Federal Ministry
Republic of Austria
Social Affairs, Health, Care
and Consumer Protection

Strategy for a Climate-Neutral Healthcare System

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Imprint

Media owner and publisher
Federal Ministry of Social Affairs, Health, Care and Consumer Protection
(Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschutz, BMSGPK),
Stubenring 1, A-1010 Vienna, Austria
Place of publishing and production: Vienna, Austria
Photo credits: Cover: © istock.com / Boy Wirat
Vienna, 2025, as at: 12 July 2024

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For citations (in research papers), the following source must be indicated: Lichtenecker, Ruperta; Schanes, Karin; Durstmüller, Felix; Lichtblau, Claudia; Truppe, Michaela; Lampl, Christina (2024): Strategy for a Climate-Neutral Healthcare System. Federal Ministry of Social Affairs, Health, Care and Consumer Protection (Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschutz, BMSGPK), Vienna.

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Foreword

Johannes Rauch
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Dear Readers,

The climate crisis' impacts on health have become increasingly visible and tangible. The related effects are evolving into a growing burden on our individual well-being and are also placing an increasing strain on the healthcare system.

According to the WHO, climate change is the biggest global health threat of the 21st century. Rapid reduction of greenhouse gas emissions in all areas is key to limiting global warming to 1.5 degrees. Due to its high demand for energy, transportation and medical products, the healthcare sector is a source of considerable greenhouse gas emissions in both Europe and the world at large – which makes it at the same time a source of climate-related health problems.

In Austria, the healthcare sector is responsible for 6.7 per cent of the national carbon footprint. What is more, analyses show that unless concrete countermeasures are taken, the consequential costs attributable to the climate crisis will be highest in the healthcare sector. The healthcare sector is thus both affected by and responsible for the climate crisis. Hence, there is a need for comprehensive action.

So far, however, the healthcare sector has hardly played a role in national climate protection strategies. By adopting this Strategy, we have thus taken an important step in the right direction, which enables us to assume a pioneering role in this respect at international level.

With a view to firmly embedding climate protection in all areas of the healthcare system, this strategy covers not only target definitions but also the status quo, starting points and recommendations for action. It seeks to lay the groundwork for ensuring that healthcare services can be provided in a climate-friendly and therefore health-promoting manner in the future.

A joint, collaborative approach is key to facilitating this strategy's successful implementation. It is essential that all stakeholders cooperate closely, are committed to, and work jointly towards realising a climate-neutral healthcare system as their clear, common goal. Only through joint commitment, broad-based participation and the involvement of all relevant stakeholders will be able to achieve the necessary transition to

climate neutrality in the healthcare sector, thus making an important contribution to health protection.

I would like to use this opportunity to thank all experts who have contributed with commitment and dedication to the development of this Strategy by sharing their specialist know-how and expert knowledge. By joining forces, we will be able to successfully manage the ecological and health-related challenges of our time and ensure a sustainable future for generations to come, promoting both climate and health protection.

Johannes Rauch
Federal Minister

Table of Contents

Abstract

Background

The effects of climate change have become increasingly visible and tangible and pose a growing threat to people's health, as well as to the healthcare system. According to the WHO, climate change is the biggest global health threat of the 21st century. Rapid and comprehensive reduction of greenhouse gas emissions across the board in all sectors is key to limiting global warming to 1.5 degrees. The healthcare sector alone accounts for a significant 6.7 per cent of Austria's carbon footprint, which illustrates the comprehensive need for action in this respect. For a long time, however, the healthcare sector had neither been specifically addressed in climate protection strategies, nor had a strategy for a climate-neutral healthcare system been developed. The many negative impacts of climate change, the enormous associated costs, the binding target structures, defined both at national and international level, as well as the recommendations made by international and national experts – including the expert opinion shared in the Austrian Special Report on Health, Demography and Climate Change – indeed call for developing and preparing a Strategy for a Climate-Neutral Healthcare System.

Methods

Part of the process of developing the Strategy for a Climate-Neutral Healthcare System involves addressing the initial situation and the impact of climate change on health and the healthcare system, including providing an overview of the current state of scientific knowledge regarding the carbon footprint of Austria's healthcare sector. This report also outlines the goals, starting points, instruments, and framework necessary to anchor climate protection in the healthcare system and to expediate the sustainable transformation that is required. In addition, it identifies key fields of action to reduce greenhouse gases in the healthcare system and explains the initial situation, climate relevance, options for action, recommendations for action, and best practice examples for each key field. The results are based on (a) a comprehensive review of the literature, (b) the first results of the pilot project "Consultation for Climate Friendly Healthcare Facilities", and (c) exchange and discussions with experts. The recommendations for action are based on (d) a participatory process with decision makers, stakeholders, and experts. A particular focus in the process was placed on hospitals as well as pharmaceuticals and medical products, the areas that contribute most to Austria's carbon footprint. A third workshop was also held on the topic of "Emergency medical services and climate protection".

Results

The Strategy for a Climate-Neutral Healthcare System was developed by the Competence Centre Climate and Health at the Austrian National Public Health Institute (Gesundheit Österreich GmbH, GÖG). It aims to tackle those health services that are indispensable – despite health promotion and the avoidance of inefficient treatment – laying the foundations for reducing their emissions and optimising their efficiency and environmental performance in order to force the pace of transformation to climate neutrality on a broad basis. This requires changes to be made in various key fields of action relating to the climate (energy, buildings, and green spaces; pharmaceuticals and medical devices; waste and resources; transport and mobility; food) and in all healthcare facilities. Measures and innovative processes are needed to ensure that health services are provided and that the materials and products for these services are manufactured, used, and disposed of in a climate-friendly manner. The framework conditions, including, in particular, financing and the legal framework, must be configured in such a way that they create incentives for climate-friendly healthcare. Successful implementation of the Strategy for a Climate-Neutral Healthcare System requires suitable structures and processes for governance that encompass the central areas, relevant stakeholders, and actors at different levels.

Conclusion

While there is increasing awareness of which measures are needed, the main challenge is to shape the framework conditions in such a way that it is possible for the healthcare sector to achieve climate neutrality. This requires a binding definition of and agreement on target structures; the commitment of relevant decision makers, stakeholders, and actors; the creation of a roadmap; the cooperation of various disciplines; and, last but not least, citizen involvement and participation.

Keywords

Strategy, healthcare, healthcare system, healthcare sector, climate change, climate protection, climate neutrality, security of supply, resilience, sustainability, transformation

1 Challenges and Motivation

Climate change is the greatest global health threat facing society in the 21st century (Romanello et al. 2021). Limiting global warming to 1.5 degrees Celsius (°C) necessitates rapid, radical and, in most cases, immediate and deep greenhouse gas reductions across all sectors within this decade (IPCC, 2022). According to scientists, however, meeting this climate target is not plausible based on current measures (Engels et al. 2023).

The Austrian climate targets for 2030 and 2040 can only be met if structures for climate-friendly living are developed and put in place in a determined, coordinated, targeted and ongoing manner (APCC, 2023).

The impacts and consequences of the climate crisis on health can already be observed today and will further intensify in the coming years and decades. Climate change affects people's health either directly (for instance through heatwaves) or indirectly through changes in natural systems (such as increased release of allergens). Hence, the healthcare system needs to adapt to the rising and changing demand for healthcare services attributable to the climate crisis. This, in turn, increases the need for healthcare services and thus the pressure on healthcare facilities, which are already facing multiple challenges.

