Salud

Health Care Without Harm

GLOBAL GREEN and HEALTHY HOSPITALS

EXECUTIVE SUMMARY

Colombia's Healthcare Carbon Footprint Measurement Project

October 2021

November 2023

Executive summary

Colombia's Healthcare Carbon Footprint Measurement

Project introduction

Passed in 2018, Colombia's Act 1931 on climate change management requires the health sector to develop and implement a Comprehensive Sectoral Climate Change Management Plan (PIGCCS in Spanish) that addresses both adaptation and mitigation aspects. In 2021, Colombia joined the COP26 Health Programme, thus committing to estimate its national healthcare systems' greenhouse gas (GHG) emissions baseline, including the supply chains.

With the aim of facilitating compliance with these commitments, in early 2022 Colombia's Ministry of Health and Social Protection and the non-governmental organization Health Care Without Harm (HCWH) announced signing a Memorandum of Understanding. The purpose of this collaboration agreement was to pilot a project to make an initial estimation of the Colombian healthcare system's carbon footprint. To this end, a sample of healthcare service provider institutions (IPSs in Spanish) was trained in the use of a tool developed by HCWH to calculate health facilities' carbon footprint, known as the Climate Impact Checkup Tool. More than 400 IPSs participated in the project and successfully completed the online training program.

After reviewing and verifying the footprint reports submitted, a total of 265 reports were assessed and approved. Based on this analysis, the final report offers specific recommendations to elaborate the mitigation component of the health sector PIGCCS.

Chapter 1. Overview

Colombia's Ministry of Health and Social Protection

The Ministry of Health and Social Protection is the regulatory agency in Colombia that establishes the rules and standards for public health, social assistance, populations at risk, and poverty. Within its areas of competence, its goal is to develop, implement, guide, coordinate, execute and assess public policies related to health, public health, and social promotion of health, as well as participate in the development of policies on pensions, periodic economic benefits, and occupational risks.

Health Care Without Harm

Health Care Without Harm is an international non-governmental organization working to transform health care worldwide so that it reduces its environmental footprint, becomes a community anchor for sustainability and a leader in the global movement for environmental health and justice. One of its major initiatives is the Global Green and Healthy Hospitals network, with over 2,000 members from 84 countries, who work to ensure a healthy future for the people and the planet.

Climate Impact Checkup Tool

The Climate Impact Checkup Tool was developed in 2016 by Health Care Without Harm Latin America team. Its methodology, based on the GHG Protocol (GHGP) Corporate Accounting and Reporting Standard, calculates emissions at the facility level and classifies them into three scopes: direct emissions, electricity-derived indirect emissions, and other indirect emissions.

Chapter 2. Colombia's Healthcare Carbon Footprint Measurement Project

Sample selection

The selection of participating institutions was limited to IPSs[1], since these organizations are the ones that directly deliver health services to the population at the different healthcare levels. Thus, the sample was designed considering the universe of more than 11,000 IPSs that, as of February 2022, were accredited and active in the Special Register of Healthcare Service Providers (REPS in Spanish).

Based on the data available in the REPS, the following criteria were agreed upon to ensure representativeness of the sample:

- **Geographic location.** Territorial units were consolidated within Colombia's five natural regions (Amazonía, Andina, Caribe, Orinoquía, and Pacífica) which share similar climatic conditions.
- **Type of administration.** IPSs are categorized in the REPS based on their type of administration: public, private, or mixed. By the end of the project, the coordination team excluded mixed-administration IPSs in the analysis.
- **Healthcare level.** IPSs were classified based on their healthcare level, that is, the scope and degree of specialization of the services offered. Level 1 includes low complexity institutions; level 2, medium complexity institutions; and level 3, high complexity institutions.

Given the characteristics of the data and the revised representativeness criteria, simple stratified random sampling was selected as the statistical method to estimate the ideal size of the sample. Thus, considering a 2% margin of error and an oversampling of 25%, the ideal sample size was established at 303 IPSs.

Call for participants

The call for participants, which was open from November 16, 2022, to January 27, 2023, was designed based on the premise that participation ought to be voluntary. To apply, IPSs had to meet the following requirements:

- **Type of service provider.** Participating institutions had to be registered in the REPS as public

[1] Independent professionals, special patient transport services, and organizations with a social goal not related to healthcare were excluded.

or private Healthcare Service Providers (IPS).

- **Data availability.** Participating institutions were required to have all necessary data to report their GHG emissions sources (for 2021) which, by the end of the project, were categorized as mandatory sources.
- **Global Green and Healthy Hospitals network.** Although being a member of the Global Green and Healthy Hospitals network was not a requirement, selected non-member IPSs went through a facilitated membership process to gain access to GGHH Connect, the online platform for GGHH members only.
- **Management capacity and dedication.** Participating institutions were required to have an environment department and/or at least one environmental contact person and/or manager.
- **Computer access.** Computer equipment and web access.

Although more than 400 IPSs registered, the representativity criteria established were not met regarding distribution: more than 70% of registrants were from the Andean region, and there were not enough participants to cover the three healthcare levels in all regions. Despite this, and acknowledging the significant number of interested IPSs (representing the largest simultaneous carbon footprint calculation exercise ever made at a global level with this tool), it was decided to train all registered institutions.

Online training and classification of sources.

