenhealth GHG Inventory Tool, or follow these steps to calculate:

Anesthetic agent	Where	Number of bottles purchased	Size*	Calculate	Footprint
Sevoflurane	Work with anesthesia champion, pharmacy, clinical engineering; use general surgery/ OR information system, EMR*		Typically 100 or 250 mL	(1.52g/mL)(130)/ (1000kg/g) (MTCO2E/ 1000CO2E)	
Isoflurane	Work with anesthesia champion, pharmacy, clinical engineering; use general surgery/ OR information system, EMR*		Typically 100 or 250 mL	(mL)(1.5g/mL) (510)/1000kg/g) (MTCO2e/1000CO2E)	
Desflurane	Work with anesthesia champion, pharmacy, clinical engineering; use general surgery/ OR information system, EMR*		Typically 240 mL	(mL)(1.46g/mL) (2540)/1000kg/g) (MTCO2E/ 1000CO2E	
Nitrous oxide	Work with anesthesia champion, medical gas vendor, clinical engineering to find total nitrous oxide (lbs) purchased for facility*		Typically medical gas vendor provides total lbs purchased for facility	(# lbs)(1 kg/2.2046)(298) (MTCO2e/1000CO2e)	

*When gathering data, ensure all potential vendors are identified and total facility consumption is captured.

The American Society of Anesthesiologists identified that the 100-year time horizon global warming potential (GWP) of desflurane is 2540, isoflurane is 510, and sevoflurane is 130, based on the Assessing the Impact on Global Climate from General Anesthetic Gases study in the Anesthesia & Analgesia Journal. The GWP for nitrous oxide of 298 comes from the IPCC 4th Assessment report.

Measurement: Refrigerants

Refrigerants are powerful greenhouse gases, and small leakages can be a significant component of a greenhouse gas inventory. These are typically refrigerants or coolants that inadvertently leak from HVAC or refrigeration equipment. Project Drawdown ranks refrigerants as the No. 1 solution for reversing global warming. Given the regulatory environment for the U.S. health care sector, most hospitals report that this is less than 5 percent of their overall GHG footprint, but it is still critical to confirm that is the case for each hospital. Given this information, there are a number of paths that can be taken to capture refrigerant emissions in a GHG inventory:

1. Conduct continuous full tracking and reporting using actual invoices and refill rates of refrigerants gathered through purchasing data. Utilize the GHG Protocol Global Warming Potential Values resource to identify the emissions factor for each refrigerant.
2. Use an internally developed estimation methodology for refrigerant leakage that is transparently shared in the reporting process. The leakage rate provided by the Climate Registry for this methodology is 15 percent, but utilizing baseline information, it could be customized to a more accurate number for the hospital/health system. Utilize the GHG Protocol Global Warming Potential Values resource to identify the emissions factor for each refrigerant.
3. Determine the full tracking of refrigerants using invoices, and then determine the percent of total GHG footprint. If less than 5 percent of the hospital footprint, the organization may utilize a simplified methodology for calculating refrigerants with a plan to revisit and check in three to five years. Utilize the GHG Protocol Global Warming Potential Values resource to identify the emissions factor for each refrigerant.

As an example using the second method, a Practice Greenhealth member shared their calculations for direct emissions of fugitive hydrofluorocarbons in all utility cooling and air conditioning equipment.

The emissions factors have been created based on national averages for a number of variables to provide a rough estimate of these emissions. The methodology behind these emissions factors is outlined below. Square footage data is based on end-of-year building totals for all owned buildings in the organization's real estate portfolio assumed to be operating chillers. Here's a detailed explanation of all assumptions used to determine which buildings operated chillers in the most recent calendar year:

1. When determining the square footage of buildings that operate chillers, we assume that only high occupancy buildings have chillers.
2. Of buildings assumed to have chillers, only those activated between 1995 and the end of the most recent calendar year will use chillers with HFC refrigerants. (Prior to 1995 = different refrigerants. After the most recent calendar year = not yet active and chilling the building.)
3. Scope 1 square footage is from all owned buildings as well as square footage from all leased buildings with billed natural gas use. Scope 3 (excluded from our GHG inventory) square footage is square footage from all leased buildings where natural gas use was not billed to the company. The assumption is that no billed usage means the company is not in financial or operational control of the boiler, and therefore also would not be in control of any building chillers.

Calculation for estimating fugitive HFC emissions from building space using air conditioning

Average cooling capacity of chiller (ft2/ton of cooling capacity)[1]	400
HFCs in chiller (kg HFC/tons of cooling)[2]	1.2
Annual HFC loss factor[3]	15%
Total annual HFC losses (MT HFC/1000 ft2)	.000450
Percent of buildings using chillers with R-134a	60%
Percent of buildings using chiller with R-410a	35%
GWP for R-134a[4]	1,300
GWP for R-410a[4]	1,725
Total annual HFC losses (MT CO2e)/1000 sq ft[5]	.623

1. HVAC sizing guidance from the American Society of Heating, Refrigerating and Air-Conditioning Engineers. Note: This is an estimate for an average U.S. building; a reasonably designed building in a climatic zone with hotter-than-average temperatures would have a lower cooling capacity (e.g., 280 ft2/ton in the Sacramento Valley).
2. Conservative assumption based on highest reported average refrigerant charge in 2004 USGBC interim report. The LEED credit for Enhancement Refrigerant Management (LEED BD+C New Construction | v4 – LEED v4 Enhanced Refrigerant Management) indicates a range of "0.5 to 5.0 lbs of refrigerant per ton of gross AHRI rated cooling capacity."
3. The Climate Registry General Reporting Protocol (GRP) v1.1., page 130; EPA Climate Leaders Guidance, January 2004. Note: This estimate is the source of the greatest uncertainty in the calculation, since the range is 2-15 percent. We assume the average is about 5 percent. However, the Climate Registry's General Reporting Protocol requires us to assume an operating emission factor of 15 percent for chillers. (See Table 16.3 of the protocol.)
4. The Climate Registry General Reporting Protocol (GRP) v1.1.
5. Emissions factor applied to the square footage of air-conditioned space. Equation: (HFC losses/1000 ft^2 * R-134a % * R-134a GWP) + (HFC losses/1000 ft^2 * R-410a % * R-410a GWP) = MT CO2e/1000 ft^2

Measurement: Limited Scope 3

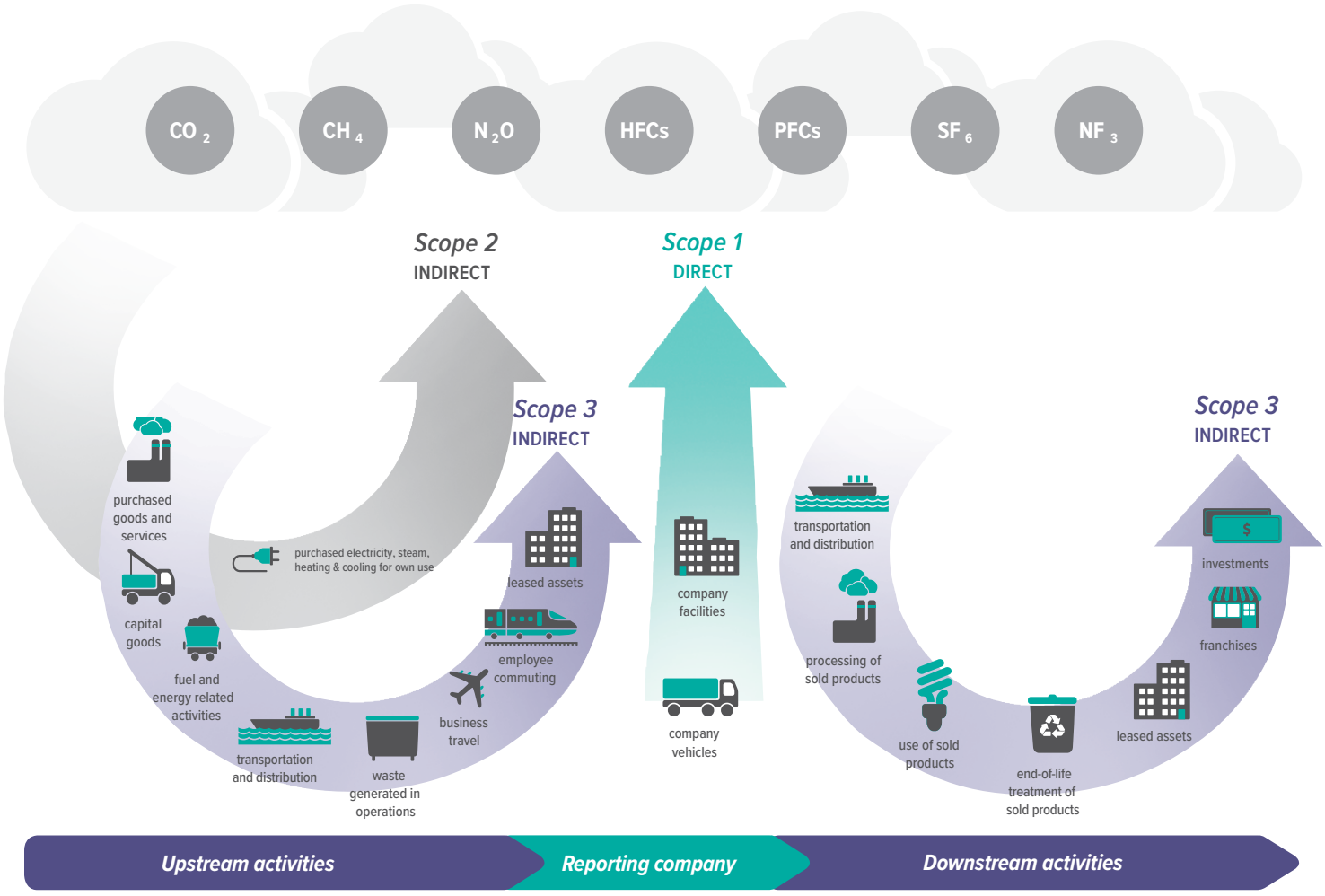
Scope 3 are the indirect emissions not covered in Scope 2 — basically, everything else. The GHG Protocol provides general guidance in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard, as well as a Technical Guidance for Calculating Scope 3 emissions, and breaks Scope 3 into 15 different categories.

