



# KONFERENCIAKÖTET

## Conference Proceedings

**Nemzetközi tudományos konferencia  
a Magyar Tudomány Ünnepe alkalmából**  
International Scientific Conference  
on the Occasion of the Hungarian Science Festival

**Sopron, 2023. november 23.**  
23 November 2023, Sopron

**FENNTARTHATÓSÁGI ÁTMENET:  
KIHÍVÁSOK ÉS INNOVATÍV MEGOLDÁSOK**  
SUSTAINABILITY TRANSITIONS: CHALLENGES AND INNOVATIVE SOLUTIONS

Szerkesztők / Editors:

OBÁDOVICS Csilla, RESPERGER Richárd, SZÉLES Zsuzsanna, TÓTH Balázs István

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## **Sustainability and Climate Protection in Hospitals - Green Hospitals in the Future in Germany**

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### **Abstract:**

Sustainability is related to climate protection, and both are ongoing trends. Not just in the private, also in the professional environment. Climate protection in hospitals in Germany can make a significant contribution to reducing greenhouse gases. Managing the climate crises also depends on reducing emissions of the hospitals. Although there is no legal basis for reporting sustainability in German hospitals, many are actively contributing to climate protection. However, there are further measures to reduce the negative impact on the environment. They require strategic implementation in the hospitals. The article investigates the sustainability and climate protection of German hospitals. Based on a fieldwork consisting of a qualitative literature research, the inquest explores the status quo of German hospitals regarding sustainability and climate protection. The article analyzes in detail the current practices in various key areas of sustainability and climate protection in hospitals in Germany and presents them.

**Keywords:** green hospitals, sustainability, climate protection

JEL Codes: I19, Q54, Q56

### **1. Introduction**

In recent years, the view of sustainability and climate protection in Germany has changed significantly. Not least due to Generation Z, who has been taking to the streets since 2018 as part of the "Fridays for Future" to demonstrate for an effective climate policy (Kühne, 2019).

In addition to the private environment, a rethink is also increasingly taking place in the professional environment. The worsening environmental developments have a significant impact on human health. Nevertheless, climate-related changes and the associated health consequences for humans, animals and nature are attributable to human behavior (World Health Organization, 2015).

The hospital sector also has a major influence on developments in this regard. Nevertheless, there is currently no legal basis that obliges hospitals to take sustainability aspects into account or to pay attention to climate protection. In Germany, a total of 1.893 hospitals are responsible for up to 6.7% of greenhouse gas emissions (Pichler et al., 2019).

An occupied bed in a hospital in Germany for example consumes between 300 and 600 liters of water per day (Braun et al., 2015). The CO<sub>2</sub> emissions from the healthcare sector, which can primarily be attributed to inefficient energy use, have so far received little or no attention in the strategy for tackling climate change (Health Care Without Harm & Arup, 2019).

Overall, Germany has a special responsibility as the world's sixth largest and Europe's largest emitter in the healthcare sector. In a climate protection agreement and the United Nations Climate Change Conference in 2021, Germany also committed to measuring and, in particular, reducing emissions from the healthcare sector in future. The aim is to achieve a climate-neutral healthcare system by 2030 (Gießelmann & Osterloh, 2021).

The article shows the current situation in hospitals in Germany with regard to climate protection and what legal requirements exist. An international comparison is also reviewed. Finally, a conclusion is drawn as to which measures need to be introduced in order to implement green management in hospitals.

## **2. Methods**

Within a qualitative literature search, the following secondary source was primarily used: Deutsches Krankenhaus Institut e.V. (DKI): „Klimaschutz in Deutschen Krankenhäusern: Status quo, Maßnahmen und Investitionskosten. Auswertung klima- und energierelevanter Daten deutscher Krankenhäuser“, 30.06.2022.

The survey focuses on the areas in the hospital that directly generate greenhouse gas emissions. The selected topics were:

- Energy and electricity,
- User behavior,
- Coldness,
- Heat,
- Water,
- Waste Management.

The survey was divided into two questionnaires, each focusing on a different topic. One half of the hospitals were asked to provide information on the topics of cooling and waste management, the other half on the topics of heating and water. The topics of adaptation strategy, energy management, user behavior, contracting and electricity were included in both versions of the questionnaire and were therefore covered by the entire sample.