Based on the existing information recording and storing systems available in Colombian IPSs, and the data that could be collected, the following emissions categories were defined as mandatory for reporting by the end of the project:

- **Stationary combustion**: GHG emissions from the burning of fuels during stationary processes.
- **Mobile combustion:** GHG emissions from the burning of fuels by vehicles owned by the health facility or third-party vehicles when the payment of economic benefits (sometimes known as «allowance for business use of personal vehicle») is directly paid by the facility.
- **Purchase of electricity:** GHG emissions from the burning of fuels used in power plants generating electricity from the local or national grid for facility use.

- **Waste:** emissions from the treatment and disposal of waste generated by the health facility, regardless of whether these activities take place inside or outside the facility.

The remaining emission sources that can be estimated with the Climate Impact Checkup Tool (anesthetic and medical gases; refrigerant gases and fire extinguishers; purchase of steam, heat, or cooling; workforce commuting: business travel; transportation of patients, visitors or third parties; inhalers; and extended supply chain) were categorized as non-mandatory or voluntary sources. The Ministry decided to **establish 2021 as the baseline year** for the calculation exercise.

Following these parameters, the online training program took place from March 21 to April 4, 2023. The program was divided into five training modules, each of which included a technical training session and a Q&A session.

Finally, **402 IPSs completed the online training program**. After this stage, the data collection period began, from April 24 to June 2, 2023.

Footprint Cafés

Once the data collection period finished, IPSs were invited to participate in a one-day (in person) working session followed by a half-day (online) session, in which the group received guidance to enter the collected data in the tool so as to calculate their carbon footprint. These working sessions, called *Huellatones* in Spanish (and *Footprint Cafés* in English), took place in face-to-face format in different cities, based on the concentration of participating IPS by region.

Footprint Cafés (selected photos from Cali, Bogotá, Medellín and Cartagena)

	
A. Cali	B. Bogotá F.D.

	
C. Medellín	D. Cartagena

Additionally, IPS representatives who were not able to attend the face-to-face sessions were given the opportunity to participate in a series of five online *Footprint Cafés* on June 20, 22, 23, 27 and 28, 2023.

After the *Footprint Cafés* stage, IPSs were given a period of time to check and complete the data entered in the system, with August 23, 2023 as the deadline. Finally, on August 15 the last online training session took place, which was focused on interpreting the data delivered by the tool and its use to inform the development of climate action plans.

Data analysis methodology

Pivot tables were designed to review the data provided by each of the institutions. Tables included general information of the institution; metrics like kg CO_2e per patient seen, and number of occupied beds per year; and data reported for mandatory and non-mandatory sources.

Despite extensive training and technical assistance, it is not unusual to find data entry or classification errors in carbon footprint reports. Therefore, a method was established to review the reports received, so that atypical values (significantly above or below the average value expected for institutions of similar size and complexity level) could be rapidly identified.

After carefully reviewing the reports with anomalies identified through the proposed methodology and registering them on a digital control dashboard, observations were e-mailed to the corresponding IPSs.

As a result of this process, **reports from 265 IPSs were validated and approved** to be included in the final report. Although this collection of reports was not enough to make up a representative sample of the Colombian health sector (as most IPSs were from the Andean region), to the date of this publication, this is the largest group of healthcare institutions globally to have ever undertaken a similar calculation exercise with this tool, simultaneously and under the same parameters. Therefore, results show valuable information on the size and composition of Colombia's healthcare facilities carbon footprint. Approximately 75% of Colombian institutions that are members of GGHH participated in this effort.

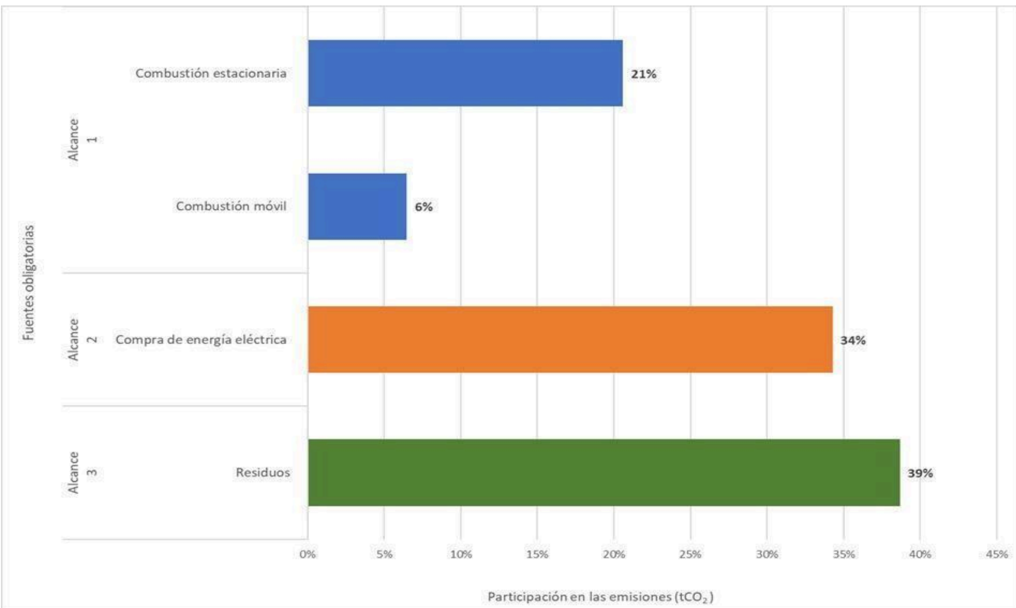
Chapter 3. Analysis of results

In total, 173 reports were received from low complexity institutions (65%), 54 from medium complexity institutions (21%), and 38 from high complexity institutions (14%).