Scope 3 is the most difficult to quantify, but it's critical due to its enormity. The National Health Service report on Identifying High Greenhouse Gas Intensity Procured Items found that 57 percent of its greenhouse gas footprint was comprised of Scope 3 purchased goods and services.

To get started on Scope 3, the categories must be places where data is available and obtainable and represent a significant portion of the footprint to make reductions. Practice Greenhealth recommends starting with these four categories:

- Business travel
- Employee commute
- Meat procurement
- Waste

Overview of GHG Protocol scopes and emissions across the value chain



Source: GHG Protocol Scope 3 Guidance

Business travel

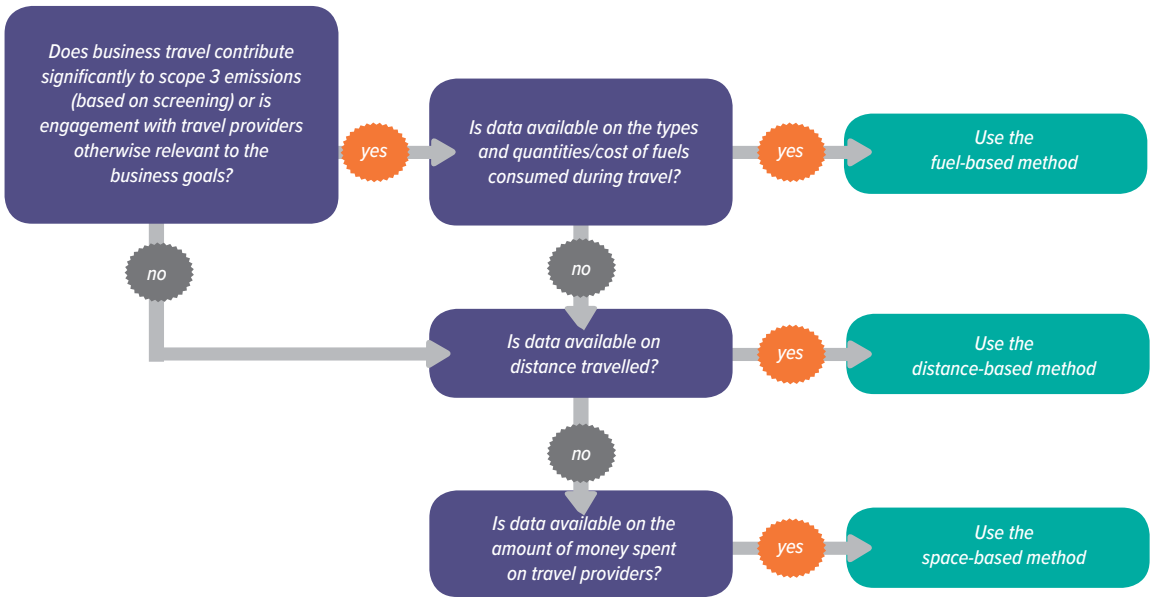
GHG Protocol's Guidance on Business Travel has three methods for calculating these emissions:

1. Fuel-based method: Determining the amount of fuel consumed and applying the appropriate emissions factor.
2. Distance-based method: Identifying the distance and mode of travel and applying the appropriate emissions factor.
3. Spend-based method: Identifying the amount of money spent on each type of mode of travel and then applying a secondary emissions factor.

To determine which method to utilize, follow the GHG Protocol's decision tree:

GHG Protocol's Guidance on Business Travel has three methods for calculating emissions.

Decision tree for selecting a calculation method for emissions from business travel



Source: GHG Protocol Scope 3 Guidance

Once the type of method is selected, see GHG Protocol's Category 6 Guidance for instructions on how to collect the data and identify the correct emissions factor.

Employee commute

Establishing an employee commute baseline typically involves the administration of a survey to a representative sample of organizational employees. Whether questions about the employee commute are incorporated into an existing employee survey or administered on a stand-alone basis, a review of survey administration guidelines will help ensure reliability and validity of survey results. Practice Greenhealth's sample employee commute survey offers questions needed to collect the appropriate data.

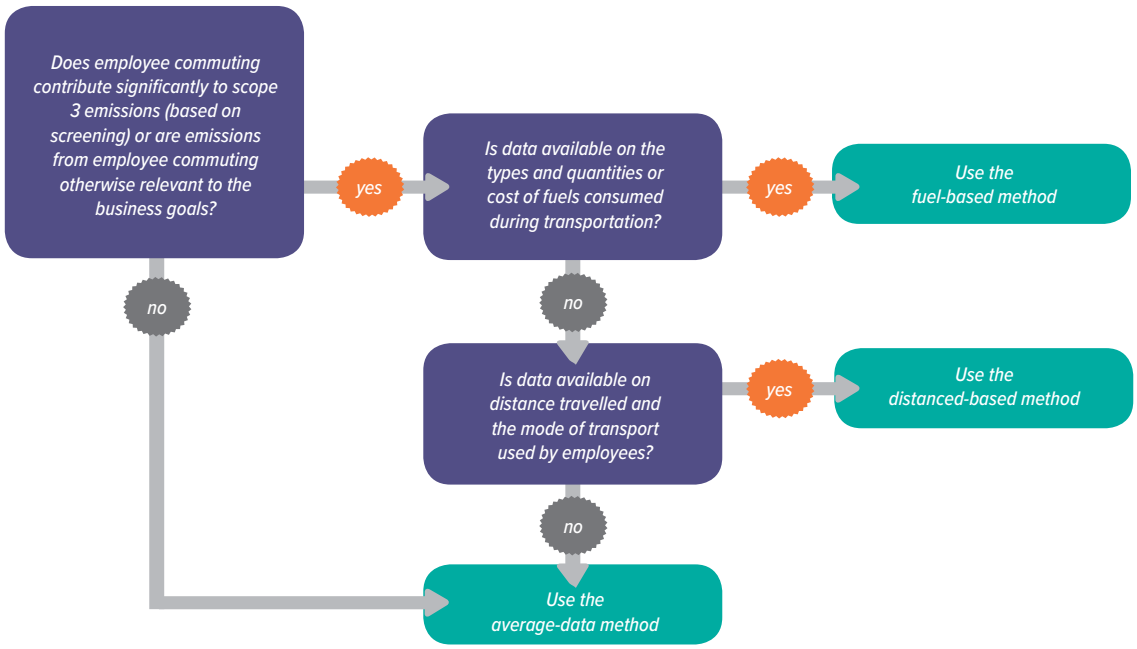
GHG Protocol's Guidance on Employee Commute outlines three methods for calculating these emissions:

1. 1. Fuel-based method: Determining the amount of fuel consumed during commuting and applying the appropriate emission factor for that fuel.
2. 2. Distance-based method: Collecting data from employees on commuting patterns (e.g. distance travelled and commuting mode) and applying appropriate emission factors for the modes used.
3. 3. Average data method: Estimating emissions from employee commuting based on average (e.g. national) data on commuting patterns.

To determine which method to utilize, follow the GHG Protocol's decision tree:

GHG Protocol's Guidance on Employee Commute outlines three methods for calculating these emissions

Decision tree for selecting a calculation method for emissions from employee commuting



Source: GHG Protocol Scope 3 Guidance

Once the method is selected, see the Category 7 guidance from GHG Protocol for instructions on how to collect the data and identify the correct emissions factor.

Meat procurement and reductions

The commitment to reduce meat and poultry purchases serves as both a climate change mitigation mechanism and an opportunity to serve and model the healthiest diet for hospital patients, staff, and visitors. Most hospitals buy substantial amounts of meat, typically through large distributors that source from the U.S. commodity beef, pork, and poultry markets. Reducing the overall amount of meat served in hospitals provides health, social, and environmental benefits consistent with prevention-based medicine.