Due to its high demand for energy, transport, products and the provision of healthcare services of all kinds, the healthcare sector itself, however, causes considerable greenhouse gas emissions in Austria and worldwide, making it one of the contributors to these climate-related health problems. In 2014, the Austrian healthcare sector was responsible for just under seven per cent of Austria's total carbon footprint (Weisz et al. 2020). Worldwide, the healthcare sector is estimated to account for 4.4 per cent of global net emissions (two billion tonnes of carbon dioxide equivalent (CO_2e)). If the healthcare sector were a country, it would be the world's fifth largest emitter (Karliner 2019).

This makes it very clear that the healthcare sector is climate-relevant – with a correspondingly urgent need for comprehensive action. Hence, it is pivotal to not only develop a Strategy for Climate-Neutral Healthcare System but also to firmly establish the respective measures enabling this target to be achieved.

In order to meet climate policy goals, such as the target of climate neutrality by 2040 (Federal Chancellery, 2020) set out in the Austrian Government Programme 2020-2024, the EU climate targets or the greenhouse gas emission reduction commitments under the Paris Agreement, it is necessary for all sectors to implement far-reaching measures (APCC 2023).

It is thus obvious that the healthcare sector can – and indeed must – make a key contribution towards this joint effort.

For a long time, the healthcare sector had neither been specifically addressed in climate protection strategies, nor has there been a national strategy for a climate-neutral healthcare system. At international level, the UK's National Health Service has been the first healthcare system worldwide to commit itself to become 'carbon net zero' by 2040 (NHS 2020).

The many negative impacts of climate change, the associated enormous costs and the binding target structures defined both at national and international level as well as the recommendations made by both national and international experts in the Austrian Special Report on Health, Demography and Climate Change (APCC, 2018) call for drafting and developing a strategy for a climate-neutral healthcare system.

The Strategy for a Climate-Neutral Healthcare System prepared by the Climate and Health Competence Centre at the Austrian National Public Health Institute (Gesundheit Österreich GmbH, GÖG) aims to lay the foundations for ensuring that necessary healthcare services – required despite health promotion efforts and avoidance of inefficient treatment – can be provided in a climate-friendly manner, adding significant impetus to broad-based transformation towards climate neutrality. The Strategy focuses not only on reducing the emissions generated when providing healthcare services but also on optimising efficiency and climate-friendliness of service provision.

Achieving the climate targets highlighted above requires comprehensive transformation – within a very short period of time. Hence, it is essential that structural framework conditions, especially governance, financing, monitoring, funding as well as strategic and legal framework conditions be designed in such a way that creates incentives for climate-friendly healthcare.

Key to this Strategy's successful execution is furthermore involvement and active contribution of all relevant actors and stakeholders as well as consistent action regarding the implementation of measures in the various fields of action.

Such a transformation is an enormous challenge but at the same time it opens up huge opportunities. The healthcare sector can have a role model effect, set examples through relevant climate protection measures, contribute to cost reductions, promote security of supply and thus strengthen the overall resilience of the healthcare system.

In this spirit, this Strategy for a Climate-Neutral Healthcare System essentially covers the following areas:

- Health impacts of climate change
- Discussion of greenhouse gas emissions caused by the Austrian healthcare system
- Analysis of the costs of climate change and the benefits of climate protection
- Target structures in the context of climate and health
- Structure of the Austrian healthcare system
- Goals, starting points and tools under the Strategy
- Definition of fields of action and options for action relevant for climate protection
- Recommendations for action developed in the workshops
- Framework conditions and prerequisites for a Climate-Neutral Healthcare System
- Identification of the key starting points for structural changes

The Strategy for a Climate-Neutral Healthcare System serves as a guideline for achieving climate neutrality in the healthcare sector by 2040 or 2050, also creating the basis for evaluating and managing the measures to be implemented. The basic principles developed under this Strategy lay the groundwork for further involvement of relevant stakeholders as well as central organisations and institutions active in the healthcare sector.

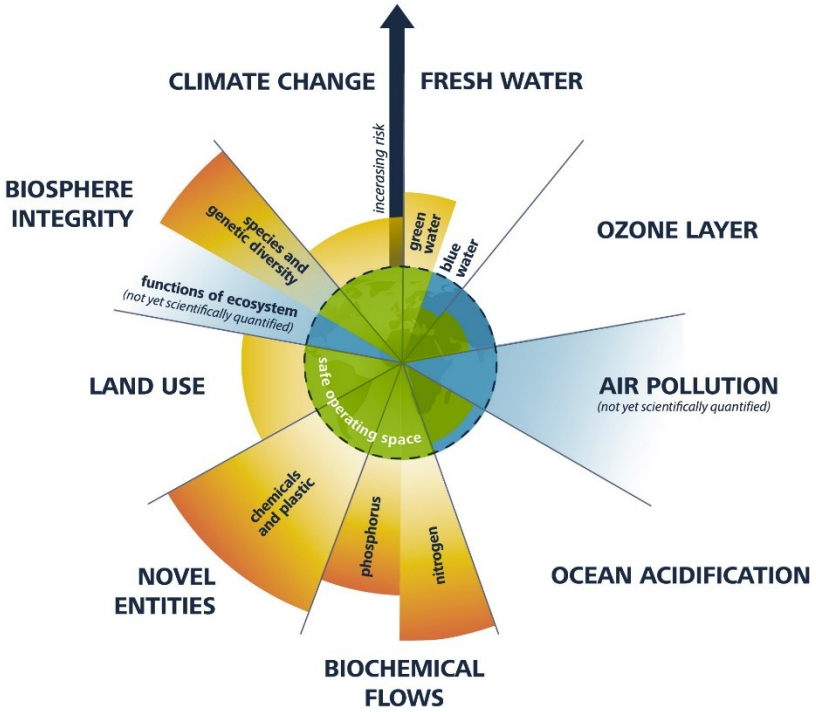
2 Status Quo

2.1 Transgression of planetary boundaries

Humanity is facing enormous challenges today. The steady rise in material prosperity in more and more countries combined with economic activities and lifestyle choices is putting the planet's ecosystem under increasing pressure. A fact that not only poses a threat to nature and the ecological basis of life, but also directly jeopardises the health and wellbeing of humanity and all living creatures.

The stress and strain on the global ecosystem can be quantified by the planetary boundaries defined by science. Figure 1 shows where and to what extent these planetary boundaries have already been exceeded. According to experts, the green circle in the centre symbolises the “safe operating space” that enables sustainable development and long-term use of natural resources (Persson et al. 2022; Steffen et al. 2015; Wang-Erlandsson et al. 2022).