The analysis of results by emissions sources was divided into two categories: mandatory sources and voluntary sources. This was because the 265 reports analyzed were only comparable in terms of the first category, since all of them included data on mandatory sources.

Of the total emissions from mandatory sources, 39% came from waste-related sources, most of which were counted as scope 3 emissions. In second place came the purchase of electricity, representing 34% of total emissions; these emissions were categorized as scope 2. Finally, as far as scope 1 mandatory emissions were concerned, stationary combustion contributed 21% while mobile combustion accounted for 6%, the lowest of all.

Figure 1. Contribution of each source to total emissions from mandatory sources



Source: Health Care Without Harm

The following summary table shows the number of tons of CO_2e from minimum mandatory sources and their percentage contribution.

Table 1. Tons of CO_2e per mandatory source

Mandatory sources summary table					
	Stationary combustion	**Mobile combustion**	**Purchase of electricity**	**Waste**	**Total**
Tons of CO_2e	22,543.9	7,088.22	37,561.99	42,379.03	109,573.14
Percentage contribution	21%	6%	34%	39%	100%

Stationary combustion

Diesel was the most used fuel (50.68%), followed by natural gas (35.29%) and liquefied petroleum gas (LPG) (12.37%). This distribution suggests that there is a window of opportunity to replace or convert diesel-fueled —and, to a lesser extent, natural gas-fueled— equipment, mainly backup generators and boilers. Passive practices or technological upgrades can also be explored for energy-saving purposes.

Mobile combustion

Diesel (51.5%) and gasoline (41.3%) were the predominant fuels. In contrast, natural gas appeared as a much less used fuel (0.8%). It is worth mentioning that, in countries with blending mandates, the tool includes the mandatory biodiesel and/or bioethanol blending ratios in force at the moment the tool was launched. In the case of Colombia, in 2021 the blending mandate required a 10% bioethanol blend in gasoline and a 10% biodiesel blend in diesel.

Although the transit of vehicles is essential in the health sector for transporting supplies, lab samples, patients, etc., it is clear there are many opportunities to promote sustainable mobility practices. Among key actions are the promotion of zero emissions forms of transport like the use of bicycles; the renewal of vehicle fleets (replacement of units with vehicles using less contaminating fuels and, preferably, with electric or hybrid vehicles); and coordination with local authorities to enable better access to the facility by means of massive public transportation routes. It is also imperative to design effective and safe strategies to reduce fuel consumption, especially in medium-heavy-duty vehicles such as vans and minivans.

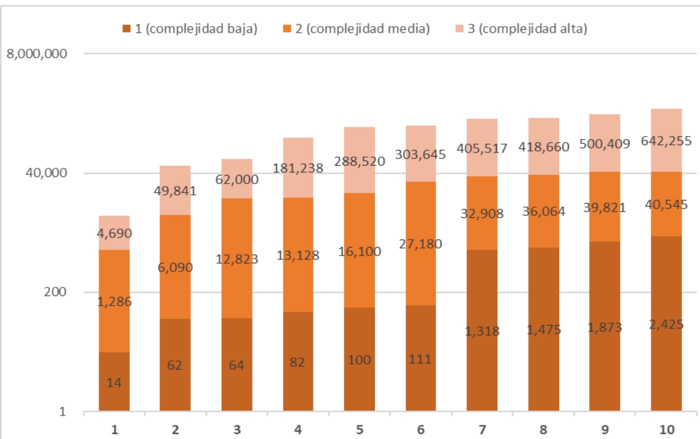
Purchase of electricity

To better understand the behavior of this source, the reports were divided based on the level of health services delivered. Then, the ten highest and the ten lowest values of each level were considered to show how electricity use varied according to the complexity of the services offered by health facilities (although there are other factors that influence electricity consumption, like the size of the facility, the constructed area, the technological capacity, among others).

This reveals that, both in the lower-consumption range as well as in the higher-consumption range (particularly the latter), low complexity institutions consume much more electricity than those within healthcare level 2 or 3. Although this tendency can be explained based on multiple factors, such as the limited access to acquiring more energy-efficient devices or technologies, the use of medium and high energy-consuming equipment, and/or maintenance inconsistencies, the most likely explanation is the daily use of electricity in highly crowded health facilities.

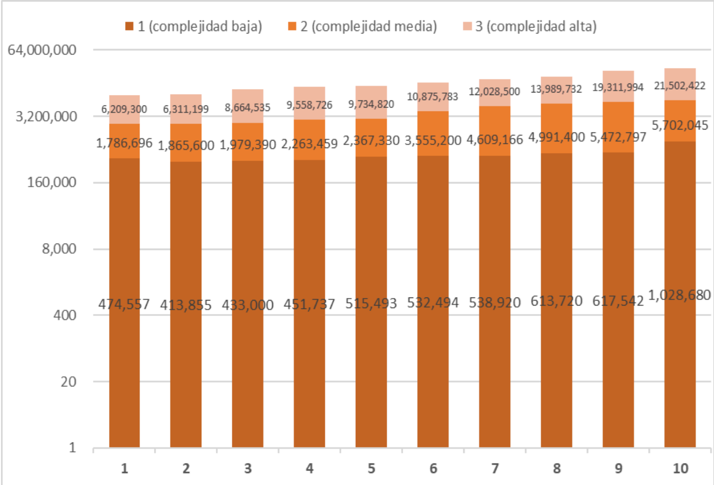
This suggests that, even though medium and high complexity facilities must identify and address highly-consuming equipment and services (such as air conditioning and cooling equipment, or diagnostic imaging devices), the main area of improvement is energy efficiency, through the implementation of measures related to the purchasing, substitution, renewing or re-engineering of equipment, as well as the incorporation of in-situ renewable sources (for instance, solar panels and water heaters).