To determine the facility's baseline purchasing levels of beef, pork, poultry, and lunch meat in pounds of product from the previous year's records, establish a method and routine for tracking these purchases. Consider engaging your food suppliers to provide you with a summary report per food category on a regular basis, such as quarterly or monthly. Health Care Without Harm and Practice Greenhealth have partnered with the World Resources

Institute to assist hospitals in participating in the Cool Food Pledge to track and reduce their food purchasing footprint. Our shared Food Category Tracking Tool can be useful for starting this baseline. This tool also tracks foods purchased and served other than meat, including seafood and plant-based proteins, to provide a broader picture of the impact on balanced menus. To convert to GHG emissions, this shared Cool Food Pledge GHG Calculator will translate your food category purchases.

Waste streams and reductions

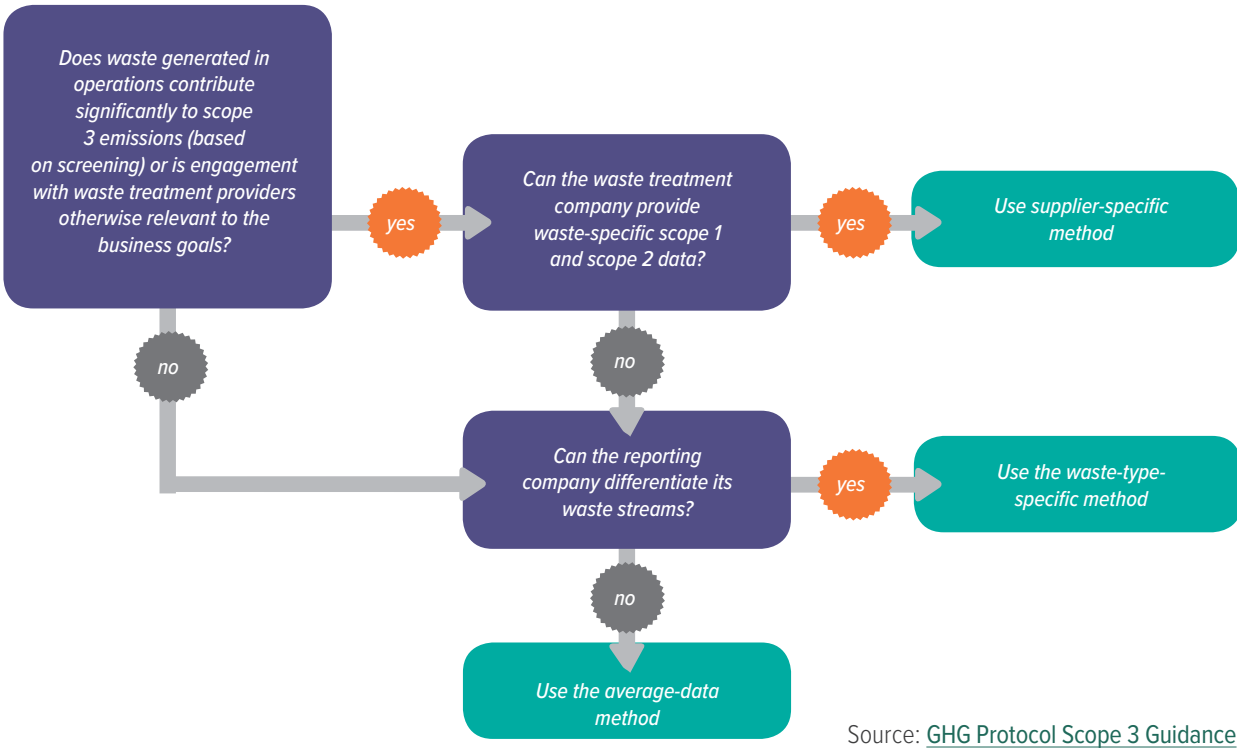
Hospitals generate 30 pounds of waste per staffed bed per day. Beyond concerns about the increasing waste removal fees and changes in the recycling markets, waste disposal can have health impacts on the communities hospitals serve. Waste incinerators emit more carbon dioxide per megawatt-hour than any other fossil fuel-based power source, including coal-fired power plants, and have been linked to an increased risk of asthma in surrounding communities. Landfilled waste produces methane, a potent greenhouse gas with 28 times the global warming potential of carbon dioxide over 100 years.

GHG Protocol's Guidance on Waste Generated in Operations outlines three methods for calculating emissions from waste:

1. Supplier-specific method: Collecting waste-specific Scope 1 and 2 emissions data from waste treatment companies, such as incineration or recycling.
2. Waste-type specific method: Utilizing emissions factors by waste type and treatment.
3. Average data method: Estimating emissions based on total waste going to each type of disposal method and average emissions factor for each disposal method.

To determine which method to utilize, follow the GHG Protocol's decision tree:

Decision tree for selecting a calculation method for emissions from waste generated in operations



Source: GHG Protocol Scope 3 Guidance

After the method is selected, see GHG Protocol's Category 5 guidance for instructions on how to collect the data and identify the correct emissions factor. It is important to note that there are limitations with incomplete emissions factors for certain waste streams such as pharmaceuticals and regulated medical waste streams.

If the waste-type specific method is selected, Mazzetti's M+WasteCare calculator can help calculate and compare environmental impacts.

Reporting GHG mitigation efforts

Once reductions are achieved through efficiencies, or cleaner energy or offsets have been purchased, it is important to capture and accurately report those reductions.

Renewable energy

The GHG Protocol issued guidance about how to account for Scope 2 emissions from purchased electricity, including renewable energy certificate purchases and power purchase agreements. The updated standard is intended to better capture the impacts of the current renewable energy market structure and institutional renewable energy purchasing practices. The GHG Protocol now asks institutions to report their Scope 2 emissions from purchased electricity using the two methods highlighted in this section: the market-based method and the location-based method.

Carbon offsets

Carbon offsets would be subtracted from the total Scopes 1 and 2 (and 3, if applicable) emissions. It is recommended to verify the carbon offsets are Green-e Certified. Green-e provides a list of qualifying projects. The GHG Protocol Corporate Standard recommends gross emissions should be reported separately from offsets. In other words, a net emissions figure should not be reported without the context of how much of that represents the offsets.

Source reduction

Similar to energy reduction, the changes in source reduction will be seen over time in comparison to the baseline year. It's critical to understand the significance threshold and base year recalculation so when new square footage is added, it can be accounted for and not seen as an increase in emissions over the year.

Looking ahead

While this toolkit only focused on a limited number of Scope 3 categories, there will be another toolkit that does a deeper dive into additional categories of Scope 3. Corporations are starting to lead on setting Scope 3 targets due to the enormous risk climate change poses to their supply chain, as well as the footprint Scope 3 represents. Emerging research for health care shows that the footprint of Scope 3 is massive, and it will soon be time for health care to leverage its supply chain power to make changes that will ripple across industries.

Leadership engagement and goal setting

Setting a greenhouse gas (GHG) reduction goal is imperative to making progress. As the saying goes, "you can't manage what you don't measure." But goal setting begins with engaging leadership in the process.

This process will be familiar to those who have participated in Practice Greenhealth's Engaged Leadership Challenge as the steps are similar.

1. Understand the goal options to address greenhouse gas emissions.
2. Find champions.
3. Make the case.
4. Identify and share successes to date in a format that makes sense to the audience.

Goal options and examples

The Practice Greenhealth GHG reduction goals have been developed to help hospitals create a baseline, set targets, and identify strategies to reduce emissions to lessen the environmental and human health impacts of emissions-related activities.

	Levels	Measure
Level 1	Establish a baseline GHG inventory and continue to track Scopes 1 and 2. RECOMMENDED: • Establish a baseline GHG inventory for a select number of Scope 3 emissions. Join the Health Care Climate Challenge if not already participating.	Determine annual GHG emissions using the GHG Inventory Tool for Scope 1 and 2 emissions categories: • Energy onsite and purchased • Refrigerants • Fleet vehicles • Anesthetic gases Joining the Health Care Climate Challenge commits your organization to setting a GHG reduction goal within a year. Data for the challenge will be captured through the Practice Greenhealth awards process.
Level 2	Set a goal: Reduce GHGs by XX% by 20XX from baseline year 20XX (Scopes 1 and 2). RECOMMENDED: • Establish a baseline GHG inventory for a select number of Scope 3 emissions. Join the Health Care Climate Challenge if not already participating.	Determine annual GHG emissions using the GHG Inventory Tool for Scope 1 and 2 emissions categories: • Energy onsite and purchased • Refrigerants • Fleet vehicles • Anesthetic gases Scope 3: Establish baseline in select areas.
Level 3	Set a goal: Carbon neutral by 20XX (Scopes 1 and 2) RECOMMENDED: • Establish a baseline GHG inventory for a select number of Scope 3 emissions. Join the Health Care Climate Challenge if not already participating.	Determine annual GHG emissions using the GHG Inventory Tool for Scope 1 and 2 emissions categories: • Energy onsite and purchased • Refrigerants • Fleet vehicles • Anesthetic gases Scope 3: Establish baseline in select areas.

