

Science-Practice collaboration as leverage for Green Hospitals

Regula Keller and Matthias Stucki

Zurich University of Applied Sciences, Institute of Natural Resource Sciences
Grüntal, 8820 Wädenswil, Switzerland
Regula.Keller@zhaw.ch
www.greenhospital.ch



Zurich University
of Applied Sciences



Life Sciences and
Facility Management
Institute of
Natural Resource Sciences

Introduction

The healthcare system and its function to provide health care services has received more attention due to the current Covid-19 pandemic. At the same time, healthcare contributes to the climate impact of nations: Studies show that **health care adds up to about 5% of the national carbon footprint of OECD countries [1]**. Hospitals play an important role in healthcare both in terms of costs as well as environmental impact, but to date bottom-up life cycle assessment of hospitals are rare.

The 'Green Hospital' project analysed hospitals from environmental, economic, and logistical perspectives as part of a multidisciplinary project of the Swiss Science Foundation in which three research groups contributed: the LCA Research Group at the Zurich University of Applied Sciences, the Fraunhofer Institute for Material Flow and Logistics (Fraunhofer IML) and the Institute for Economic Studies in Basel.

Goals and Methods

The **goals** of the project were to (1) **analyse life cycle environmental impacts** in hospitals, to (2) **test hands-on applications** for environmentally optimised processes and to (3) **identify environmental best practices** and investigate the currently **realisable options**.

(1) The **global warming potential** of over thirty hospitals in Switzerland was assessed based on company-specific foreground data. These were collected with a survey sent to all Swiss acute care hospitals. The **hospital areas** electricity, heating, electronic equipment, water, and large medical equipment were **directly modelled** with the information provided by the survey. Building infrastructure, catering, waste & waste water, and medical products were modelled with **key data** from the survey linked with life cycle data from chosen hospitals. Pharmaceuticals, housekeeping supplies, textiles, and laundry were modelled with **financial data** linked with life cycle data from chosen hospitals. Paper use and printing was included with the amount used per full time equivalent and year.

(2) A hospital area with a high potential to reduce climate impact was chosen to **implement measures in one hospital**. This area was chosen based on the hotspots determined by the results of the life cycle assessment and the improvement potential from a process perspective assessed by the experts from Fraunhofer IML.

(3) To further promote the implementation of best practices in hospitals, **two network meetings** were organised where successfully implemented best practice measures were presented and discussed.

Results

(1) **Hotspots** for the global warming potential were determined to be **catering, building infrastructure, and energy provision** (see figure 2).