Figure 1: Planetary boundaries



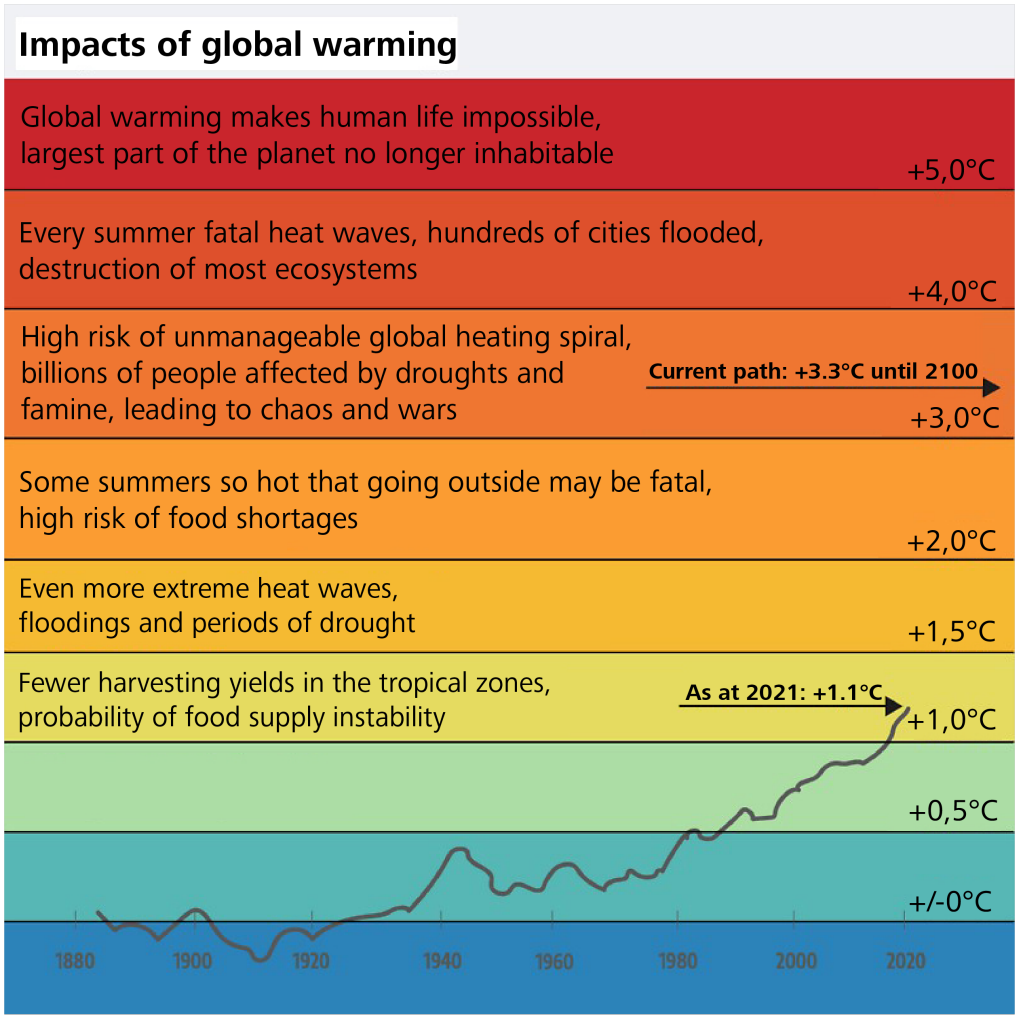
Source: Krautwig (2022), originally by Azote for the Stockholm Resilience Centre based on Wang-Erlandsson et al. (2022), Persson et al. (2022), Steffen et al. (2015)

Some of the planetary boundaries have already been reached or transgressed many times over. In this context, the massive changes going on in the biosphere interact, impacting and often reinforcing one another. Hence, the rise in temperatures attributable to climate change has led to a reduction of soil moisture levels (“green water”), which is, for instance, important for rainforests to thrive. While changes in land use, often serve to foster climate change.

The fact is that our planet’s ecological capacities are far from sufficient to be able to sustain our current levels of economic activity and lifestyle in the medium to long term and to provide a safe living space for humanity. Thus, what is urgently called for is a comprehensive and immediate change of course to enable a return to the “green zone” and, in the interests of sustainable development, “not to compromise future generations’ ability to meet their own needs and choose their own lifestyle” (Hauff 1987, 46).

Regarding planetary boundary transgressions, climate change is currently attracting the highest levels of public attention by far. Since the times of the industrial revolution in the 19th century, greenhouse gas emissions – especially carbon dioxide (CO_2) from fossil fuels – have been on the rise, which has in turn led to an ongoing rise in global average temperatures (see Figure 2). The resulting changes in the global climate have already triggered a large number of negative effects, witnessed and experienced year after year, that also entail enormous consequential costs. Such effects include natural disasters triggered by extreme weather events, failed harvests, water shortages, loss of biodiversity and destroyed ecosystems, to name but a few.

Figure 2: Impacts of global warming



Source: Raftery et al. (2017)

2.2 Planetary Health, One Health and EcoHealth

Three of the currently most influential concepts in the field of human, animal and ecosystem health are Planetary Health, One Health and EcoHealth.

Planetary Health deals with the interconnections between human health and the political, economic and social systems as well as the state of our planet's natural systems on which the existence of human civilisation depends. The concept thus refers to the close mutual interdependence between human health and intact ecosystems (Whitmee et al. 2015). The approach refers to the health of individuals, communities and the population. The main objectives pursued under this concept are protecting the health of present and future generations and promoting inter- and intra-generational equity and justice (Horton et al. 2014).

One Health is an integrated, unifying approach that aims to sustainably balance and optimise not only the health of people, but also of animals (especially vertebrates) and, to some extent, of ecosystems (One Health High-Level Expert Panel et al. 2022).

The EcoHealth approach extends the One Health approach to also include the concept of sustainability, highlighting that a flourishing ecosystem ensures the sustainable health of humans and animals (Waltner-Toews 2009).

Requiring comprehensive, interdisciplinary and cross-sectoral analysis and cooperation, these three concepts form both framework and basis for the necessary development and implementation of the Strategy for a Climate-Neutral Healthcare System as well as the related options for action.

2.3 The climate crisis – status quo and consequences

2.3.1 Impact of climate change on health and the healthcare system

The effects of climate change on health have become increasingly visible and tangible and pose a growing threat not only to individual health, but also to the healthcare system (Romanello et al. 2021).

At the individual level, a distinction is to be made between the direct and indirect health effects of climate change. These direct health effects include the immediate impact of weather phenomena on physical and mental health. Generally, this relates to "extreme" weather events such as extreme heat or cold, storms, heavy rain or drought. Heat has one of the most important direct effects on health. Climate change leads to an increase in the number of hot days and heatwaves in Austria, which in turn increases heat-related mortality (APCC, 2018). Furthermore, mental stress and the associated consequences are also expected to increase (Clayton 2020; Crandon et al. 2022). The indirect health effects of climate change include the climate-related spread of vectors, pests or allergenic plants, as well as the associated impacts on agriculture and consequently on our diet and therefore our health (APCC, 2018).

All population groups are affected by climate variability and extremes, but certain population groups will feel these adverse effects much more strongly than others. Climate change exacerbates existing health inequalities, has a negative impact on population health, the social determinants of health, and disproportionately affects population groups that are already vulnerable such as older people, people with disabilities and/or chronic diseases, children, and people on low incomes (WHO 2021).

On the one hand, the emissions caused by the healthcare system are also deemed responsible for a major loss of healthy life years (i.e. disability-adjusted life years, DALYs). In the USA, this loss of healthy life years is estimated to range at around 470,000 DALYs (Eckelman/Sherman 2016).