The survey population comprised all general hospitals in Germany with 50 beds or more. A total of 1.399 general hospitals were sent the questionnaire. A total of 263 hospitals took part in the survey. This corresponds to a response rate of 18.8% (DKI, 2022).

## **3. Results**

The climate crisis is a multifactorial problem. This means that hospitals need to focus on different areas of action in order to find solutions. One possibility is the Balanced Scorecard. This is a strategic management tool that can be used to better measure and therefore achieve corporate strategies. While management was initially only used for the key financial figures of traditional accounting, it is now used to manage resources and processes in companies. Above all, the internal perspective is taken into account. The foundation of the key figures is the derivation from the development of cause and effect relationships. The Balanced Scorecard also goes hand in hand with an ongoing communication of the company's objectives (Boersch & Elschen, 2007). The following illustration shows the structure of a Balanced Scorecard for sustainability (Figure 1).

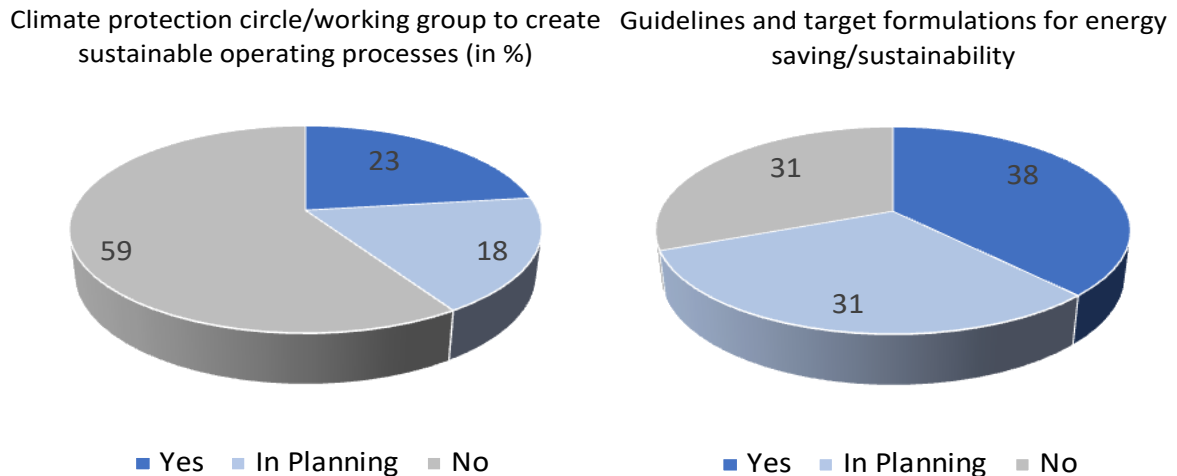


**Figure 1: Balanced Scorecard for sustainability**  
 Source: Own illustration based on Weimann (2023)

Overall, combating climate change comprises two strategies: Climate change mitigation and climate change adaptation (IPCC, 2018). Hospitals therefore take both components into account in their strategic orientation, which is why the survey conducted by the German Hospital Institute was initially divided into climate protection and climate impact adaptation. In the process, 54% of hospitals stated that they protect the climate and 49% of hospitals stated that they implement climate change adaptation measures such as heat action plans (DKI, 2022). Green management in hospitals must be included in an integrated management approach, then it can bring the following benefits, among others:

- Clear, binding and mandatory goals for a green hospital.
- All employees are involved in the entire process in a structured manner.
- More "bottom-up" instead of "top-down".
- A continuous change process is developed towards a sustainable hospital (Debatin et al., 2011).

