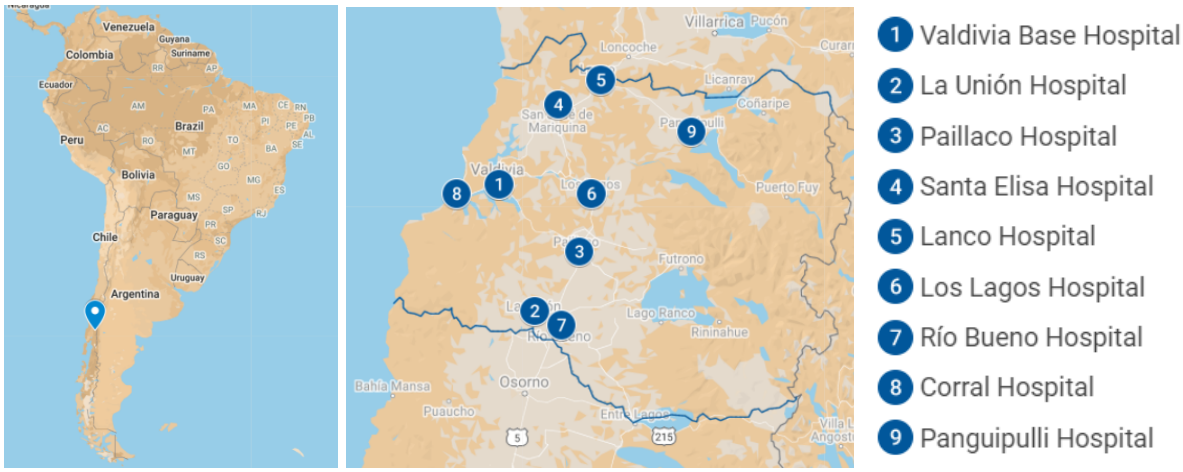
Case Study: Valdivia Health Service

Carbon footprint calculation at a public health service

The Valdivia Health Service (VHS) is part of the Ministry of Health of Chile and covers the Los Ríos Region in the country's south. It consists of the Valdivia Base Hospital (high complexity), the La Unión Hospital (medium complexity), several low complexity hospitals, and a Family Health Center. Unlike other public health systems in Latin America, the health services in Chile have an Environmental Management Unit that communicates, promotes, and coordinates the initiatives developed by the Ministry of Environment and the Ministry of Health for the health care facilities that comprise the service. Additionally, at each facility of the VHS, there is a person in charge of occupational risk prevention and environmental management.



Los Ríos Region: Hospitals of the VHS

The Ministry of Health worked with Health Care Without Harm to reduce the environmental footprint of the Chilean health sector. Through an Institutional Management Commitment established by the Ministry, the VHS joined the Global Green and Healthy Hospitals (GGHH) network in 2014 and ratified its commitment towards health and the environment. As a member, it has worked on various goals of the GGHH Agenda, such as **Leadership, Waste, Energy, Water, Food,** and **Transportation**.

In 2019, the first *Huellatón* in Chile was held in the city of Santiago. The *Huellatón* is a capacity building event to train health facility personnel on the use of the Climate Impact Checkup. Two members of the VHS participated. After this training experience, the service decided to replicate the event locally so that all interested parties could take part, train, and get involved. The goal was to achieve a more detailed calculation of the service's carbon footprint at the facility level, as well as their contribution to the Chilean public health care service´s greenhouse gas (GHG) emissions. As a result of these initiatives, VHS hospitals have reported their estimated carbon footprint to Health Care Without Harm since 2019.

Applying Climate Impact Checkup

The first time that the VHS estimated its GHG emissions was in 2019, using the tool developed by Health Care Without Harm Latin America. This process contributed to the establishment of a GHG baseline, detection of high-emission activities, identification of opportunities for improvement, and the ability to evaluate progress and results of the mitigation measures implemented.

One of the main difficulties encountered was the lack of data and access to necessary information. This limitation is prevalent in many facilities in Latin America. By using the calculator annually, the sustainability directors understood the importance of data recording and, each year, more details are included in the estimation, such as refrigerant gases and anesthetic gases in some facilities.

Since the first time Checkup was applied together with other initiatives, inefficient and highly polluting systems were spotted, and the aggregated results triggered the need for changes. One of the most relevant decisions was assessing the wood-burning boilers, which resulted in the decision to upgrade **to more efficient water heating and heating systems** in different facilities.