On the other hand, climate change also jeopardises the healthcare system and its ability to provide healthcare services and thus ensure the population's health. Prolonged periods of heat or natural disasters may adversely affect the performance of hospitals and may in the future progressively push them – at least in some respects – to their capacity limits,

similar to the situation witnessed during the COVID-19 pandemic. Heat periods and natural disasters may also place a massive strain on emergency services and doctors working in general practice settings. What is more, they may also impair the proper functioning of hospitals, including storage of medicines, for instance. Another important aspect is that hospital buildings with poor thermal insulation and/or buildings without air conditioning can contribute to heat stress among patients or heat-related performance losses among medical staff (Curtis et al. 2017; Haas et al. 2014).

All of this exacerbates the – already substantial – pressure on the healthcare system. A fact that is also highlighted by the EU in its 2021 Climate Change Adaptation Strategy: "Climate change will also increasingly challenge the ability of public health systems to function effectively, e.g. to develop capacities to deal with diseases previously unknown in Europe." (European Commission 2021b).

2.3.2 The healthcare sector's CO_2 footprint

A prerequisite for successful transformation to a climate-neutral healthcare system is identification and quantification of the areas that contribute significantly to the healthcare sector's CO_2 emissions. By preparing detailed CO_2 footprints it is possible to define clear starting points that enable the definition of fields of action and the corresponding options for action.

In the last few years, three studies[1] have been published on greenhouse gas emissions in the Austrian healthcare sector. Providing very concrete figures, the findings generated by these studies as well as the methods and data sources used are presented in a summary overview in Table 1. While the study by Weisz et al. (2020) focuses on a detailed CO_2 footprint assessment for Austria, Lenzen et al. (2020) and Karliner et al. (2019) analyse and compare emissions generated by the healthcare sector in a wide range of countries.

When comparing the studies, it should be noted that Weisz et al. (2020) only considered CO_2 as the most important greenhouse gas, while Lenzen et al. (2020) and Karliner et al.

[1] For the sake of completeness, it should be mentioned that there is another relevant study conducted by Pichler et al. (2019) under the same research project as the study by Weisz et al. (2020). As it generated the same results for Austria, Pichler's study is not cited here.

(2019) also included the other climate-impacting/greenhouse gases. For this reason, the findings are expressed in tonnes of CO_2 or tonnes of CO_2e.

Table 1: Overview of studies on the Austrian healthcare system's total CO_2 footprint

Study	Total footprint	Footprint per capita	Share of the total Austrian footprint	Method*	Data source
Weisz et al (2020)	6.8 Mt CO_2	0.80 tonnes of CO_2	6.7 %	EE-MRIO and bottom-up approaches	EORA 2014**
Lenzen et al (2020)	6.6 Mt CO_2e	0.76 tonnes CO_2e	4.5 %	EE-MRIO	EORA 2015
Karliner et al (2019)	5.0 Mt CO_2e	0.59 tonnes CO_2e	5.2 %	EE-MRIO	WIOD 2014

*The methods are explained in more detail below.

**The study calculated the footprint over a period of several years. The table above shows the most recent value.

Illustration: GÖG/Austrian National Public Health Institute

Funded by the Climate and Energy Fund under the Austrian Climate Research Programme (ACRP) and conducted by the University of Natural Resources and Life Sciences, the Potsdam Institute for Climate Impact Research, the Humboldt University of Vienna and Gesundheit Österreich GmbH (GÖG, the Austrian National Public Health Institute), the study by Weisz et al. (2020) calculated the carbon footprint of the Austrian healthcare system in 2014 and arrived at a total value of 6.8 megatonnes (Mt) of CO_2. This corresponds to 0.8 tonnes of CO_2 per person or 6.7% of Austria's total carbon footprint in 2014. In this context, it should be noted that this study only considered CO_2, as the most important greenhouse gas, and did not take account of any other climate-relevant/greenhouse gases.

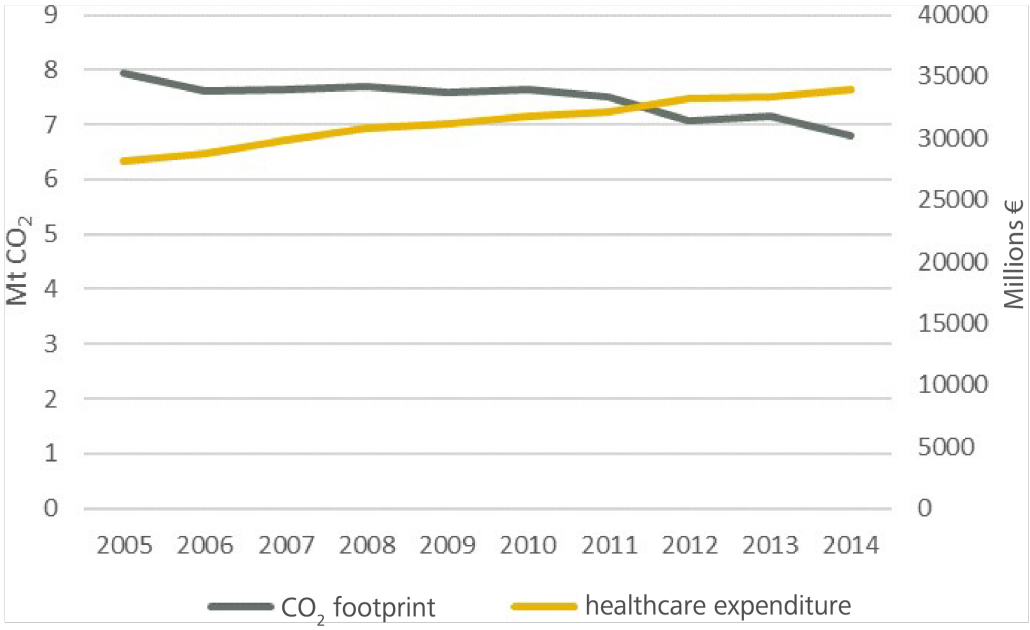
The two other studies, which included emissions of all greenhouse gases, arrived at a GHG footprint of 6.6 Mt CO_2e, which corresponds to 0.76 t of CO_2e per person (Lenzen et al.

2020), or 5.0 Mt equalling 0.59 t of CO_2e per person (Karliner 2019), respectively, for the Austrian healthcare system. The different results generated by the individual studies are somewhat surprising at first glance – especially as the footprint calculated by the studies that include all greenhouse gases is lower than that presented by Weisz et al. in 2020, which only covers the carbon footprint. With respect to the study by Karliner (2019), the major deviation in the results is attributable to the different database used. The discrepancy between the findings generated by Weisz et al. (2020) and Lenzen et al. (2020) is within the fluctuation range typical for such studies (HCWH 2022). In principle, the results presented by Weisz et al. (2020) can be assumed to constitute the best approximation to the Austrian healthcare sector's footprint, as the calculation methodology used was specifically adapted to the Austrian healthcare system. Hence, Weisz et al. (2020) was used as the basis for all subsequent analyses. As of today, only a few comparable international analyses are available, all of which arrive at similar core findings (Eckelman/Sherman 2016; Eckelman et al. 2018; Malik et al. 2018; Nansai et al. 2020; Tennison et al. 2021; Wu 2019).

Emissions over time

In 2005, the Austrian healthcare sector's CO_2 footprint amounted to 7.93 Mt CO_2. In line with the national emissions trend, it subsequently declined to 7.64 Mt CO_2 by 2010 and further to 6.8 Mt CO_2 by 2014, while healthcare expenditure increased steadily over the same period (please see Figure 3). During the period under review, healthcare expenditure was furthermore decoupled from CO_2 emissions in the healthcare sector. This represents a development which is fundamentally positive and primarily attributable to efficiency improvements and the switch to renewable forms of energy in the energy supply.