At least 15 Practice Greenhealth member health systems have already set some type of GHG reduction goal. The most ambitious is Kaiser Permanente, which set a goal to be carbon net positive by 2025 goal, as well as a 100 percent renewable electricity goal to help achieve that. Hospitals in the Boston and New York City area have aligned with city-wide efforts. Boston's Green Ribbon Commission is a task force set up to help achieve the city-wide target of carbon neutrality by 2050 and includes a health care working group to engage Boston area hospitals, which include over 65 buildings with 24 million square feet. Partners HealthCare and Boston Medical Center are aligned with the carbon neutral goal by 2050. New York City has set up a city-wide Carbon Challenge, and similar to Boston, has a hospital work group to help support their journey to a 50 percent reduction goal by 2025. There are a number of other cities and states that have set GHG reduction goals. A report from the World Wildlife Fund, Measuring up 2015: How US Cities are Accelerating Progress Towards National Climate Goals, reviews 34 cities that have at least committed a goal of reducing GHG emissions 80 percent by 2050. The Carbon Disclosure Project has a database that can be filtered by countries to see all the cities that have made any type of GHG reduction goal, and Arup and C40 aggregated city climate commitments in this report.

To date, health system goals have only addressed Scope 1 and 2 emissions. For Scope 2 reporting, organizations can choose to set a goal based on either market- or location-based methodology or set a goal for each. If an organization is planning to use instruments such as renewable energy certificates (RECs) or power purchase agreements (PPAs) to meet their goal, a market-based approach is highly recommended. For additional information on selecting a method to follow for a goal, see the Greenhouse Gas Protocol's Scope 2 guidance.

Examples of Practice Greenhealth member GHG reduction goals

- Boston Medical Center: 25% by 2020 and 100% by 2050
- Cleveland Clinic: Carbon neutral by 2027
- Dartmouth Hitchcock: 25% reduction by 2020
- Dignity Health: 40% reduction by 2020
- Gundersen Health: Energy independence achieved in 2014
- Kaiser Permanente: Carbon net positive by 2025
- Memorial Sloan Kettering: 50% reduction by 2025
- Montefiore Health System: 50% reduction by 2025
- NYU Langone: 50% reduction by 2025
- Ohio State Wexner Medical Center: Carbon neutral by 2050
- Partners Healthcare: 25% by 2020 and 100% by 2050
- Providence St. Joseph Health: 30% reduction by 2025 and 100% by 2040
- Rochester Regional Health: 100% renewable electricity by 2025
- Sutter Health: 50% by 2025 and 80% by 2030 with a 2014 baseline
- University of California Health: Carbon neutral by 2025
- Virginia Mason Memorial Yakima: Carbon neutral by 2025

For some hospitals and health systems, a greenhouse gas reduction goal is not the right fit for their leadership or the communities they serve. Those members can consider a few other types of goals to commit to for Level 1:

- **Energy independence goals:** Gundersen Health achieved its first days of energy independence in October 2014 by implementing deep energy efficiency measures and developing its own portfolio of renewable energy generation projects.
- **100 percent renewable energy/electricity goals:** Rochester Regional Health became the first health system to publicly announce a 100 percent renewable electricity goal by 2025. They have a 500-kilowatt solar array at system headquarters and are working to bring other projects online including a 5.5 megawatt solar farm, additional onsite solar, and an off-site 10 megawatt wind farm.
- **Public and ambitious energy efficiency/reduction goals:** Ascension's Environmental Stewardship Program met the Better Buildings Challenge goal of 20 percent energy reduction by 2020 across its acute care hospital portfolio more than three years early. From July 1, 2008, through Dec. 31, 2016, Ascension reduced energy use by 21 percent, saved $53.3 million, and reduced over 1,114,600 tons of carbon dioxide emission across 141 health care facilities.
- And it's not just large health systems that can achieve significant savings. Advocate Eureka Hospital, a critical access hospital in Illinois, achieved ENERGY STAR certification two consecutive years and was recognized by the American Society for Healthcare Engineering for their significant energy reduction of more than 10 percent in just a year.

Comparing market-based and location-based methods: Set a goal for one or both

	Market-based method	Location-based method
Definition	A method to quantify the scope 2 GHG emissions of a reporter based on GHG emissions emitted by the generators from which the reporter contractually purchases electricity bundled with contractual instruments, or contractual instruments on their own	A method to quantify scope 2 GHG emissions based on average energy generation emission factors for defined geographic locations, including local, subnational, or national boundaries
How method allocates emissions:	Emission factors derived from the GHG emission rate represented in the contractual instruments that meet Scope 2 Quality Criteria	Emission factors representing average emissions from energy generation occurring within a defined geographic area and a defined time period
Where method applies:	To any operations in markets providing consumer choice of differentiated electricity products or supplier-specific data, in the form of contractual instruments	To all electricity grids
Most useful for showing:	• Individual corporate procurement actions • Opportunities to influence electricity suppliers and supply • Risks/opportunities conveyed by contractual relationships, including sometimes legally enforceable claims rules	• GHG intensity of grids where operations occur, regardless of market type • The aggregate GHG performance of energy-intensive sectors (for example, comparing electric train transportation with gasoline or diesel vehicle transit) • Risks/opportunities aligned with local grid resources and emissions
What the method's results omit:	• Average emissions in the location where electricity use occurs	• Emissions from differentiated electricity purchases or supplier offerings, or other contracts

Source: GHG Protocol Scope 2 Guidance

Finding champions

Determining who your climate champions are at all levels and the kind of influence they have is critical to beginning the goal setting process.

Cleveland Clinic's Office for a Healthy Environment senior director Jon Utech describes the process of building momentum toward a carbon neutral goal as engaging leaders with different climate "hooks." He took the time to understand what mattered to his stakeholders and tailored his message to reflect their priorities. For example, for his human resources leader, he focused on the positive impact a GHG reduction goal and mitigation plan could have on employee recruitment and engagement based on research in the field. For his CFO, he highlighted the anticipated cost savings and risk mitigation.

Cleveland Clinic climate pitch summary

Climate "hook"	Sample message for leader
Mitigation	Save $50 million+
Engagement	Attract the best
Resilience	Adjust to the future
Relationships	Build partnerships
Population health	Impact regional health
Societal transformation	Change the nexus
Transpersonalism	Be the change
Moral obligation	Do the right thing
Leadership	Lead the sector

Source: CleanMed 2018 presentation: Demystifying Greenhouse Gas Tracking and Goal-setting in Health Care

Following that lead, take a moment to fill in this table for your own hospital or health system leadership, courtesy of Cleveland Clinic's Office for a Healthy Environment.

Role	Individual	Relevant information	Climate "hook"
CEO			
CFO			
Chief of staff / medical director			
Chief human resources officer			
Government affairs			
Chief nursing officer			
Chief marketing officer			
Nurses			
Physicians			
Facilities			
Frontline caregivers			
Other leaders with influence			

Making the case

Once the champions are identified, consider the appropriate messenger(s) for a formal request to leadership and what initiatives have been well-received in the past. After completing the table above, consider which voice has the combined background, standing in the organization, and comfort level in talking with leadership about a formal commitment to greenhouse gas tracking, goal setting, and reduction measures. Provide these individuals with information and data to make the case, such as cost saving information, recruitment statistics, how it aligns with other strategic priorities, and health outcome projections. Practice Greenhealth's Making the Case worksheet may be a useful resource to identify the leverage points that will resonate with leadership. Due to the complexity of the issue, it may be helpful to have two or three people message the request with different backgrounds, such as a clinical leader, energy manager, human resources, or quality professional.

Perhaps other ambitious goals have already been established at the organization. Review existing goals to see where a new greenhouse gas reduction goal could fit and look at overarching goals to demonstrate the value it brings to achieving existing goals and/or priority areas. Connect the dots for leadership to help them recognize that GHG reduction will help achieve other goals, such as cost savings and community health improvement.

As stated in Setting Greenhouse Gas Goals to Protect Health, health care has three key points to make the case in setting a goal:

1. The imperative: Climate change affects health and health care delivery, and hospitals are dealing with the impacts today. Reducing GHG emissions protects the health of patients, employees, and communities.
2. Mission alignment: Health care's carbon footprint is significant, and a hospital cannot simultaneously contribute to climate change and meet its mission to "do no harm."
3. Operational benefits: Reducing GHG emissions leads to cost savings and makes hospitals more resilient in the face of extreme weather events.

The American Hospital Association's Sustainability Roadmap offers guidance around setting energy-related targets and recommends hospitals drastically decrease the use of fossil fuels:

- Stop all increases in consumption of energy from fossil fuels no later than 2015.
- Drop energy consumed from fossil fuels to 40 percent below current levels by 2020.
- Further decrease fossil fuel consumption to 80 percent below current levels by 2050.

Many medical societies are also releasing statements or setting ambitious goals. The Medical Society Consortium on Climate and Health has a list of medical societies that have signed their consensus statement and are beginning to make commitments of their own.