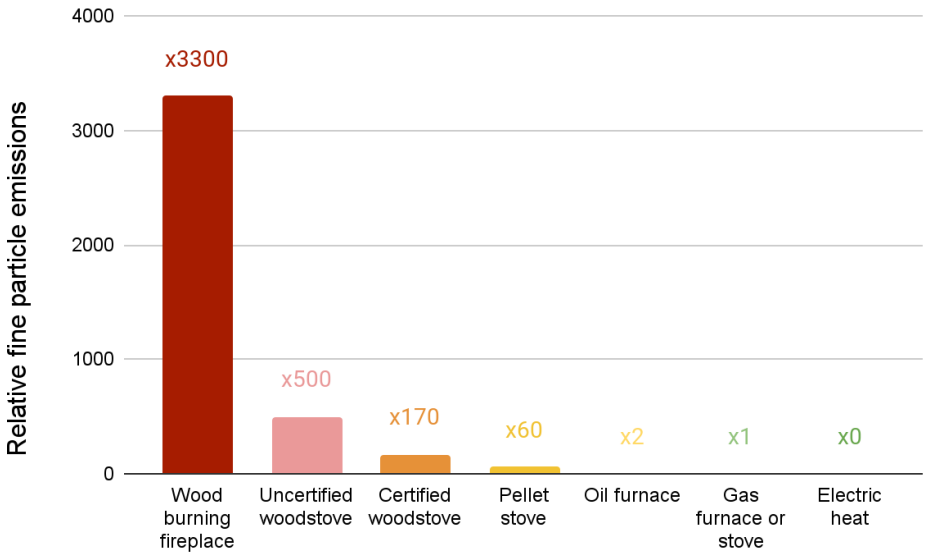
Boiler replacement

Air pollution is a pressing environmental health problem in Chile. Although progress has been made through the Air Decontamination Plans and numerous regulations, much work remains, and heating systems, especially fuel sources, are among the main issues.

The Los Ríos Region is no exception. Most of the VHS facilities used wood-burning boilers for heating and water heating. While calculating their carbon footprint, obsolete equipment was identified, including equipment that had exceeded its life cycle, which represented a need and an opportunity to shift to more efficient and less polluting technology. Some of the conclusions regarding the disadvantages of the original system were:

- Service life: some boilers had exceeded their service life, which made them inefficient and increased their operation and maintenance costs.

- Efficiency: even new and adequately functioning wood-burning boilers are less efficient than liquified petroleum gas (LPG) boilers.
- Highly polluting: wood-burning boilers produce 3,300 times more fine particles than gas boilers. Furthermore, if the fuel wood is damp, the relative emissions can increase to 6,600 times[1].



Adapted from the Ministry of Environment of Chile[2]

[1] *Futuro de la calefacción en Chile: Opciones y Consecuencias [Heating future in Chile: Options and Consequences].* Ministry of Environment. Chile. Available at: https://mma.gob.cl/wp-content/uploads/2015/05/FUTURO-DE-CALEFACCION-EN-CHILE-SEBASTIAN-TOLVETT-MMA.pdf

[2] *Calefacción como solución para la descontaminación del aire en las ciudades en el sur de Chile [Heating as a solution for air decontamination in cities in the south of Chile].* Ministry of Environment. Chile. Available at: https://www.ebpchile.cl/sites/default/files/project/uploads/2.%20Marcelo%20Fern%C3%A1ndez%20-%20Ministerio%20de%20Medio%20Ambiente.pdf

- Storage space: firewood requires large storage spaces. The wood is often stored outdoors and absorbs humidity, reducing energy efficiency and further increasing the emission of fine particles.

- Emergencies: in emergency situations, wood-burning boilers are slow to ramp up.

- Operation: the system is fed manually, creating a demand for consistent laborers. Additionally, loading and handling firewood can cause injuries or ergonomic problems such as low back pain.

Given the need to replace the boilers, alternatives were analyzed considering health, environmental, social, and economic aspects. The main options were: **new wood-burning boilers** or replacing the heating system with **LPG boilers.**

Initially, the targets were the Santa Elisa Hospital boiler due to its significant deterioration and the already installed LPG boiler at Río Bueno Hospital for laundry. Based on facility characteristics, location and services, energy consumption, and the age and condition of the boilers, a decision was made to expand the initiative to four hospitals.

The advantages of switching to LPG boilers related to efficiency, health, and environmental factors, and in this particular case, the initial investment was low to none. This opportunity arose because the offer of the chosen company to replace the boilers included the new boilers, installation, and maintenance free of charge, to supply LPG to the boilers for seven years.

After estimating the medium-term expenses and conducting a cost-benefit analysis, VHS concluded that purchasing new wood-fired boilers, building a firewood storage space, fuel consumption, and equipment maintenance made the cost difference insignificant despite the much higher cost of LPG. Benefits of using LPG boilers included:

- Environmental: the considerably lower emissions of fine particles reduce air pollution sources. Pressure on forest resources is decreased by not using wood-fired boilers. Importantly, the more efficient new boilers reduce the total energy requirements.