Figure 3: CO_2 emissions and healthcare expenditure in the Austrian healthcare system 2005-2014



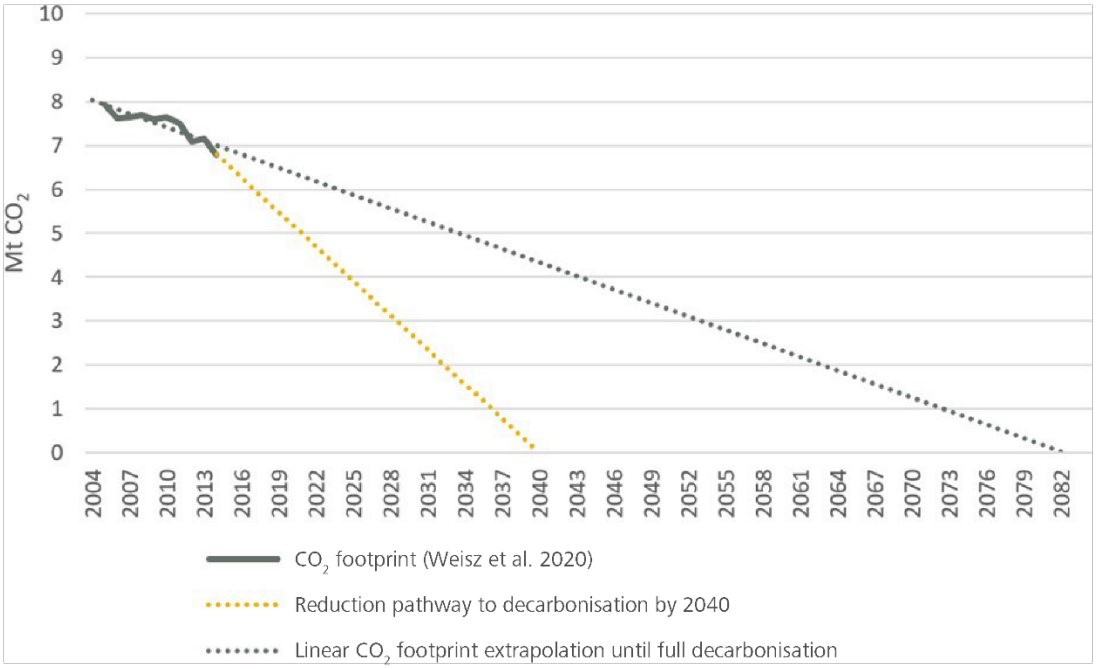
Source: Weisz et al. (2020), illustration: GÖG/Austrian National Public Health Institute

It must be pointed out that this development only reflects the period under review from 2005 to 2014 and that it is not possible to derive any statements based on these figures for the development since 2014. As Austria's national greenhouse gas emissions fell between 2005 and 2014, but have increased again since 2014, it may be assumed that emissions from the healthcare sector also followed this trend, rising again since 2014 (Weisz et al. 2020). What is more, the COVID-19 pandemic constituted a massive additional strain on the healthcare sector, which might well have led to a renewed increase in this sector's greenhouse gas emissions. Therefore, further studies would be necessary to investigate the pandemic's actual effects on the healthcare sector's greenhouse gas emission intensity.

Even under the assumption that the reduction in greenhouse gas emissions in the healthcare system continues in a linear fashion and to the extent of the reductions seen between 2005 and 2015, the healthcare sector's footprint would actually not become carbon net zero until 2082 (please see Figure 4). Compared with a full decarbonisation of the healthcare sector by 2040, it once again becomes very clear that there is an urgent

need for carbon reduction action in the healthcare system, especially with a view to the Austrian goal of climate neutrality by 2040.

Figure 4: Pathways to climate neutrality in the Austrian healthcare sector[2]



Source: Weisz et al. (2020), illustration: GÖG/Austrian National Public Health Institute

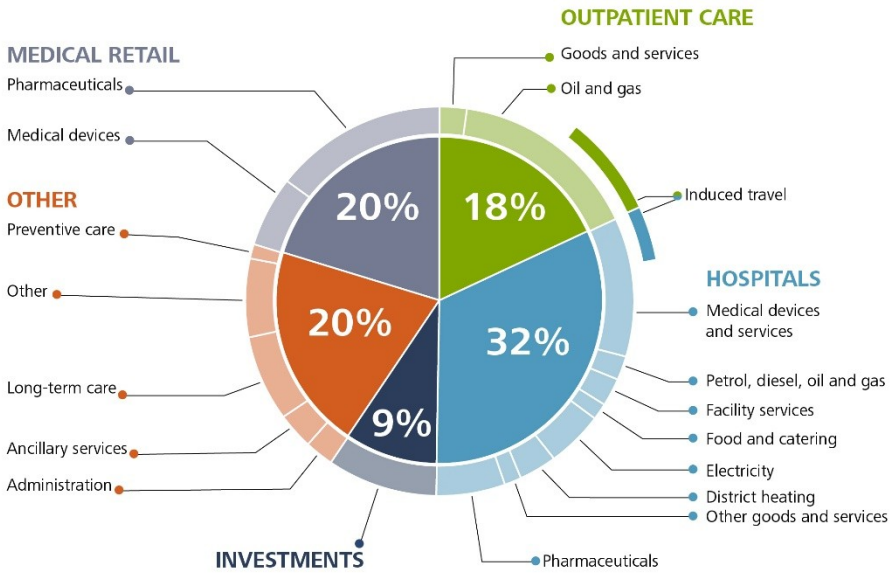
CO_2 footprint by individual healthcare sector

Figure 5 provides a detailed overview of the healthcare system's emissions, broken down by sector. At 32 per cent, hospitals account for the largest share of emissions, while healthcare in the primary/outpatient care sector (including doctors' surgeries and mobile care services) account for 18 per cent of the healthcare system's emissions. Medical retail

[2] The extrapolated trend regarding further greenhouse gas reductions in the healthcare system is based on the highly simplified assumption of a constant linear development and only serves to illustrate the fact that without further interventions, the goal of climate neutrality will only be achieved much later than 2040. A more accurate forecast of emission development in the healthcare system would require both more recent footprint calculations and a forecast that is modelled on the interrelation between expected demand for healthcare services and national as well as global decarbonisation strategies (HCWH 2022).

trade in pharmaceuticals and medical products makes up a share of 20 per cent, while the long-term care sector contributes seven per cent to the overall footprint