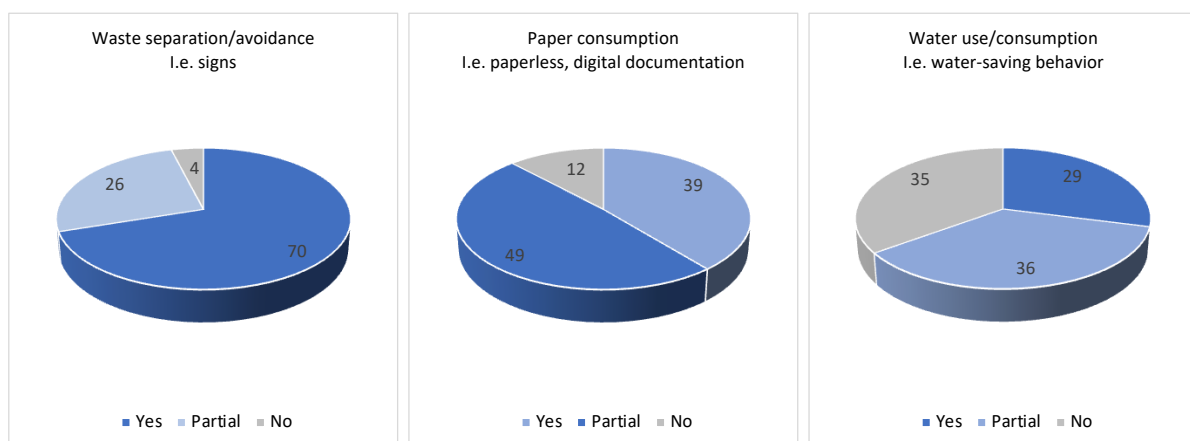
In its survey, the German Hospital Institute also included strategic measures under the question "Which of the following strategic measures are taken into account for energy management in your hospital?" (Figure 2).



**Figure 2: Which of the following strategic measures are taken into account for energy management in your hospital?**

Source: Own illustration (2023) based on DKI (2022)

38% of respondents stated that they have guidelines and target formulations for energy saving/sustainability. In 31% of the companies, these are in the planning stage and in 31% the aspect is in the planning stage. In contrast, only 23% of the hospitals surveyed stated that they were implementing "climate protection circles/working groups to create sustainable operating processes". 18% of the hospitals are planning such measures and 59% of the hospitals do not have a working group to create sustainable operating procedures. The question of whether a climate protection officer or a climate protection manager should be appointed was answered in the affirmative by 30%, in the planning stage by 11% and in the negative by 59%. Against this background, the hospitals were also asked which structures and aspects had already been successfully established within the respective hospitals. The specific question here was "In which areas are structures/concepts for energy-efficient behavior in place in your hospital?". The following diagram represents the feedback from the hospitals on the topics of waste separation/avoidance, paper consumption and water use/consumption (DKI, 2022).



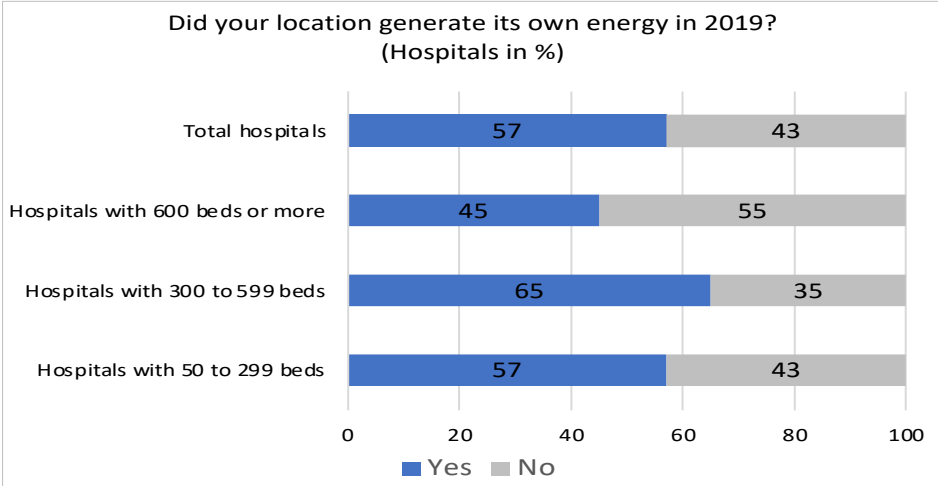
**Figure 3: In which areas are structures/concepts for energy-efficient behavior in place in your hospital?**

Source: Own illustration (2023) based on DKI (2022)

The Figure 3 shows that 70% of the hospitals surveyed separate or avoid waste. 26% partially implement concepts in this regard and 4% do not implement them at all. In contrast, the proportion of paper consumption decreases slightly. Here, only 39% of companies stated that they work with paperless i.e. digital documentation. 49% are in the process of partial implementation and 12% stated that they do not have any concepts for energy-efficient behavior with regard to paper consumption. Within the third aspect of water use or consumption, 29% of hospitals stated that they were implementing measures such as instructions on water-saving behavior. 36% partially and 35% of respondents do not implement any measures.