Action by other sectors

Health care can point to GHG reduction progress by leaders in other sectors to help make the case. Many are following guidance from the U.N. Intergovernmental Panel on Climate Change (IPCC). In its fifth climate assessment report, the IPCC, which represents our best scientific understanding of climate change, found that we need to reduce our greenhouse gas emissions 40 to 70 percent below 2010 levels by 2050 and 100 percent by 2100 to avoid a 2 degree Celsius warming, which is the scientifically agreed level to avoid catastrophic impact. This drove the development of the Paris Agreement, under which countries committed to a long-term goal of keeping the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels and aim to limit the increase to 1.5 degrees Celsius to significantly reduce risks and the impact of climate change.

The guidance and agreement triggered action in U.S. cities and states and around the world. Both Boston and New York City have recommended goals and committees to support many different sectors, including health care, to make progress toward these goals. Health Care Without Harm contributed to guidance for municipalities to include goals and strategies to tackle meat reduction in their climate action plans as part of a toolkit released in 2017. California has some of the most ambitious GHG reduction goals in the country. Building a Climate-Smart Health Care System in California presents recommendations for hospitals and policymakers to support the health care sector, which makes up 13 percent of the state's GDP, in contributing to the state's reduction goals.

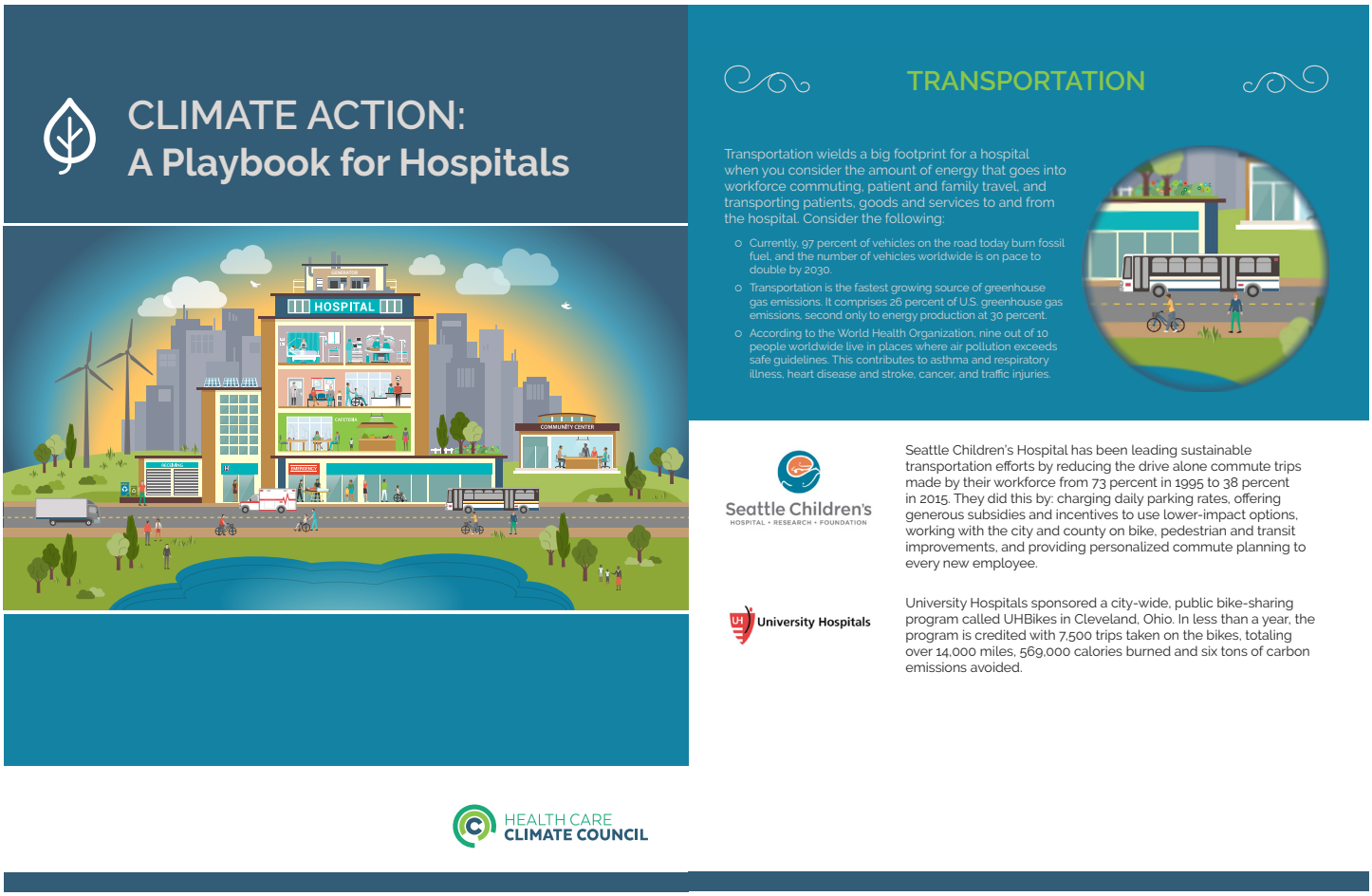
An analysis of 600 companies showed that those experiencing the impacts to their business are the ones taking action. Nine out of 10 Fortune 500 companies reporting to the Carbon Disclosure Project use the GHG Protocol standard to set their goals and report on progress, and they are making a real difference: The reported annual emission reductions from these companies are equivalent to taking 45 coal-fired power plants offline for one year, according to Power Forward 3.0.

Universities are also taking notice. Thirteen prestigious universities came together to form the University Climate Change Coalition and create a roadmap for university action on climate change. Their aim is to "prototype a collaborative model designed to help local communities achieve their climate goals and accelerate the transition to a low-carbon future." The Presidents' Climate Leadership Commitment has been signed by hundreds of college presidents and chancellors, and nearly 350 universities have signed onto the We Are Still In pledge. The University of California, a member of the university coalition, includes their health system as part of its goal to be carbon neutral by 2025. An added bonus is students choosing their university based on its green rating.

It is time for a turning point in the health sector as well. In the Commonwealth Fund article, To Be High Performing, the U.S. Health System Will Need to Adapt to Climate Change, Dr. David Blumenthal and Shanoor Seervai make the point that lowering emissions from health care will allow the sector to reduce the cost of care as well as help hospitals meet their mission of improving health. They note the health sector is beginning to respond, but it needs to happen at a faster pace and with larger numbers.

Identify and share successes

Your hospital or health system has likely already been working on sustainability initiatives in multiple areas that result in emissions reduction: energy, waste, transportation, and food. Capturing this information in a new way — through emissions reduction in addition to cost savings — is a critical component to sharing successes to date. Tracking greenhouse gas emissions provides the ability to compare with other sectors, be proactive and prepare for future regulation or mandatory reporting, and to identify opportunities to reduce costs. Take a look at the Climate Action Playbook to see where there have been successes by other Practice Greenhealth members and Health Care Climate Council members, and capture the emissions reductions and cost savings related to those initiatives.

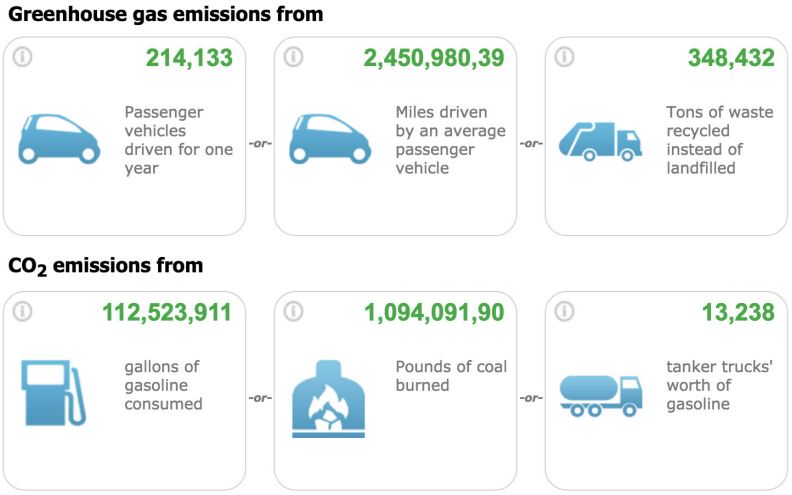


Source: Health Care Without Harm Climate Action Playbook

When presenting data on emissions reduction, it can be helpful to convert these numbers into more understandable and meaningful impact indicators:

1. The Energy Impact Calculator estimates premature deaths, chronic bronchitis, asthma attacks, emergency room visits, and more by kilowatt hour per year, based on energy consumed.
2. EPA's GHG equivalencies calculator allows users to input energy or emissions data and convert into cars off the road, gallons of gasoline, coal burned, number of homes' energy and electricity use for a year, etc. This can be used for different activity emissions — from energy to meat reduction.
3. EPA's WARM calculator determines emissions reduction from reducing waste, and moving to recycling or composting over traditional landfill options.
4. The EPA's social cost of carbon method estimates the benefits of GHG reductions, which includes items such as "changes in net agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning." The value used by the federal government in 2015 was $37 per metric ton of CO2, but other studies have estimated the cost to be as high as $220 per metric ton of CO2.