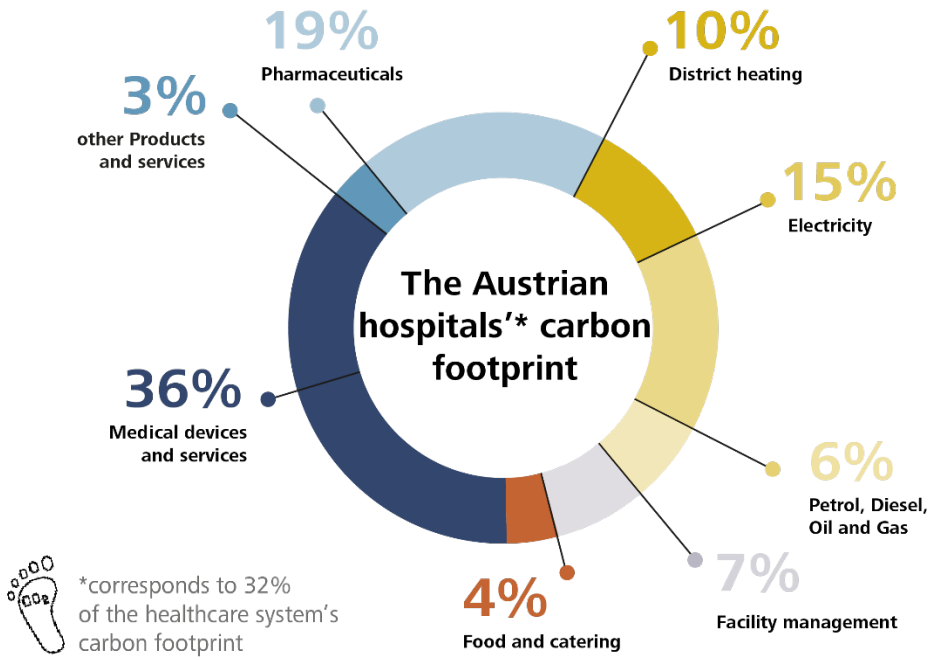
Figure 5: The Austrian healthcare system's CO_2 footprint by sector



Source: Weisz et al. (2020), illustration: GÖG/Austrian National Public Health Institute

A closer look at the largest contributor, namely hospitals (see Figure 6), shows that 32 per cent of emissions in this sector are attributable to energy demand (Scope 1 and Scope 2 – for definition and explanation of Scope 1, 2 and 3 please see Chapter 5.2.1.3). Despite hospitals' high demand for energy, their share is – proportionally speaking – lower than the emissions generated by the use of medical devices and the provision of medical services (treatments), which account for 36 per cent of total hospital emissions. At 19 per cent, pharmaceuticals also account for a significant share of the emissions created by the inpatient sector.

Figure 6: The Austrian hospitals' CO_2 footprint (corresponds to 32 per cent of the healthcare system's total carbon footprint)



Source: Weisz et al. (2020), Illustration: GÖG

The Austrian healthcare system's CO_2 footprint in an international comparison

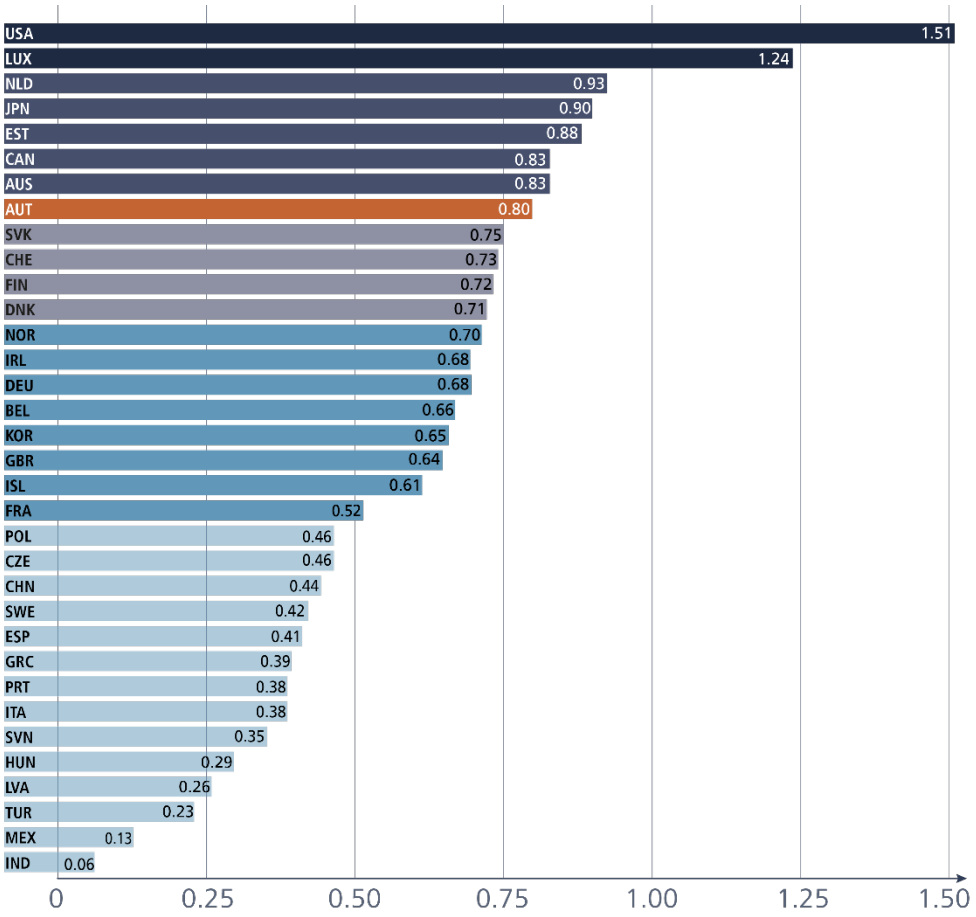
An international comparison proves useful when seeking to get a better feeling of where the Austrian healthcare system stands in terms of its carbon footprint.

A study by Pichler et al. (2019)[3] compares the healthcare sector's per capita greenhouse gas emissions in 36 countries. This comparison of healthcare carbon footprints clearly sees the USA with 1.51 tonnes of CO_2 per capita in the lead and India with only 0.06 tonnes per capita healthcare carbon footprint at the tail end, with Austria occupying eighth place reporting 0.8 tons of CO_2 emissions per capita (see Figure 7). After Luxembourg, the

[3] As the study by Pichler et al. (2019) was conducted under the same research project as the Weisz et al. (2020) study, it is based on the same calculation method and shows the same result for Austria.

Netherlands and Estonia, Austria is the country with the fourth-highest per capita CO_2 healthcare sectors emissions in Europe.

Figure 7: International comparison of per capita healthcare carbon footprints



Source: Pichler et al. (2019), illustration: GÖG/Austrian National Public Health Institute

2.3.3 Climate protection in Austria

Adopting the “European Green Deal” in 2019, the European Commission proclaimed the goal of net-zero greenhouse gas emissions by 2050 (European Commission 2019). By adopting the “Fit for 55” programme in 2021, it further specified the pathway towards climate neutrality, setting the target of an EU-wide net greenhouse gas reduction of at least 55% by 2030 (European Commission 2021a). Subsequently, these strategic goals were enshrined in a legally binding manner in the 2021 European Climate Law.