The aspect of renewable energies was also taken into account in the survey, as climate protection cannot be achieved without renewable energies. It has been proven that the average global temperature has been rising for several decades and that this increase is linked to the human-induced emission of greenhouse gases (Cook et al., 2013). Another measure to protect the climate sustainably is therefore to increasingly switch to renewable energies. However, when we talk about renewable energies, we are referring to a wide variety of technologies. The primary energy sources at this point are the sun, the moon and the earth. While the sun primarily uses solar radiation for photovoltaics, for example, the moon uses tides for a tidal power plant, for example, and the earth uses geothermal energy for a geothermal heating power plant. Renewable energies are used to generate both electricity and heat. Ultimately, they are used throughout the entire energy system (Hennicke and Fishedick, 2010).

With regard to the topic of renewable energies, the survey conducted by the German Hospital Institute in 2019 asked whether hospitals generated their own energy in 2019. A distinction was made here between hospitals with 50 to 299 beds, hospitals with 300 to 599 beds, hospitals with 600 beds or more and hospitals as a whole. It is striking here that primarily medium-sized hospitals generated their own electricity (65%). The figure was 57% for smaller hospitals and 45% for larger hospitals. Overall, 57% of hospitals in Germany generated their own electricity. Of these, 24% have their own photovoltaic systems (DKI, 2022). The other hospitals used a combined heat and power plant to generate their own electricity. This is a technical system for the simultaneous provision of electricity and heat (Viezens, 2011).



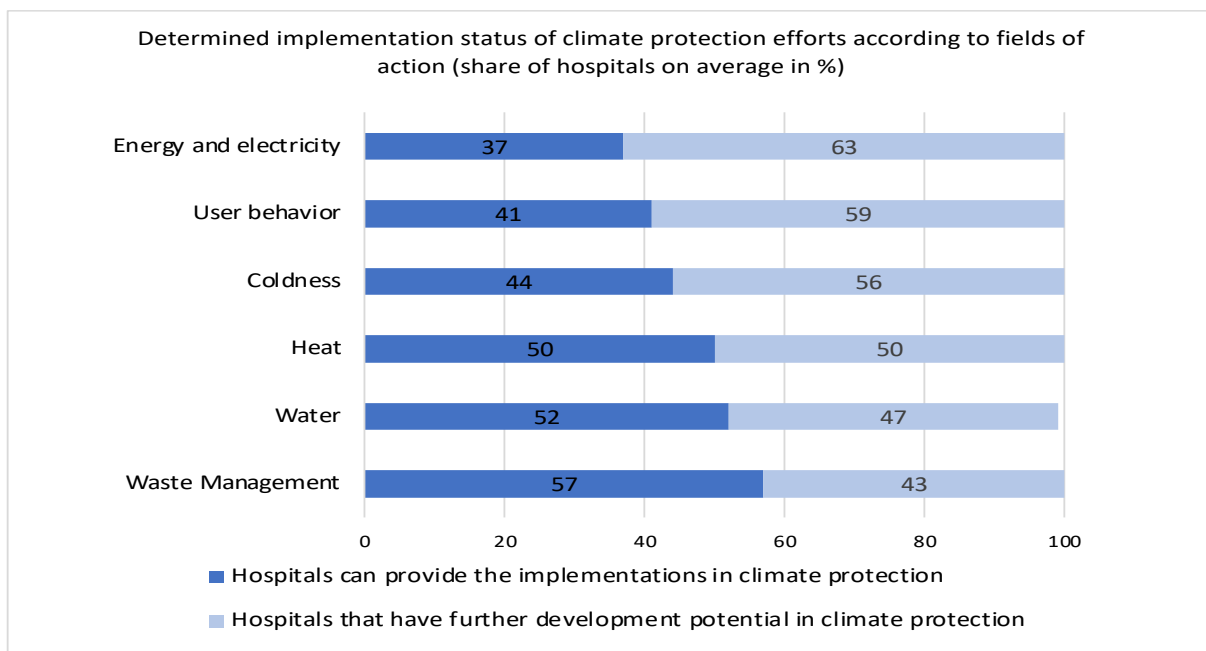
**Figure 4: In which areas are structures/concepts for energy-efficient behavior in place in your hospital?**