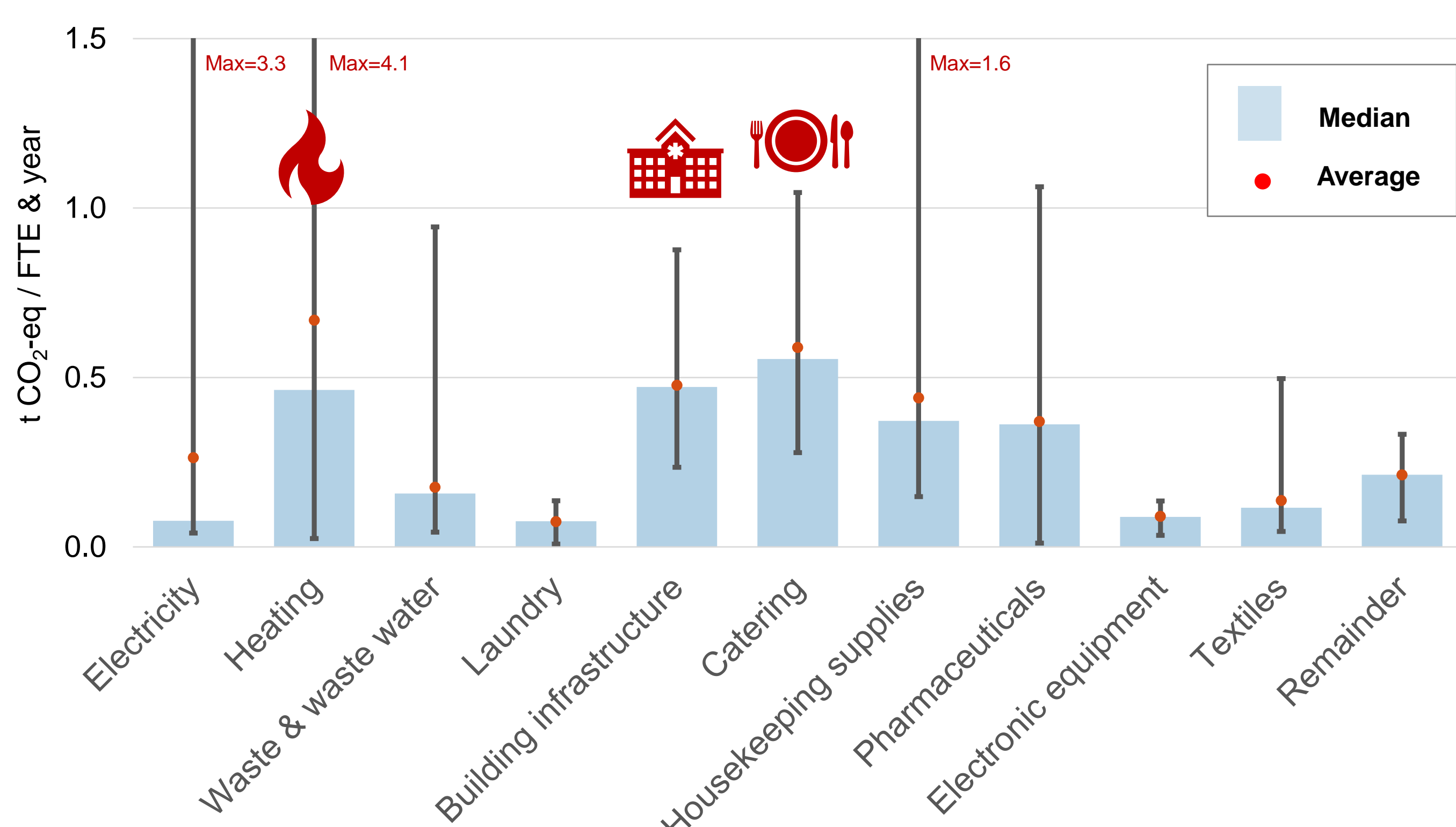


Figure 2. Greenhouse gas emissions different hospital areas in kg CO₂-eq per health care provided per full time equivalent (FTE) and year [2], assessed with the IPCC 2013 method [3]. Water, large medical equipment and paper use & printing are summarised in "remainder".



The impact of the hospital areas show a **large variation** among the individual hospitals. This is especially true for electricity and heating, where both the amount of energy provided as well as the type of energy source used have a great influence of the climate impact.

(2) **Catering** was chosen as the area to implement reduction measures in one hospital based on its climate impact reduction potential. The meals of the menu type "front cooking" were changed from standard recipes to **climate-friendly vegetarian** for two weeks. The impact of the meals was assessed with a life cycle assessment based on detailed ingredients lists provided for two weeks before and during implementation. **The average climate impact per meal was reduced by 50%** during the implementation weeks, while even slightly more meals of this type were sold (see figure below).