Figure 2. Sample of the 10 lowest values for the purchase of electricity (kWh) by complexity level



Source: Health Care Without Harm

Figure 3. Sample of the 10 highest values for the purchase of electricity (kWh) by complexity level



Source: Health Care Without Harm

Regarding the origin of purchased electricity, over 97% of the sample gets its electricity from the National Interconnected System (SIN, acronym in Spanish). It should be emphasized that Colombia's electricity generation matrix is the sixth cleanest in the world, with 68% of hydraulic energy generation, 31% thermal, and 1% solar, wind and co-generation.[2]

On the other hand, only 7 institutions, accounting for slightly less than 3%, reported obtaining 100% of their electricity supply from sustainable sources, which translated to no scope 2 emissions reported. The purchase of electricity from these sources is validated by means of Renewable Energy Certificates. From a financial point of view, investing in renewable energy can be cost-effective on the long run by reducing operational costs associated with the purchase of electricity. This represents a great opportunity to replicate successful experiences in other countries of the region whose governments have developed, facilitated, and supported processes for the creation of electricity markets based on free competition, so that users can choose freely among the different electricity generation and distribution companies.

Waste

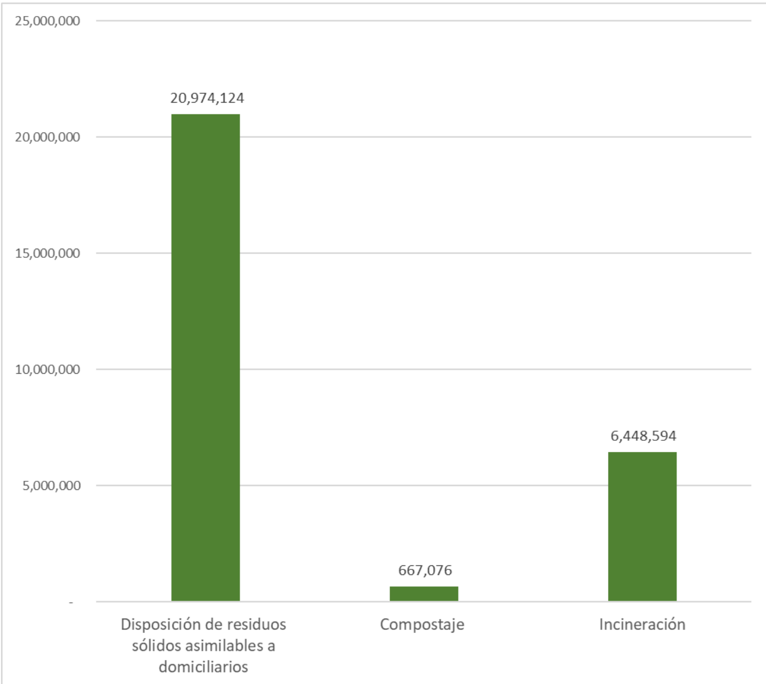
Of the total waste reported in the sample (in kg), only 633 kg (0.10%) was treated in situ, as a result of small-scale composting efforts within IPSs.

In the rest of the cases, waste management was carried out exclusively by external waste management companies duly certified by municipal or departmental authorities. Of all waste

[2] Learn more at: https://acolgen.org.co/

managed ex situ, the final disposal of residential-like waste in landfills was by far the most common processing method, accounting for 75% of the total. Incineration (combustion-based thermal treatment) came in a distant second place with 23%, and composting[3] was the treatment least used accounting for 2%.

Figure 4. Classification of waste (kg) by type of treatment or final disposition



Source: Health Care Without Harm

First, these results show that adequate waste segregation and classification practices are in place. One of the goals of integrated healthcare waste management is that the amount of waste requiring special treatment is lower than the amount of common waste. It can also be inferred that facilities are migrating to suppliers with technologies that are less harmful to the environment, such as high-efficiency deactivation by autoclave, physical-chemical agents or microwave, or that the offer and availability of these safer alternatives is growing, and thus replacing incineration.

However, there is a significant opportunity to generally reduce waste by implementing the waste hierarchy and incorporating sustainability criteria into purchasing processes. For instance, when

[3] Composting is one of the most recommended types of treatment for organic waste, despite some methane and nitrous oxide emissions are generated during the process. On the one hand, composting avoids sending organic waste to landfills, which prevents significant environmental impacts, like the generation of large volumes of methane as a result of the anaerobic conditions of these sites. On the other hand, composting also helps to restore the natural cycle of nutrients, which go back into the soil once the compost is produced. As in the case of solid waste disposal, this activity generates carbon dioxide emissions, but since they have a biogenic origin, these emissions are considered neutral in net terms and, therefore, are not counted.

selecting products, procurement officials can give priority to supplies or devices that can be reused, or that have recyclable or smaller packaging.