Source: Own illustration (2023) based on DKI (2022)

With the help of the individual subject areas, it was possible to ask in detail what the current status is with regard to the implementation of climate protection measures in hospitals in Germany. During the evaluation, it became particularly clear that the greatest need for further



development exists in the area of energy and electricity. Only 37% of the hospitals surveyed had already implemented measures in this area. In the area of energy management, user behavior and climate impact adaptation, only 41% of hospitals were also able to implement measures, while 59% showed potential for further development. In the area of cooling supply, a total of 44% of hospitals can report positive developments, although 56% still need support for development in the future. In the area of heating, 50% of hospitals have developed well in terms of climate protection measures and 50% have not optimized their technical systems or taken any structural measures. Similar values were achieved in the improvement of the water supply: 52% of the hospitals already have savings measures in place. In 47% of hospitals, on the other hand, there is still potential for further development in terms of climate protection in the area of water supply. Overall, the sub-area of waste management performed best. Even though 34% of hospitals were still able to identify development potential for expanding climate protection measures in waste management, 57% have implemented a structured waste management system that includes measures such as a waste separation culture or switching from disposable to reusable products.



**Figure 5: Determined implementation status of climate protection efforts according to fields of action**

Source: Own illustration (2023) based on DKI (2022)

#### 4. Conclusions

Global warming poses a fundamental threat to humanity. Nevertheless, changes in behavior such as CO<sub>2</sub> reduction represent a major challenge. The fact that climatic changes are known, but that this knowledge is not used to guide action, plays a central role here. The key factor here is that a threat is only perceived as such when it is immediate, concrete and indisputable (Bracha, 2004). Measures are therefore urgently required at political, innovative, economic and personal level. All healthcare institutions have a relevant responsibility in this regard (Bunz & Mücke, 2017).

The presented data from the hospital surveys provide an overview of the current situation regarding energy-efficient refurbishment in the German hospital landscape. The data analyzed focuses on the topics of user behavior, coldness, heat, water and waste management. The overall

results are heterogeneous. In addition to hospitals with few activities, there are also hospitals with numerous climate protection and sustainability activities. Based on the available secondary data sources, it can be shown that although there is currently no legal basis for climate protection or sustainable behavior in German hospitals, approaches do exist. Nevertheless, there is a need for further action and refurbishment.

As the situation regarding the financing of investment costs in relation to climate protection and sustainability has not been sufficiently facilitated by the federal states in the past, it can be assumed that the progress will continue to be severely hampered.

Particularly in view of the fact that the issue of environmental and climate protection is a problem for society as a whole and that the costs can not be borne by regular hospital revenues, special funds should be set up for this purpose. A hospital climate protection fund is therefore proposed for the energy-efficient refurbishment of German hospitals. Similar to the Hospital Future Fund for the aspect of digitalization in hospitals, it should be financed via mixed financing from the federal and state governments (DKI, 2022).

In addition to the large investments that need to be made in the long term to move towards a green hospital, small steps can already be taken in some areas through conscious behavior. For example, signs on waste garbage cans can be used as a reminder to separate waste. Hospitals can also provide their employees with regular training on water use. Furthermore, environmentally friendly paper can be used if patient files made of paper are not yet completely dispensed with. Even measures at a personal level that are supported within the workforce also contribute to climate protection and sustainability. Complete climate neutrality and therefore green hospitals are the goal to be strived for.