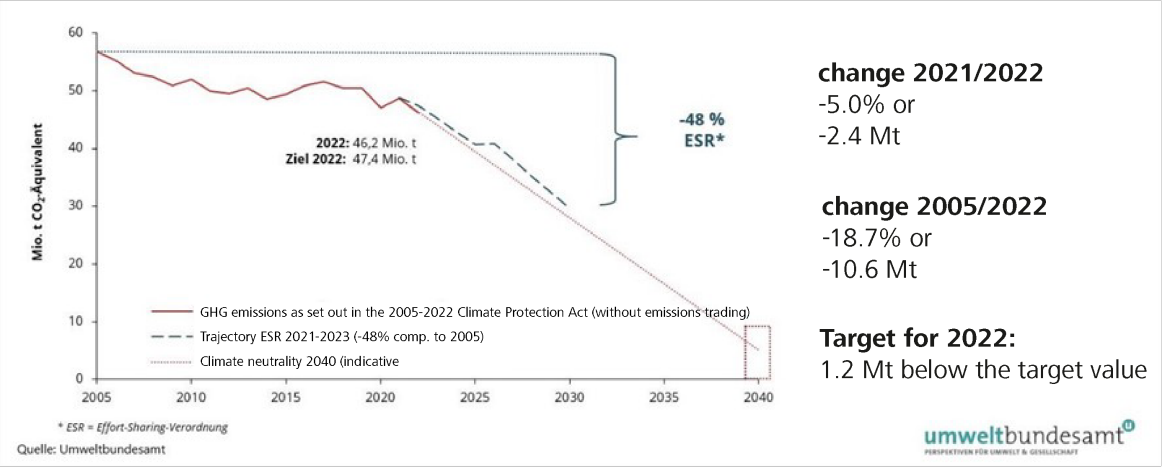
Based on the updated Effort Sharing Regulation (ESR), Austria is thus obliged to reduce greenhouse gas emissions (outside of emissions trading) by 48 per cent by 2030 compared with 2005 levels (Effort Sharing Regulation 2023).

The national greenhouse gas emission targets (outside of emissions trading) are laid down in the Climate Protection Act (Klimaschutzgesetz, KSG). However, this act was last amended in 2017 and sets out the maximum permissible annual emissions by 2020. The goal of climate neutrality by 2040 was adopted by the Austrian Federal Government enshrined in its government programme. The European Climate Law sets binding emission reduction targets that are also applicable for Austria.

Measures and actions towards achieving these targets are specified in the National Long-term Strategy covering the period until 2050, and in the National Energy and Climate Plan (NECP) 2021-2030. Both are mandatory documents based on the corresponding EU governance regulations.

According to the 2023 Climate Protection Report prepared by the Environment Agency Austria (Umweltbundesamt GmbH), some 77.5 million tonnes of CO_2 equivalent were emitted in Austria in 2021 and hence greenhouse gas emissions were 1.9% lower than in 1990 (Environment Agency Austria, 2023). Compared with 2020, this represents an increase of 4.9% or 3.6 million tonnes – although it should be noted that 2020 was marked by the global COVID-19 pandemic, which led to a significant decrease in emissions from the transport sector, energy supply and industry (Environment Agency Austria 2022a). However, the current greenhouse gas footprint for 2022, prepared by the Environment Agency, shows that greenhouse gas emissions in Austria had declined by 5.8% or 4.5 million tonnes to 72.8 million tonnes of CO_2 equivalent from 2021 to 2022 (Environment Agency Austria 2024b), as is also reflected in Figure 8.

Figure 8: Austria's greenhouse gas emissions as set out in the 2005-2022 Climate Protection Act (without emissions trading) plus trajectory



Source: Environment Agency Austria (2024c)

Initial estimates for 2023 also report a further approx. 4.3% reduction in greenhouse gas emissions compared to 2022, although these results are still subject to some fluctuation and final figures will not be available until summer 2024. However, if the current forecast is confirmed, this will mark the lowest value since 1990 (Environment Agency Austria 2024a).

Nevertheless, the Environment Agency Austria estimates (as of May 2023), that Austria – based on measures taken (scenario WEM "with existing measures") – would not be able to meet the stricter EU climate targets for 2030 and 2050 as well as the longer-term reduction requirements. On the assumption that a significantly expanded and intensified range of measures is implemented (scenario WAM "with additional measures"), emissions are expected to decline by 35 per cent by 2030 (without emissions trading) compared to 2005 (Environment Agency Austria, 2023).

In order to achieve a 48% reduction, it would thus not only be necessary to prepare effective additional climate protection measures but also to implement such measures without delay and most ambitiously considering the available period of only six years to generate an impact. Some approaches towards reaching this goal were outlined in the 2020-2024 government programme and the recommendations made by the Austrian Citizens' Climate Assembly (Klimarat der Bürger:innen) in July 2022 (Environment Agency Austria 2022a). The APCC Special Report on structural conditions for climate-friendly living also identifies comprehensive structural measures in the various areas of life and contains

concrete approaches for organising and structuring health and social systems in a climate friendly manner (APCC 2023). Likewise, the UniNEtZ options report presents a range of options for socio-ecological transformation, whose proposals focus primarily on meeting the sustainability goals (Alliance of Sustainable Universities in Austria 2021).

From October to December 2019, the Austrian Court of Audit (ACA) conducted its most recent review of climate protection measures and related target achievement in Austria. It criticised the fact that a reversal of trends, i.e. towards a sustainable reduction in emissions, had not been achieved and that no binding trajectory for the maximum permissible amount of greenhouse gas emissions for 2021 to 2030 had been stipulated in the Climate Protection Act.

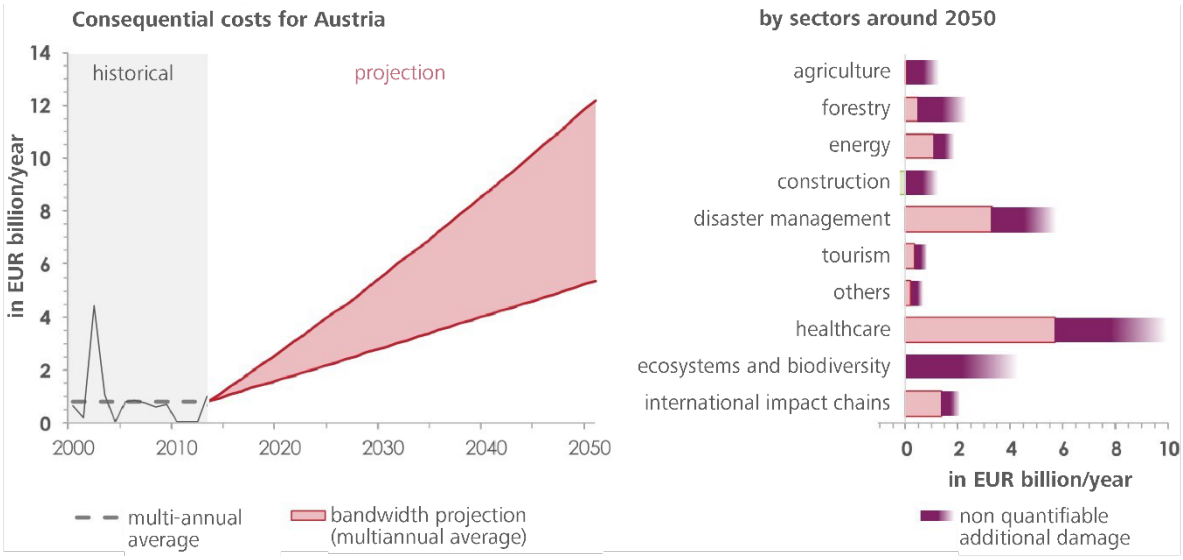
The ACA thus recommends that inter alia the current maximum levels for greenhouse gas emissions set at European level be transposed into Austrian law without delay and considered in the National Energy and Climate Plan. Furthermore, the ACA calls for setting ambitious and binding greenhouse gas reduction targets for the 2021 to 2030 period and for introducing a concrete mechanism aimed at reviewing and enforcing the envisaged maximum permissible levels.