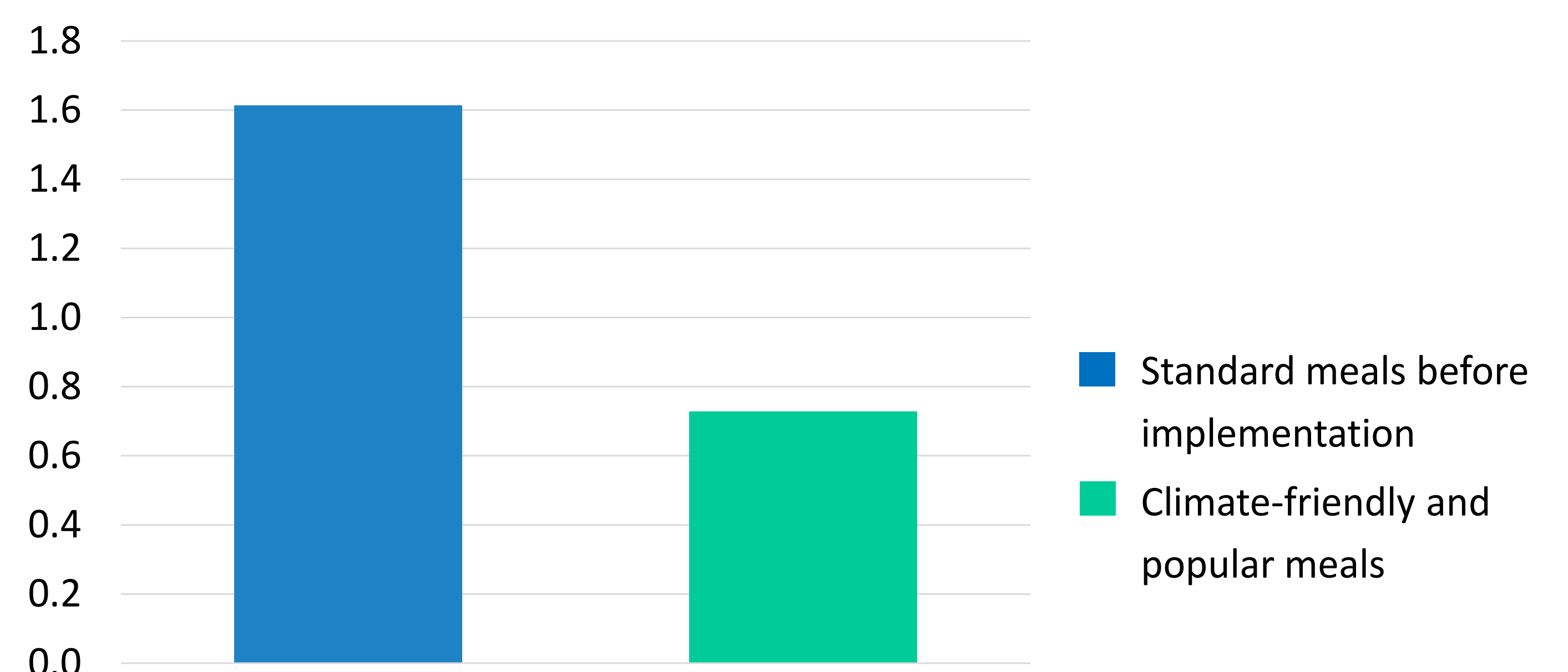


Figure 3: Average global warming potential in kg CO₂-eq per meal in two standard weeks and in the two weeks of the implementation.

(3) The discussions in the **network meetings** highlighted the importance of the commitment of individuals but at the same time emphasised how important the general situation is: Decisions are strongly influenced by the **availability of a sustainability strategy** in a hospital plus political and legal requirements as well as financial conditions. Hospital representatives also expressed a **need for exchange** with other hospitals in the area of sustainability and a need for more hands-on information on best practice.

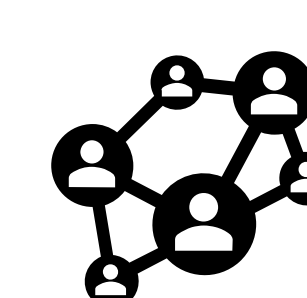
Discussion and Conclusion



The 'Green Hospital' project shows that a **strong collaboration of people in practice and science** is key for the implementation of life cycle thinking into organisations.



Catering is a hospital area with a high potential for environmental impact reduction by **offering more climate-friendly meals**.



To advocate implementation and learn from other hospitals, **network meetings are crucial** to foster sustainability impact in healthcare.



References

- Pichler, P.-P., Jaccard, I. S., Weisz, U., & Weisz, H. (2019). International comparison of health care carbon footprints. *Environmental Research Letters*, 14(6), 064004. <https://doi.org/10.1088/1748-9326/ab19e1>
- Keller, R., Muir, K., Roth, F., Jattke, M., & Stucki, M. (2021). From bandages to buildings: identifying the environmental hotspots of hospitals. *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2021.128479>
- IPCC. (2013). *Climate Change 2013: The physical science basis*. Contribution of working group I to the fifth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press.