In the case of waste treated by **incineration**, the tool distinguishes between different categories of waste:

- **Residential-like solid waste**: It was the type of waste least present, accounting for 5.5% of total incinerated waste. Despite contributing a small percentage, common waste incineration could be indicative of the adoption of energy valorization (known as waste-to-energy) or chemical recycling strategies by IPSs, which means thermal combustion of waste. These methods are not recommended as far as environmental sustainability is concerned, thus opening an opportunity to promote efforts to assess and phase-out their use.
- **Mixed clinical waste:** This includes biohazardous and chemical waste. Based on sample analysis, this category contributed the most to incinerated waste, accounting for 73.8% of the total.
- **Hazardous waste:** Known in Spanish as CRETIR (corrosive, reactive, explosive, toxic, flammable and radioactive). Based on sample results, this category ranked in a distant second place, accounting for 20.7% of the total. Although chemical recovery alternatives exist, access to them is sometimes extremely limited.

Non-mandatory sources

Among reports including data for non-mandatory sources, the most reported source was the recharging of refrigerant gases in air conditioning and/or cooling equipment, and fire extinguishers. This indicates that collaboration with suppliers to ensure data availability and transparency in preventive and corrective maintenance of this type of equipment is on the increase, since this service is typically outsourced. However, many institutions reporting this source only had fire extinguishers data available, and lacked data regarding cooling equipment.

The second most reported source was medical and anesthetic gases. While it is more common that health facilities keep a record of inhaled anesthetic gases quantities (in ml), medical gases reporting is less frequent.

Refrigerant gases and fire extinguishers

- **Reported emissions:** aggregate emissions for this source from the 159 reports submitted, totaled 306,443.73 tCO_2e.

To illustrate, a random sample of 10 reports including data for this source was taken per complexity level. This exercise identified that the most used gases were R-410A (a hydrofluorocarbon with a 100-year global warming potential of 2088), followed by R-22 (a hydrochlorofluorocarbon with a 100-year global warming potential of 1810), and lastly R-134A (a hydrofluorocarbon with a 100-year global warming potential of 1430), mainly in refrigeration equipment such as mini-split systems, central air conditioning systems, and freezers.

Regarding fugitive emissions from recharging fire extinguishers containing refrigerant gases, the sample showed that the most used gas was perfluorocyclopropane accounting for 96.6%, followed by halogenated agent HFC-23 at 3.4%, and finally CO_2, at 0.02%.

Medical and anesthetic gases

- **Reported emissions:** aggregate emissions for this source from the 81 reports submitted, totaled 322,522.52 tCO_2e.

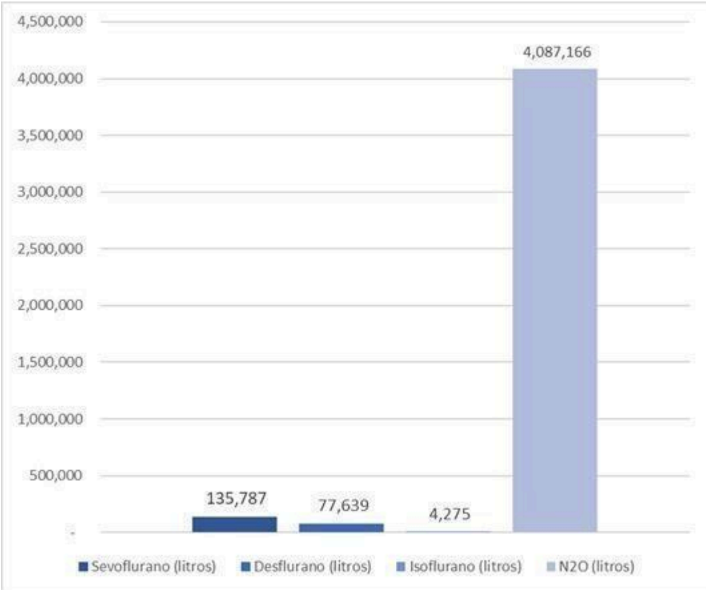
Of the 4,304,867 total liters of inhaled anesthetic gases reported for 2021, 95% was nitrous oxide.[4] Sevoflurane, which accounted for 3% of all anesthetic gases reported by IPSs with data available for that source, is by far the least polluting of these gases, with a global warming potential that is 2410 units lower than desflurane, 380 lower than isoflurane, and 168 lower than nitrous oxide.

This provides a significant opportunity to reduce the carbon footprint of hospitals with specialty surgeries, by including these agents in the list of priority chemicals for elimination or gradual substitution, as some health systems have been doing globally.

Other strategies are: TIVA (total intravenous anesthesia) or PIVA (partial intravenous anesthesia) and/or reducing anesthesia flow rate while maintaining the quality of health care. These efforts must require market availability, government support for facilities to have access to quality equipment, customized awareness campaigns, among other measures.

[4] It should be noted that this does not imply that most institutions report a high level use of nitrous oxide, but that some high-complexity IPSs use large amounts of this gas for their surgeries. For instance, one high-complexity institution reported to have used 1,618,000 liters, which represents 37% of the total amount reported for this source.

Figure 5. Liters of anesthetic and medical gases reported



Source: Health Care Without Harm

Regarding medical gases, of the 17,214,098 liters reported in total, the most used gas was an N_2O/O_2 mixture (65%), a compressed gas composed of 50% nitrous oxide and 50% medical oxygen. This mixture is prescribed for short-term treatments of low to moderate pain when rapid analgesic effects are required, both at pain onset as well as its resolution. The second most used gas reported (35%) was carbon dioxide (CO_2), an insufflation gas prescribed for minimally invasive surgeries (laparoscopy, endoscopy, and arthroscopy). In general, mitigation actions for this category must be addressed from a preventive maintenance and the appropriate use approach to avoid releases, since neither medical gases use nor hospital access can be limited.