Sample greenhouse gas emissions equivalents



Source: EPA's GHG equivalencies calculator

Looking ahead

The most cutting-edge approach is to set a science-based target (SBT), which is an emission reduction target aligned with climate science. There are two methods for setting an SBT:

1. Sector-based approach: The global carbon budget is divided by sector, and an organization's required emissions reduction is sector-specific.
2. Absolute-based approach: All companies reduce their absolute emissions at the same rate, which refers to the total quantity of GHG emissions.

This is not part of Practice Greenhealth's current recommendation goal structure, but an important methodology to be aware of for future goal setting.

Engaging leadership has always been a critical step in the process for achieving sustainability goals, and this is no exception. Leaders who understand the importance of a GHG reduction goal and the multiple benefits that come with it — cost savings, community health improvement, risk mitigation — will be champions for this work and the journey ahead.

Making GHG reduction progress

Once the greenhouse gas (GHG) goal has been set with a baseline and target year, the next step is to develop a plan to meet the reduction goal. As highlighted in the section on goal setting, there are likely multiple areas across the hospital where reduction work has already started; it just may not yet be identified as emissions reduction.

Source: Health Care Without Harm Climate Action Playbook

Steps to develop a GHG reduction plan:

1. Identify areas to reduce greenhouse gas emissions and set targets for reduction.
2. Develop action plans with annual milestones needed to achieve these reductions.
3. Monitor and report progress internally and externally.

Several reports identify strategies for emissions reduction in different areas of a health care facility. "Addressing Climate Change in the Health Care Sector: Opportunities for Action" outlines strategies in energy, transportation, waste, and food services. The Lancet recently published a study on the carbon reduction strategies in the operating room, with a focus on desflurane, an anesthetic gas, and occupancy-based ventilation reduction strategies.

The World Bank's Climate-Smart Health Care report provides examples of actions on page 10 in "Mitigation strategies applicable to the health sector," as well as on page 17 in "Climate-smart interventions and the related GHG scopes." For a U.S.-specific example, "Building a Climate-Smart Health Care System in California" includes a set of sector recommendations and actions to further progress.

Mitigation strategies applicable to the health sector.

MITIGATION STRATEGY	ACTIONS	GHG IMPACT	HEALTH BENEFITS
Improve energy supply and distribution efficiency	• Fuel switching • Energy recovery • Distributed generation • Combined heat & power	• Reduced transmission losses • Reduced emissions from energy use, fuel production and transport	• Immediate energy savings and operational resilience/reliability • Reduced air pollution exposures • Improved access to reliable healthcare • Better energy security
On-site renewable energy sources	• Solar photovoltaics • Thermal solar energy • Wind • Other renewable energy sources	• Reduced emissions from energy use, fuel production, and transport	• Improved operational resilience/reliability • Long-term energy savings • Reduced ambient air pollution • Better energy security
Reduced-energy devices	• Non-electric medical devices • Direct-current devices • Energy efficient appliances	• Reduced emissions from energy use, fuel production and transport	• Energy and operations savings and energy security • Improved functionality at night and device reliability • Improved diagnosis of tuberculosis with low-energy LED microscopes • Increased access to healthcare and energy security
Passive cooling, heating, and ventilation strategies	• Natural ventilation in healthcare settings • Evaporative cooling • Desiccant dehumidification • Underground earth-pipe cooling	• Reduced direct emissions from on-site energy production; reduced emissions from energy use, fuel production, and transport	• Energy and operations savings and energy security • Improved indoor air quality • Decreased transmission of airborne infections • Improved social welfare, productivity and patient health
Facility wastewater and solid waste management	• Advanced autoclaving of infectious healthcare waste • On-site wastewater pre-treatment and sanitation improvements • High-heat incineration of pharmaceuticals with pollution scrubbers	• Reduced energy emissions for waste and water treatment • Reduced greenhouse gas (GHG) footprint from waste treatment processes in some settings • Reduced aquifer and ecosystem damage	• Savings in waste/water disposal fees • Reduced waste volumes • Improved compliance with local air quality regulations/guidelines • Improved hygiene around facility • Reduced methane and other emissions • Reduced risks of exposure to infectious agents and to diarrhea and other waterborne diseases
Reduced GHG emissions from anesthesia gas use and disposal	• Waste anesthetic gas recapture and scavenging	• Reduced direct emissions from anesthesia gas waste	• Anesthesia cost savings with reuse • Reduced health risks for health workers exposed to gas • Improved health worker productivity
Reduced procurement carbon footprint	• Better-managed procurement of pharmaceuticals, medical devices, business products and services, food/catering, and other facility inputs	• Reduced energy footprint in production and transport of unused pharmaceuticals and products	• Resource savings on unused/wasted products • Reduced risks from use of outdated/expired products
Telehealth/ Telemedicine	• Home patient telemonitoring and guidance • Emergency response • Health worker advice & collaboration via mobile phones	• Reduced emissions from healthcare-related travel	• More cost-effective healthcare • Reduced risk of travel-related injuries • Improved management of chronic conditions, such as diabetes and heart disease, as well as emergency response • Better access to healthcare advice in poorly-resourced remote locations
Health facilities in proximity to public transport and safe walking/cycling	• Public transport options mapped during planning of buildings to locate new facilities nearby • Employee incentives for public active transport use and facilities	• Reduced transport-related emissions from health worker and hospital visitor travel	• Reduced traffic injury risk for health workers and hospital/clinic visitors travelling to health facilities • Potential for active transport by healthcare workers to reduce risks of hypertension, cardiac disease and diabetes • Improved facility access for health workers and visitors who do not have cars
Conserve and maintain water resources	• Water-efficient fixtures, leakage management, water safety • Onsite water treatment and safe water storage in health facilities • Rainwater harvesting, greywater recapture/ recycling	•Reduced energy use for water extraction from surface/aquifer sources, therefore lower emissions • Reduced truck transit of water resources	• Improved performance due to better access to safe water • Savings in water fees • Reduced water contamination from health facility activities • Reduced disease transmission from unsafe water and drinking water • Improved access to safe, potable water in poorly resourced health facilities • Reduced aquifer and ecosystem damage • Better water security

Source: World Bank's Climate-Smart Health Care report

Climate-smart interventions and the related GHG scopes.

INTERVENTIONS TO REDUCE GHG EMISSIONS	SCOPE 1	SCOPE 2	SCOPE 3
Infrastructure development:			
Buildings' design and construction: new and retrofit	x	x	x
Operational delivery:			
Energy including efficiency and renewables	x	x	
Waste disposal			x
Water	x		
Transport and Travel including planning, own fleet and tele-solutions	x		x
Food including purchasing and waste reduction			x
Procurement and supply chain engagement			x
Pharmaceuticals			x
Waste anaesthetic gases and health sector refrigerants	x		
Service delivery and low-carbon models of care	x	x	x

Source: World Bank's Climate-Smart Health Care report

Below are reduction opportunities with their corresponding resources and scope designation to help with the process of creating sub-goals to meet the overall reduction goal. Practice Greenhealth tools and resources listed below have suggested goals to help guide this work.

Energy

Because of the 24/7 nature of hospital operations, the U.S. health care sector spends $9.6 billion annually on energy, and energy use is a significant contributor to health care's carbon footprint. Using the Practice Greenhealth Energy Impact Calculator, a 30 percent cut in health care electricity carbon pollution by 2030 would reduce greenhouse gas emissions, preventing an estimated 4,130 premature deaths, 85,000 asthma attacks, 4 million respiratory symptom events, and 3,750 hospital visit incidents, saving about $1.2 billion in medical costs. So energy is a natural target for efficiency reductions and signals an opportunity to move toward clean energy or to begin to quantify reductions to date. There are many resources to help you reduce energy-related emissions.

> "We have reached a turning point. It is no longer just about raising the ceiling. It is about lifting the floor. The time has come for bold and scalable solutions, not just from a few leading companies, but from companies of all sizes and across all sectors who need to transition from making commitments to taking concrete actions."
>
> – MINDY LUBBER, CERES PRESIDENT AND CEO

Energy efficiency resources:

- The Practice Greenhealth Leaner Energy How To Guide outlines steps to form a team and bring together relevant stakeholders to address energy reduction.
- The Climate Action Playbook lists several examples of health systems making significant energy reductions and achieving cost savings.
- The Practice Greenhealth Energy Impact Calculator helps translate energy reductions or renewable energy into health impacts.
- EPA has a Combined Heat and Power Energy and Emissions Savings calculator.
- EPA's ENERGY STAR program provides a large number of resources, including Portfolio Manager to track and compare energy performance with other hospitals, a checklist of low-cost measures to implement, resources to obtain ENERGY STAR certification for free, a calculator to provide financial analysis for energy improvement projects, and a sample energy management policy from a hospital, among others.
- The American Hospital Association (AHA) and the American Society for Healthcare Engineers have a program called Energy to Care, which provides tools and guidance such as the Energy to Care Toolkit. This includes energy efficiency guidance, videos, and examples of performance improvement measures.
- The AHA Sustainability Roadmap for Energy also offers guidance, including a roadmap for energy management with tools for creating an energy management plan, strategies for financing projects, and easily adopted performance improvement measures for results at a low cost.
- Advanced Energy Economy has useful reports on energy efficiency, such as the Advanced Energy Market Trends Report, which can assist in building the case for leadership about trends of the energy market.
- The American Council for an Energy-Efficient Economy offers several helpful publications, such as Saving Energy, Saving Lives: The Health Impacts of Avoiding Power Plant Pollution with Energy Efficiency.