## References

- Boersch, C. & Elschen, R. (Eds.) (2007). *Das Summa Summarum des Management: die 25 wichtigsten Werke für Strategie, Führung und Veränderung*. Wiesbaden: Gabler Verlag.  
<http://doi.org/10.1007/978-3-8349-9320-5>
- Bracha, H. S. (2004). Freeze, Flight, Fight, Fright, Faint: Adaptationist Perspectives on the Acute Stress Response Spectrum. *CNS Spectrums*, 9(9), 679–685.  
<https://doi.org/10.1017/S1092852900001954>
- Braun, A., Rijkers-Defrasne, S., & Seitz, H. (2015). *Ressourceneffiziente Wasserkonzepte für Krankenhäuser*. Berlin: VDI Zentrum Ressourceneffizienz GmbH. Retrieved: 27.12.2023, from [https://www.ressource-deutschland.de/fileadmin/user\\_upload/1\\_Themen/h\\_Publikationen/Kurzanalysen/2015-Kurzanalyse-11-VDI-ZRE-Krankenhaeuser.pdf](https://www.ressource-deutschland.de/fileadmin/user_upload/1_Themen/h_Publikationen/Kurzanalysen/2015-Kurzanalyse-11-VDI-ZRE-Krankenhaeuser.pdf)
- Bunz, M., & Mücke, H.-G. (2017). Klimawandel – physische und psychische Folgen. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, 60(1), 632–639.  
<https://doi.org/10.1007/s00103-017-2548-3>
- Cook, J., Nuccitelli, D., Green, S. A., Richardson, M., Winkler, B., Painting, R., Way, R. Jacobs, P. & Skuce, A. (2013). Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, 8(2), 024024.  
<https://doi.org/10.1088/1748-9326/8/2/024024>
- Debatin, J. F., Goyen, M., & Kirstein, A. (Eds.) (2011). *Alles grün... .. auch im Krankenhaus: Green Hospital – Wege zur effektiven Nachhaltigkeit*. Stuttgart: Georg Thieme Verlag.  
<https://doi.org/10.1055/b-002-33688>
- Deutsches Krankenhaus Institut e.V. [DKI]. (2022). *Klimaschutz in Deutschen Krankenhäusern: Status quo, Maßnahmen und Investitionskosten: Auswertung klima- und energierelevanter Daten deutscher Krankenhäuser*. Retrieved: 20.09.2023, from [https://www.dkgev.de/fileadmin/default/Mediapool/1\\_DKG/1.7\\_Presse/1.7.1\\_Pressemitteilungen/2022/2022-07-19\\_DKI-Gutachten\\_Klimaschutz\\_in\\_deutschen\\_Krankenha\\_\\_usern.pdf](https://www.dkgev.de/fileadmin/default/Mediapool/1_DKG/1.7_Presse/1.7.1_Pressemitteilungen/2022/2022-07-19_DKI-Gutachten_Klimaschutz_in_deutschen_Krankenha__usern.pdf)

- Gießelmann K., & Osterloh, F. (2021). *Klimaschutz im Gesundheitswesen: Klimaneutralität bis 2030*. Deutsches Ärzteblatt. Retrieved: 20.09.2023, from <https://www.aerzteblatt.de/archiv/222006/Klimaschutz-im-Gesundheitswesen-Klimaneutralitaet-bis-2030>
- Health Care Without Harm & Arup. (2019). *Health care's climate footprint: How the health sector contributes to the global climate crisis and opportunities for action*. Retrieved: 27.12.2023, from [https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint\\_092319.pdf](https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf)
- Hennicke, P., & Fishedick, M. (2010). *Erneuerbare Energien: mit Energieeffizienz zur Energiewende*. München: C.H.Beck Wissen. ISBN 9783406555145.
- IPCC. (2018). *Global warming of 1.5°C*. Special Report. The Intergovernmental Panel on Climate Change. Retrieved: 04.12.2023, from <https://www.ipcc.ch/sr15/>
- Kühne, R. W. (2019) *Climate Change: The Science Behind Greta Thunberg and Fridays for Future*. Open Science Framework. <https://doi.org/10.31219/osf.io/2n6kj>
- 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>
- Viezens, A. (2011). *Die Bedeutung von Blockheizkraftwerken im Strom- und Wärmemarkt*. München: GRIN Verlag. ISBN 9783640843039.
- Weimann, E. (2023). Klimaschutz im Krankenhaus: Auf dem Weg zu einem Netto-Null-Gesundheitssystem. *Monatsschrift Kinderheilkunde*, 171(2), 138–146. <https://doi.org/10.1007/s00112-022-01675-6>
- World Health Organization [WHO]. (2015). *Climate and Health Country Profiles - 2015: A Global Overview*. Retrieved: 27.12.2023, from [https://iris.who.int/bitstream/handle/10665/208855/WHO\\_FWC\\_PHE\\_EPE\\_15.01\\_eng.pdf](https://iris.who.int/bitstream/handle/10665/208855/WHO_FWC_PHE_EPE_15.01_eng.pdf)