Purchase of steam, heat, or cooling

Among all IPSs participating in the project, only one reported having a centralized thermal energy supplier. This was Serena del Mar District, in Cartagena de Indias, which has an energy operator that supplies cold and hot water to Serena del Mar Hospital.

The following table shows the information provided by the institution for 2021:

Table 2. Cold and hot water production (kWh), Serena del Mar

Year	Cold water production (kWh)	Hot water production (kWh)	Total	Emissions in tCO_2e
2021	19,108,036	739,925	19,847,961	4,735

Source: Serena del Mar Hospital

It is important to emphasize that the purchase of steam, heat, or cooling through centralized systems must be subject to a comprehensive environmental assessment, since, depending on the technology used for production, these systems may not necessarily result in lower emissions. However, if the system is demonstrated to be a more sustainable alternative, it would be a recommended solution for users.

Business trips

- **Reported emissions:** aggregate emissions for this source from the 68 reports submitted, totaled 225,825 tCO_2e.

Among IPSs that reported this type of travel, air transportation is by far the most polluting, with long-haul flights accounting for 52% of related emissions, followed by medium-haul flight accounting for 11%. For ground vehicles, emissions from gasoline-powered cars were significant (9%), followed by the use of gasoline-powered vans (7%). It is worth mentioning that only ground transportation by third-party vehicles is considered, since emissions from the use of vehicles owned by the institution fall under scope 1 mobile combustion.

There is an opportunity to implement sustainable mobility measures, including passive measures (such as awareness campaigns), as well as the creation of incentives to foster decision-making processes that prioritize sustainability criteria.

Workforce commuting

- **Reported emissions:** aggregate emissions for this source from the 73 reports submitted totaled 6,673.93 tCO_2e.

Among IPSs that reported this source, the most commonly used means of transport by staff was the bus (51%), followed by gasoline-powered cars (26%) and motorcycles (15%). The widespread use of buses must be recognized and encouraged further by means of employment, economic and other types of incentives and benefits.

Also, it is suggested implementing more specific strategies such as re-location of staff to workplaces closer to their home when several hospital branches are available; encouraging carpooling by identifying nearby routes; promotion of teleworking, providing staff with tools and technologies to facilitate remote work; establishing non-face-to-face workdays; offering flexible working hours, allowing staff to travel at off-peak times; provide parking for hybrid and electric vehicles; among many other measures.

Transportation of patients, visitors or third parties

- **Reported emissions:** aggregate emissions for this source from the 10 reports submitted, totaled 84.51 tCO_2e.

Among IPSs that reported this source, vehicles with the highest emissions were gasoline-powered vans (67%), followed by diesel-powered vans (29%), gasoline-powered cars (3%), and diesel-powered cars (1%). It is important to note that this category may vary based on the healthcare scheme (contributory or subsidized) served by the health facility: in general, when institutions receive patients from the contributory scheme, traveling by car or van is more frequent, while in the case of institutions receiving patients from the subsidized scheme it is common to see a higher use of motorcycle or public transport (bus or taxi).

The tool also gathers data on the reasons why patients, visitors or third parties go to the institution. Since only 10 reports contained data from this source, there is no conclusive information so as to draw significant conclusions. The most frequent reason to visit the health facility was urgent care, closely followed by procedural consultations.

Inhalers

- **Reported emissions:** aggregate emissions for this source from the 53 reports submitted totaled 20,360.21 tCO_2e.

Of all inhalers reported, 64% were provided by the institution; of these, 92% (298,394 units) were MDIs[5], while the remaining 8% (27,076 units) were DPIs[6]. 26% of reported inhalers were prescribed by health professionals; of these, 89% were MDIs, and 11% were DPIs. The remaining 10% of reported inhalers were provided through central pharmacies; of these, 64% were MDIs, and 36% were DPIs.

Since they use hydrofluorocarbons as propellants, MDIs' carbon footprint is significantly larger than

[5] Metered dose inhaler
[6] Dry powder inhaler

that of DPIs. In terms of emissions (in $kgCO_2e$), of all inhalers reported by IPSs that included this source in their inventories, 99.7% were MDIs.

Although DPIs are more environmentally friendly in terms of emissions, further medical-scientific studies as well as comparative analyses of emissions per unit are still necessary to provide evidence to support a general replacement of MDIs. The shift to DPIs should only be recommended when considered medically feasible based on the specific needs of each patient.

Extra supply chain

- **Reported emissions:** aggregate emissions for this source from the 69 reports submitted totaled 299,806.95 tCO_2e.

For this source, the tool requires to enter annual spending based on the spend categories of the World Input and Output Data Base (WIOD) and its environmental accounts. 69 IPSs included data for this source in their inventories.

Pharmaceutical products ranked first both spending and emissions (of the latter, they account for over 90%) for the reports that included this source.

Chapter 4. Recommendations based on the analysis

Colombia's Healthcare Carbon Footprint Measurement project not only demonstrated IPSs' growing interest and commitment to address climate change, but it also made evident the national health sector's significant needs in terms of capacity building. It is recommended that an institutional and regulatory framework be established, that would to progressively enable:

- Continue measuring the healthcare sector's annual emissions, using the Climate Impact Checkup Tool or any other tool required by the Ministry of Health and Social Protection.
- Implement the necessary data collection mechanisms to gradually improve emissions inventories, both in terms of scope and data quality, ensuring accurate, up-to-date, and reliable information.
- Develop climate action plans for each health facility or hospital network according to the minimum elements and formats defined by the Ministry, establishing specific mitigation goals targeting the most significant emission sources in their inventories.