Renewable energy resources:

- The EPA Green Power Partnership has resources related to renewable energy procurement, such as the Green Power Equivalency Calculator.
- Rocky Mountain Institute's Business Renewables Center offers the Buyers Roadmap and various primers and guides.

Refrigerants

Refrigerants are powerful greenhouse gases, and small leakages can have an impact on a greenhouse gas inventory. These are typically refrigerants or coolants that inadvertently leak from HVAC or refrigeration equipment. Project Drawdown ranks refrigerants as the No. 1 solution for reversing climate change. Given the regulatory environment for the U.S. health care sector, most hospitals report that this is less than 5 percent of the overall footprint, but it is still critical to confirm that is the case for each hospital. The EPA offers resources and guidance for managing refrigeration and A/C equipment.

Anesthetic gases

The use of anesthetic agents is unique to the health care sector. While typically associated with inpatient and ambulatory surgical settings, anesthesia is also used in cardiac catheterization labs, GI endoscopy, diagnostic imaging procedures, labor and delivery, pediatrics, and other departments. Health care is responsible for nearly 10 percent of U.S. emissions, and of that, anesthesia is estimated to be responsible for 5 percent. Anesthetic gases — desflurane, sevoflurane, isoflurane and nitrous oxide — used for patient care are greenhouse gases. In many health care settings, the waste anesthetic gases — those gases that are exhaled or unused by the patient — are scavenged from the immediate clinical setting and vented directly off the roof of the building into the local community and atmosphere. A recent study from the Lancet focuses on carbon emissions reductions starting in the OR, and first with reducing desflurane, the anesthetic gas with the highest global warming potential.

Practice Greenhealth is developing an anesthetic gas toolkit. Here are additional resources to help build your case and complete the reduction work:

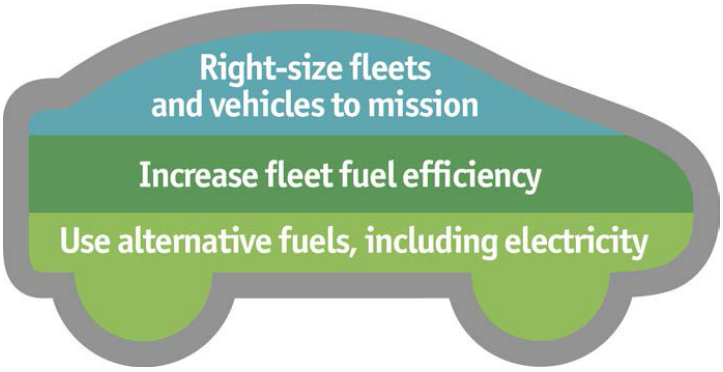
- American Society of Anesthesiologists: Greening the Operating Room and Perioperative Arena
- Practice Greenhealth compiled list of resources
- The impact of surgery on global climate: a carbon footprinting study of operating theatres in three health system
- Hospitals are scrambling to solve their air pollution issue
- University of Wisconsin-Madison Department of Anesthesiology: Sustainable Anesthesiology

Fleet vehicles

As community anchors, major employers, and as an economic sector, hospitals and health systems are ideally positioned to lead the transition to healthier transit modes and fuels, and in doing so, benefit occupational, financial, community, and environmental health. Transitioning to alternative transit modes and fuels means cleaner air, fewer greenhouse gas emissions, fuel savings, safer and more active, healthier communities. The public health hazards posed by air pollution make addressing the health impacts of hospital-related transportation a priority for hospitals and health systems working to reduce their overall environmental impact.

Many hospitals and health systems own, lease, or outsource fleet vehicles — including passenger and courier vehicles, ambulances, helicopters, shuttles, vans, buses, and light-, medium-, and heavy-duty trucks — to move patients, visitors, employees, and materials. Transitioning fleet vehicles away from conventional fossil fuels beginning with diesel — the worst offender in terms of hazardous airborne particulate matter and soot — toward low/zero-emission, fuel-efficient, and alternative-fuel vehicles is a key strategy for reducing air pollution as well as fuel and maintenance costs. The Practice Greenhealth Transportation toolkit has a recommended goal for fleet management that could build into an overall GHG reduction goal.

Federal, state, and local grants and nonprofit organization funding is available to help support transition from conventional to alternative fuels, such as electricity, compressed natural gas, ethanol, propane, hydrogen, methanol, and batteries. Additional fleet vehicle strategies include re-refining used motor oil, using and requesting lead-free wheel weights, and using nitrogen to fill tires. Tires inflated with compressed air lose close to two pounds per square inch per month, but it takes up to six months or more for the same loss with nitrogen. Nitrogen-filled tires have been shown to provide a 3.3 percent average increase in miles per gallon, eliminate chemical aging of the tire, promote longer tire life by up to 25 percent, and increase re-treadability, according to a Harvard University study.



Source: U.S. Department of Energy Report

Scope 3 emissions

Although the overall GHG reduction goal is typically set for Scopes 1 and 2, only in health care, Scope 3 reductions are a large part of health care's footprint and account for nearly 60 percent of the total footprint, according to the National Health Service Sustainable Development Unit. Scope 3 reduction targets can also be effective for influencing health care's supply chain and telling the hospital's story.

Employee commute and business travel strategies

Employee commute and business travel are Scope 3 areas that have both manageable data to gather and offer real cost savings, which is likely why this is a place many companies begin their Scope 3 reporting. The U.S. Census Bureau estimated in 2013 that 76 percent of U.S. workers drive alone to work each day. A pay-to-park program can both fund a transportation program and open up related parking infrastructure and maintenance expenses to allow for more health-centered capital investment. For companies that track their environmental footprint, almost all measure business air travel activity, with 92 percent of U.S. companies and 96 percent of European companies reporting this data.

Resources:

- The Practice Greenhealth Transportation toolkit covers resources for tracking and setting goals around employee commuting, including a sample employee commute survey, a Get Started Guide, and a checklist filled with alternative transportation ideas to improve employee commute rates. Key strategies include providing employee transportation benefits such as free or subsidized public transit passes, bike racks and amenities, electric vehicle charging stations and discount programs, tax deferral programs for commute expenses, a daily stipend for those who do not drive alone to work, or bike, car, and rideshare services with an emergency ride home provision.
- Page 10 of the EPA's Guide to Greenhouse Gas Management offers guidance on how to collect and report the data on employee business travel-related emissions. This CSR Wire article, How Companies Can Make Business Travel More Sustainable, also features strategies to get started.

Food strategies

As the health care sector takes a more holistic approach to improving health, food is understood as a critical element both in terms of what patrons consume as well as what a hospital serves or wastes. Eight of Drawdown's top 20 solutions are related to food, including practices such as reducing food waste, eating a plant-rich diet, managed grazing, and regenerative agriculture. U.S. animal protein consumption far exceeds what is necessary for good nutrition and could be substantially replaced with plant-based sources with health benefits and reduced environmental impacts.

A plant-centered diet can also mitigate climate change. According to the Intergovernmental Panel on Climate Change, agriculture, forestry, and other land use practices are collectively responsible for just under a quarter of anthropogenic GHG emissions, mainly from deforestation and agricultural emissions from livestock, soil, and nutrient management. Globally, animal agriculture alone is responsible for about 14 percent of all GHG emissions. Ruminants, mostly beef, are responsible for nearly half of greenhouse gas emissions from agricultural production. A contributing factor is the production and use of synthetic nitrogenous fertilizer. According to the U.S. Energy Information Administration, in 2010 the nitrogenous fertilizer industry consumed more than 200 trillion Btu of natural gas as feedstock and another 152 trillion Btu for heat and power.

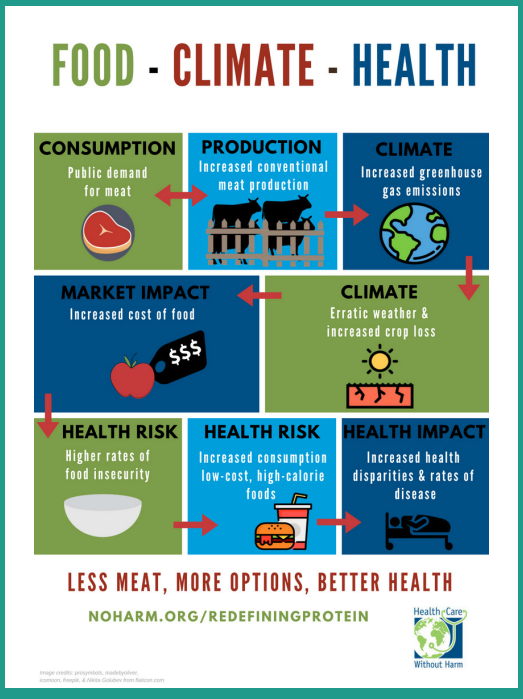
If Americans ate beans instead of beef, the United States would meet 50 to 75 percent of its GHG reduction targets for the year 2020. A Johns Hopkins study found that cutting global food waste by 50 percent by 2050 could reduce emissions by an estimated 4.5 gigatons. Transitioning to diets with more plant-based ingredients is an essential action to mitigate climate change to promote health, food security, and long-term environmental sustainability.