- Health: according to the Chilean Ministry of Environment, there are at least 4,000 premature deaths nationwide from outdoor air pollution. An estimated 10 million people are exposed to an average annual concentration of PM 2.5 higher than national regulations[3]. Decreasing ambient PM emissions reduces associated respiratory and cardiovascular morbidity, lung cancer, and mortality. Society will benefit, especially the most vulnerable populations such as people with pre-existing lung and cardiovascular

[3] *Calefacción como solución para la descontaminación del aire en las ciudades en el sur de Chile [Heating as a solution for air decontamination in cities in the south of Chile]*. Ministry of Environment. Chile. Available at: https://www.ebpchile.cl/sites/default/files/project/uploads/2.%20Marcelo%20Fern%C3%A1ndez%20-%20Ministerio%20de%20Medio%20Ambiente.pdf

disease, older adults, and children[4]. Also, the strain on health systems in treating these diseases is reduced.

- Labor: by not handling wood fuel, fewer accidents and occupational health complications occur.
- Infrastructure: the material from the disassembled firewood storage warehouses can be used to build other storage spaces for waste management supplies and separated materials. Río Bueno Hospital implemented this initiative, since large volumes of waste need to be stored during extreme weather events because it may take several days for waste transportation trucks to access the facility.

Other outcomes

In addition to the heating system renovation, the carbon footprint calculation established baseline emissions for each facility. This data inspired targeted and information-based mitigation measures. Furthermore, the results were included in the "First report on the estimation of health care facilities' carbon footprint" published by the Ministry of Health, and Checkup was selected as the GHG calculator for all health facilities nationwide.

In addition, results were communicated to the VHS personnel as part of a training program that covered topics related to waste and recycling, water quality, and energy.

The process impacted procurement as well, collaborating to reinforce the energy efficiency criteria when renewing equipment. Although no formal changes were made, the Supply Team considers these characteristics and currently prioritizes highly efficient equipment.

Coordination with other initiatives and next steps

Race to Zero

In 2021, the VHS joined the Race To Zero campaign and committed to achieving net-zero emissions by 2050. Understanding that it is a very ambitious goal, the Environmental Management Unit is designing a mitigation plan based on strengthening the initiatives implemented to date and expanding the successful experiences to all hospitals.

Because they know their GHG baseline, they will regularly evaluate their progress on mitigation measures and report results. Checkup's indicators are also helpful for comparing hospitals within

[4] *Health effects of particulate matter*. World Health Organization. 2013. Available at: https://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf

the same system, identifying opportunities for improvement, and making adjustments to ongoing plans to achieve this crucial objective.

Energy efficiency

The ESCO programs promoted by the Ministry of Energy are already being implemented in other areas of Chile. The ESCO model consists of "energy service companies supporting energy efficiency investments in public or private clients. These investments are paid mainly with the savings generated in the buildings or facilities intervened"[5]. These programs are based on evaluating the current energy system and identifying specific changes to improve its efficiency and subsequent cost savings.

Meters have been installed at the VHS facilities in different building areas to design the most appropriate energy efficiency strategy. These strategies include incorporating renewable energy, the improvement of air conditioning technology, and the replacement of light bulbs with LED units.

By using Checkup and comparing the carbon footprint calculation of previous years, it will be possible to assess energy system usage, keep track of the results of applied interventions, and monitor energy savings and reduction of GHG emissions.

Conclusions

The VHS began to work with Health Care Without Harm in 2014 developing initiatives related to the GGHH Agenda. In 2019, it hosted the second Huellatón in Chile, where it offered training on the use of Climate Impact Checkup. Its health care facilities' GHG emissions were estimated and reported from that moment onwards.

Calculating the facilities' GHG footprint served several purposes. Firstly, it was possible to set a baseline disaggregating the emissions of the different facilities. Secondly, based on this calculation, the VHS detected opportunities for improvement, identified carbon-intensive areas or activities, raised awareness among workers about the need for climate action and the responsibility of the health care sector, made informed decisions on how and where to mitigate emissions, and established realistic objectives adapted to each facility.

One of the most critical decisions from this process was the change from wood-burning to LPG boilers in four hospitals. This intervention was selected not only for its potential to reduce fine

[5] Modelo ESCO para potenciar la eficiencia energética [*ESCO model for enhancing energy efficiency*]. Ministry of Energy, Chile. 2016. Available at: https://www.energia.gob.cl/noticias/metropolitana-de-santiago/modelo-esco-para-potenciar-la-eficiencia-energetica

particle emissions but also for its multiple co-benefits in reducing health and environmental impacts and improving air quality.

From now on, Checkup will play a key role in coordinating with other initiatives in the mid- and long-term planning. Any implemented action will be based on data with measurable and verified results. The objectives can be set, tracked, and processes-adjusted accordingly.

The health care sector faces the double challenge of mitigating emissions while working on climate change adaptation and resilience. The Chilean Ministry of Health and the VHS understand this challenge and have recognized the importance of an environmental perspective in health management. In doing so, they demonstrate their climate action leadership and are an example for other health institutions. Health Care Without Harm and the GGHH network will continue to collaborate with these institutions, provide resources such as Climate Impact Checkup and highlight these climate-smart initiatives with the shared purpose of protecting the environment and public health.