- Provide ongoing training and technical support for health facilities environmental managers or leaders.
- Establish mechanisms for progress monitoring and report, that progressively increase the level of ambition and provide incentives for environmental performance.
- Promote the implementation of climate action plans, providing technical support, subsidies, and access to funding sources for high mitigation potential projects.
- Strengthen programs that promote the implementation of practices that contribute to healthcare decarbonization, such as telemedicine and care closer to home, with a focus on preventive interventions.
- Facilitate the systematization of successful experiences and knowledge sharing through health institutions benchmarking.

Recommendations for mandatory sources

Stationary combustion

- Conduct an equipment inventory that includes type of fuel used, consumption per hour, and working time per day, so as to keep track of equipment consumption.
- Consolidate fuel consumption data of all equipment on a monthly basis to determine variability and identify changes in consumption due to adjustments in the processes, and to propose reduction or control strategies.
- Conduct an assessment of fuel supply sources for all industrial equipment in order to find alternatives with better compositions and octane rating.
- Evaluate technological reconversion of equipment parts such as valves, engines or burners to allow for the substitution of fuels with alternatives that have a lower global warming potential. This includes industrial equipment like power plants or substations, boilers and furnaces, among others.
- Establish regular schedules for equipment preventive maintenance, including verification and calibration to achieve optimum combustion.
- Conduct routine inspections to identify leaks, and adjustment issues in seals, valves and

burners.

Mobile combustion

- Conduct an inventory of vehicles owned by the institution, including the type of fuel used, fuel consumption per kilometer traveled, and distance covered per day, to keep track of consumption per route.
- Consolidate information on fuel consumption of all vehicles on a monthly basis in order to determine variability and changes in consumption due to adjustments in routes, schedules, etc., and to propose reduction or control strategies.
- Evaluate purchasing fuels with better compositions and higher octane rating.
- Include within purchase and substitution plans the acquisition of hybrid, electric or low-carbon vehicles.
- Develop a route plan to reduce unnecessary travels and optimize fuel and time.
- Evaluate technological reconversion of equipment parts like valves, engines or combustion systems to enable the substitution of fuels with alternatives with lower global warming potential.
- Conduct regular inspection rounds to identify operational issues and maintenance needs, informing decisions and prioritizing fleet renewal.
- Implement satellite location systems to track travels in real time to identify the best routes for scheduled trips.

Electric energy (electricity consumption)

- Conduct energy inventories to identify high consumption areas and develop targeted reduction strategies. This includes an assessment of lighting and visual comfort needs in the areas or spaces of highest electricity use.
- Establish annual and long-term goals for reducing energy consumption, and evaluate these goals on a regular basis through an iterative process that would enable a gradual increase of ambitions. Two options are recommended to establish the baseline: average electricity consumption of the last 12 months from the institution's electricity bills, or reference data from other national or sectoral institutions.

- Develop equipment purchasing criteria that meet energy efficiency labeling requirements (e.g. A+ for appliances and Energy Star for computers), which will allow to optimize energy consumption during equipment use.
- Explore alternatives to power the facility with carbon pollution-free electricity, either by installing renewable power generation equipment in situ or buying electricity under renewable energy agreements.
- Include within infrastructure construction, renovation or expansion plans designs that maximize the entrance of natural light and ventilation, that use external materials that allow for an enhanced indoor temperature, and that expand landscape areas to increase CO_2 capture and reduce the burden of synthetic materials.
- Choose technology that uses renewable energy, whether generated in situ (like solar water heaters) or supplied by third parties.
- Centralize and automate the operation of devices using on-off, motion and temperature increase or reduction controllers to reduce energy consumption resulting from manual operation.

Disposal of residential-like solid waste

- Quantify in situ generated waste by implementing internal weighing and recording systems; and check collected data against waste management bills to reduce uncertainty derived from digitalization.
- Implement socialization and training strategies for patients, visitors, and officers focused on promoting the waste hierarchy.
- Develop and implement sustainable procurement strategies targeted at selecting supplies, equipment, and products that are reusable, more durable and/or minimally packed, while avoiding the purchase of single-use plastics and other environmentally prioritized elements.
- Benchmark other institutions on best practices and demonstrative experiences.
- Establish short, medium and long-term goals and metrics for waste reduction.
- Implement programs in each of the areas generating waste, to ensure more precise monitoring and better compliance.

- Adopt strategies for reusing waste within the same processes or in new production chains through third-party companies.
- Generate agreements to ensure waste treatment and final disposal in unconventional and more sustainable ways.
- Systematically review and maximize the use of resources to avoid waste and redundancies.
- Implement user quick guides at locations with more than two waste containers to prevent inadequate segregation of waste; visual aids can be posted nearby to allow users to assimilate the information.
- Implement waste segregation programs targeted at waste storage areas to increase the amount of materials that can be recovered by third-party companies through recycling.
- Look for alternatives to manage organic waste from food through processes such as composting or vermiculture.