Resources:

- Practice Greenhealth's less meat guide outlines strategies to begin reducing the amount of meat served in hospital cafeterias and patient rooms.
- Health Care Without Harm's report, Redefining Protein: Adjusting Diets to Protect Public Health and Conserve Resources, and associated purchasing considerations provides guidance on moving to different types of protein.
- Health Care Without Harm's Blended Burger purchasing guidance, pilot study of four hospitals, and sample poster help hospitals move to a healthier and lower emissions burger for its cafeterias and patient rooms.
- The Menus of Change initiative, a collaboration between the Culinary Institute of America and the Harvard T.H. Chan School of Public Health, is a cross-sectoral program for the

The prospect of regenerative agriculture

"Regenerative agriculture" refers to an agriculture production system that integrates food animal production and perennial crops among other practices to eliminate the need for synthetic nitrogen fertilizer and optimize the ability of healthy soil to naturally sequester carbon. According to IPCC, the most cost-effective climate-change mitigation options in the agricultural sector are cropland and grazing land management and restoration of organic soils. Early research shows responsibly pastured meats, as part of a regenerative agriculture system, are an important component of creating this soil carbon sink. Stay tuned as regenerative agriculture production begins to take hold and offer a new opportunity for hospitals to shift food purchases to reduce their carbon footprint. This includes an opportunity to quantify the impact of a reduction in meat purchases on not only GHG emissions but also water and land use. Those looking to get a head start should focus on reducing the purchase of conventional meat and increasing the purchase of healthy legumes.



food service industry that provides guidance, resources, and education on healthy and sustainable food choices. See Protein Flip: Transforming protein menu concepts for the health of our customers and the planet.

- Action on Sustainable Diets helps food service professionals develop a holistic plan for creating sustainable diets.
- Sign up for the Cool Food Pledge to track and report the GHG reductions achieved through changes in your food purchasing.

Waste strategies

Hospitals create more than 30 pounds of waste per staffed bed per day. Beyond concerns about increasing waste removal fees and changes in recycling markets, waste disposal can have health impacts on the communities hospitals serve. Waste incinerators emit more carbon dioxide per megawatt-hour than any other fossil fuel-based power source, including coal-fired power plants, and have been linked to an increased risk of asthma in surrounding communities. Landfilled waste produces methane, a potent greenhouse gas with 25 times the global warming potential of carbon dioxide over a 100-year period.

Resources:

- Practice Greenhealth's Less Waste Toolkit outlines ways to manage hospital waste streams.
- The EPA's WARM calculator can help quantify emissions reductions related to changes in waste management practices.
- Practice Greenhealth's Less Food to Landfill Toolkit explores various strategies to reduce and divert food waste.
- The Mazzetti's M+WasteCare calculator is a free online tool for health care organizations to understand the environmental footprint of their waste streams and compare scenarios to identify changes for improvement.

Looking ahead

In 2015, countries working on the sustainable development agenda at the United Nations created 17 sustainable development goals. While these goals were meant to guide governments on focus areas and targets, many companies are aligning their goals with them as well. Already 38 percent of Fortune 50 companies have aligned and support the 17 goals.

Some states and local governments already have energy or greenhouse gas reduction goals or mandates. The Center for Climate and Energy Solutions has a map summarizing state efforts to date.

Now is the time for hospitals to follow the lead of innovative businesses and countries. The health care sector can begin to understand their current emissions through establishing a baseline, and then setting a target to reduce emissions, save money, and improve the health of their community.

ADDENDUM

Examples of location-based and market-based methodology

The GHG Protocol Scope 2 Guidance recommends organizations use two reporting and calculation approaches for Scope 2 purchased energy: market- and location-based. These are two different ways of tracking energy-related emissions and are not added together, but rather reported as two distinct totals.

Location-based methodology: Hospitals will apply the grid-average emission factors (e.g. the eGrid factors) to all of their electricity usage from all sources.

Market-based methodology: Hospitals will apply supplier-specific emission factors if these are available from the utility, or residual mix factors to all of their electricity usage from all sources.

Market-based instruments (i.e. renewable energy certificates, power purchase agreements, or other contracts for renewable energy) must meet the quality criteria for the Scope 2 guidance (page 63) before the emissions can be counted toward the market-based total (see table below). If they do not meet the quality criteria, use standard grid average emissions factor (eGrid).

Example 1: Hospital in a deregulated market that purchases 10 percent of its energy through renewable energy certificates (RECs) for wind from Texas, and the rest of the energy is procured at auction.

- Market-based total: The 10 percent RECs would count toward market-based total with zero emissions for that portion of its consumption, and then the remaining 90 percent of energy procured at auction would use supplier-specific emissions factors (if available), or would use the standard grid average emissions factor (eGrid).
- Location-based total: 100 percent at eGrid emissions factor

Example 2: Hospital in a regulated market that purchases 20 percent of its energy through a green tariff and the remaining from its utility.

- Market-based total: The 20 percent green tariff would count toward the market-based total with zero emissions for that portion of its consumption, and then the remaining would use the supplier-specific emissions factors (if available), or would use the standard grid average emissions factor (eGrid).
- Location-based total: 100 percent at eGrid emissions factor

Example 3: Hospital in a deregulated market that has 10 percent onsite solar and purchases the rest of its energy from a company that has a 60/40 split between natural gas and coal, but the grid that the hospital physically consumes electricity from is 78 percent large hydro, 12 percent natural gas, and 10 percent renewables (solar/wind).

- Market-based total: The onsite solar would not be reported; it simply reduces the total emission generated by purchased energy.* The remaining 60/40 split would use the utility supplier-specific emissions (fossil fuel) profile, or would use the standard grid average emissions factor (eGrid).
- Location-based total: 100 percent at eGrid emissions factor

*Onsite solar is providing electricity that would otherwise need to be purchased so the total amount of energy purchased and potential emissions generated by that energy are reduced.

Example 4: Hospital in a deregulated market that has 10 percent onsite solar through a PPA but sold its RECs*, and the rest of its electricity is purchased through reverse auction.

- Market-based: 10 percent eGrid (for the onsite solar PPA with RECs sold), 90 percent supplier-specific emissions factors (if available), or would use the standard grid average emissions factor (eGrid).
- Location-based: 100 percent at eGrid emissions factor.

* Since the RECs were sold, the hospital cannot take credit for the renewable energy procured.

Market-based Scope 2 data hierarchy examples

Data forms listed here should convey combustion-only (direct) GHG emission rates expressed in metric tons per MWh or kWh. Reporting entities should ensure that market-based method data sources meet Scope 2 Quality Criteria. Instruments listed here are not guaranteed to meet Scope 2 Quality Criteria but are indicative of instrument type.

Emission factors	Indicative examples	Precision
Energy attribute certificates or equivalent instruments (unbundled, bundled with electricity, conveyed in a contract for electricity, or delivered by a utility)	• Renewable Energy Certificates (U.S., Canada, Australia, and others) • Generator Declarations (U.K.) for fuel mix disclosure • Guarantees of Origin (EU) • Electricity contracts (e.g. PPAs) that also convey RECs or GOs • Any other certificate instruments meeting the Scope 2 Quality Criteria	Higher
Contracts for electricity, such as power purchase agreements (PPAs) and contracts from specified sources, where electricity attribute certificates do not exist or are not required for a usage claim	• In the U.S., contracts for electricity from specified nonrenewable sources like coal in regions other than New England Power Pool and Pennsylvania New Jersey Maryland Interconnection LLC • Contracts that convey attributes to the entity consuming the power where certificates do not exist • Contracts for power that are silent on attributes, but where attributes are not otherwise tracked or claimed	
Supplier/Utility emission rates, such as standard product offer or a different product (e.g. a renewable energy product or tariff), and that are disclosed (preferably publicly) according to best available information	• Emission rate allocated and disclosed to retail electricity users, representing the entire delivered energy product (not only the supplier's owned assets) • Green energy tariffs • Voluntary renewable electricity program or product	
Residual mix (subnational or national) that uses energy production data and factors out voluntary purchases	• Calculated by EU country under RE-DISS project	
Other grid-average emission factors (subnational or national) – see location-based data	• eGRID total output emission rates (U.S.). In many regions this approximates a consumption-boundary, as eGRID regions are drawn to minimize imports/exports • Defra annual grid average emission factor (U.K.) • IEA national electricity emission factors	Lower

Source: GHG Protocol Scope 2 Guidance