Incineration

- Implement socialization and training strategies to motivate staff to apply the waste hierarchy and minimize the amount of waste that is sent to incineration.
- Explore the availability of technologies and external suppliers that can help migrate to safer and environmentally recommended practices, such as microwave sterilization or physical-chemical treatments.
- Avoid false alternative solutions to incineration such as energy valorization, chemical recycling, pyrolysis or plasma sterilization.
- Implement staff training programs on waste segregation and the reuse, recovery and recycling of medical devices, where possible.

Recommendations for non-mandatory sources

Refrigerant gases and fire extinguishers

- Invest in cold chain technology for vaccine distribution —such as refrigeration equipment, storage, and distribution facilities— that is low or zero emissions, renewable energy-powered and high efficiency.

- Request suppliers responsible for air-conditioning and cooling systems maintenance to include in every report the amount of gas recharged (in kg) and the type of refrigerant gas used.
- Include provisions in the contract with the cooling equipment maintenance or operation suppliers to ensure the recovery of extracted gases, whenever possible.
- Reconvert equipment by replacing engines and valves to be adapted to gases with a lower GWP.
- Implement testing and preventive maintenance procedures to avoid equipment overpressure that could lead to malfunctions and gas leaks.
- Maximize green spaces and natural air-conditioning solutions, as well as the use of thermal insulation technologies to reduce the need for heating and air-conditioning.

Medical and anesthetic gases

- Conduct interdisciplinary consultation and training processes with medical staff to establish criteria and procedures to phase-out nitrous oxide and desflurane, and promote the use of medical and anesthetic gases with a lower GWP.
- Actively involve medical staff and nurses from Anesthesia departments in training processes and environmental or sustainability campaigns.
- Evaluate with medical staff low fresh gas flows protocols and the introduction of technologies like TIVA and PIVA, as well as other sustainable alternatives.
- Convert or adapt anesthesia machines to enable the use of gases with a lower GWP and an adequate automated flow monitoring.

Business trips, workforce commuting, and transportation of patients, visitors or third-parties

- Conduct online surveys to collect transportation data, including point of departure and arrival, type of vehicle, fuel used, and number of trips completed during the week, with the aim of informing decision-making. For business trips, reinforce data collection within administrative departments.
- Start a transition towards the use of zero-emission fleet vehicles and encourage the use of

active and public transport for patients and staff where possible.

- Reduce business travels, while promoting remote work and travel arrangements with lower emissions. Systematically discourage air travel by implementing a justification process and the requirement of authorization from an authority.
- Ensure adaptation of institutional logistics and infrastructure to promote sustainable mobility programs, such as agreements for the installation of electric vehicle charging stations, bicycle parking solutions and/or showers for staff.
- Maximize useful life of vehicles through adequate maintenance programs.

Inhalers

- Conduct interdisciplinary consultations and training processes with medical staff to define criteria and procedures to evaluate clinical feasibility of prioritizing the formulation of DPI or MDI with less propellant gas content.
- Identify tools or channels to determine inhalers use and administration within the institution, and establish data recording mechanisms to track their delivery, sale or formulation.
- Educate patients and their families about the impact of each type of inhaler.
- Include climate mitigation strategies into professional clinical training programs related to pharmaceutical prescription and administration.
- Socialize among health staff the importance of single administration of inhalers when applicable.
- Implement an accurate logging system at central pharmacies or clinics to monitor inhalers delivery or sale by type of inhaler and number of doses.

Extra supply chain

- Use information capture and processing tools to associate total spend of the institution with spend categories assessed within the extra supply chain.
- Design and implement with all stakeholders participation a sustainable procurement plan (products and services) including sustainability criteria, goals and metrics.
- Plan circular procurement by working with supply chain partners to adopt new circular

economy business models, which align commercial incentives with long-lasting, low-impact, reusable, and upgradeable building systems and components.

- Conduct comprehensive evaluation of each device, supply and service to be purchased by the institution, including aspects such as life cycle assessment, return on investment, financial and environmental benefits, reusability, and content of chemicals of high concern for the environment and human health, among others.
- Support policies, including subsidies or tax exemptions, to promote the rapid and accelerated adoption of clean energy and fuels, like solar, small-scale hydro, and wind generated electricity.

Acknowledgments

Project coordination

Colombia's Ministry of Health and Social Protection

- Diego Moreno Heredia, Grupo Territorio Saludable Coordinator
- Lina Marcela Guerreo Sánchez, Grupo Territorio Saludable Specialist
- José Andrés Corredor Martínez, Contractor

Colombia's Ministry of Environment and Sustainable Development

- Diana Lucía Jiménez Buitrago, Sectoral Support Specialist for MinSalud

Health Care Without Harm

- Andrea Hurtado Epstein, Climate Program Manager for Latin America
- Claudia Lorena Paz Giraldo, Technical Projects Facilitator for Latin America
- Maribel Muñoz Roncancio, Technical Consultant

Special thanks

Health Care Without Harm

- Carolina Gil Posse, Director of Programs and Communications for Latin America
- Diana Picón Manyari, International Climate Director
- María Sol Aliano, International Climate Consultant
- Lucila Citcioglu, Climate Initiatives Coordinator
- Antonella Risso, former member of HCWH team for Latin America

Footprint Cafés host institutions

- Santiago de Cali's Public Health District Secretariat
- Pablo Tobón Uribe Hospital, Medellín
- Fundación Santa Fe de Bogotá University Hospital
- Medihelp Clinic, Cartagena

Partner institutions

- Pan American Health Organization (PAHO)
- Organismo Andino de Salud - Convenio Hipólito (ORAS- CONHU)
- Clean Air Institute