Regarding climate protection measures, the ACA recommends setting clear and harmonised targets, such as specific quotas for thermal insulation and refurbishment of buildings, for instance, or defining specific energy saving targets, as well as prioritising measures based on their expected greenhouse gas reduction effect, to name but a few. With a view to evaluating target achievement, the ACA suggests using the measures' expected greenhouse gas reduction potential. In any case, the Court calls for indicators to be based on standardised nationwide calculation principles, enabling meaningful comparisons between local authorities (ACA, 2021).

2.3.4 Costs of climate change

Failure to act on climate policy will not only adversely affect the environment and health but will also entail massive additional burdens on public budgets. In Austria, for instance, total consequential costs of damage directly attributable to weather extremes and climate change amounted to some two billion euros in 2020. By 2050, this sum is expected to climb to between six and twelve billion euros per year, with the healthcare sector accounting for the largest share of these costs (Steininger et al. 2020) (see Figure 9).

Figure 9: Consequential costs attributable to weather and climate change-related damage in Austria



Source: Steininger et al. (2020)

In addition to consequential costs directly attributable to damage caused by weather extremes and climate change, climate policy inaction will also adversely affect the economy. The additional costs of climate policy inaction can be subdivided into three dimensions (Steininger et al. 2020):

- Additional expenditure to remedy damage attributable to climate change and expenditure for climate change adaptations. In 2020, the costs of weather and climate change-related damage in Austria ranged at some two billion euros and are expected to increase to six to twelve billion euros annually by 2050. What is more, costs for climate change adaptation measures totalled around one billion euros in 2020. This sum is expected to double to around two billion euros by 2050. In the context of development cooperation Austria furthermore funded climate protection and climate change adaptation projects in the Global South totalling some 200 million euros in 2022. This amount is expected to quadruple to around 800 million euros by 2050 (Steininger et al. 2020).
- Expenditure to be incurred if Austria fails to meet its EU climate and energy policy targets: It is to be assumed that Austria will not be able to meet its greenhouse gas reduction obligations under EU law and will clearly miss the greenhouse gas reduction target of 36 per cent by 2030 compared to 2005 emission levels. Should Austria miss the climate targets, it would be required to compensate for the additional emissions

by purchasing emission allowances. A study by the Austrian Court of Audit estimates that the expenditure required for purchasing emission allowances in the commitment period 2021 to 2030 will amount to up to 9.2 billion euros (Court of Audit 2021). Furthermore, failure to meet the binding climate targets will lead to reputational damage for Austria (Steininger et al. 2020), with potential medium-term consequences at political and economic levels.

- Costs of dirty, environmentally harmful subsidies: Such "climate-counterproductive" subsidies have a detrimental impact on the climate and their effects run counter to compliance with the binding EU climate and energy targets and therefore increase the level of GHG emissions, reduce the share of renewable energies in final energy consumption and/or reduce energy efficiency. According to a study by the Austrian Institute of Economic Research, the volume of climate-counterproductive subsidies in Austria has over the last few years ranged on average at between 4.1 and 5.7 billion euros annually (Kletzan-Slamanig et al. 2022).

Overall, the costs of inaction will result in economic damage that amounted in 2020, for instance, to some 9.6 billion euros[4]. Hence, "the (...) detrimental effect of climate change on the Austrian national economy is enormous" (Austrian Court of Audit, 2021).

2.3.5 The benefits of climate protection and emissions reduction

This calls for ambitious climate protection action to be taken without delay. Failure to act is expected to lead to increased risks and in some cases unavoidable damage to humans and ecosystems. Far-reaching and timely implementation of climate protection measures in this decade would not only reduce the predicted losses and damage to people and ecosystems but also generate many additional benefits, especially with respect to air quality and health (IPCC, 2022). Ambitious climate protection generates numerous advantages and benefits in a wide range of areas. These positive additional effects and

4 For the purpose of this calculation the estimated maximum values given in the studies on the costs of weather and climate change-related damage, the costs of climate change adaptation measures and the cost of climate-counterproductive subsidies were used. The estimated expenditure for purchasing emission allowances for the 2021-2030 commitment period was included on a pro rata basis, assuming that the necessary costs are distributed evenly across the individual years of the commitment period.

benefits are becoming increasingly important and are key drivers for the implementation of climate protection measures.

The beneficial impact of climate protection and climate change adaptation measures is reflected in

- cost reductions,
- positive effects on health and
- safeguarding livelihoods and promoting security of supply.

Climate protection measures reduce not only damage attributable to climate change but also the associated consequential costs and penalties (described in Chapter 2.3.4) faced by Austria should it fail to meet its national climate targets. Experts agree that these consequential costs will exceed the costs of committed climate protection in the long term. When also taking the health benefits and advantages of climate protection into account, a cost-benefit analysis shows that the benefits of climate protection outweigh the associated investment costs by far (Shindell et al. 2021).

By saving energy, switching to more energy-efficient products, processes and renewable sources, and shifting energy production increasingly to a regional or local level, it would be possible to reduce oil and gas imports – which in turn means reduced dependence on imported fossil fuels and therefore greater energy supply security.

At the cross-sectoral interface between climate and health policy, options for action that have both a positive impact on the climate and generate additional individual and social benefits, above all for people's health, can be identified (Salas et al. 2020). These co-benefits foster health promotion and prevention, leading to reduced utilization of healthcare services, thus making a valuable contribution to climate neutrality. Key approaches in this respect include promoting active mobility (walking, cycling), fostering healthy and climate-friendly nutrition and creating green spaces. What is more, the associated co-benefits constitute another important element on the path towards climate neutrality.

Switching from motorised private transport to active mobility not only serves to foster physical activity but also has health benefits, contributes to climate protection and saves costs (Brand et al. 2021; Neves/Brand 2019). Lack of physical activity is considered one of the most important causes for developing chronic diseases (including cardiovascular

diseases, type 2 diabetes mellitus, some cancers and back pain) (Booth et al. 2017). Diseases attributable to lack of exercise require treatment (seeing the doctor, hospitalisation, medication and diagnostics) and therefore increased use of the healthcare system's resources.

Food systems also offer synergies at the interface between climate and health. Switching from a meat-based diet to a more plant-based diet has particularly high potential for positive effects on both health and the climate (Sun et al. 2022; Tukker et al. 2011). Studies show that the mortality rate is higher in people who consume a lot of red and processed meat (Godfray et al. 2018). A plant-based diet with a high fibre content and fresh foods is beneficial to health and has the lowest impact on the climate. Relevant calculations show that switching to a healthier diet could save around eleven million lives year on year (Willett et al. 2019).

Urban green spaces and environmental zones, such as green roofs and green façades, generate a wide range of environmental and social benefits.

Green roofs, for instance, enable effective thermal insulation of building roofs, reduce the building's heating/cooling load and energy consumption, and have the potential to improve air quality and consequently foster health (Shafique et al. 2018).

There is ample scientific evidence that air pollution (e.g. from sulphur dioxide, nitrogen oxides, particulate matter pollution) is linked to a wide range of diseases. A significant proportion of premature deaths occurring in European cities every year could be avoided by reducing air pollution concentrations (Khomenko et al. 2021).

In healthcare facilities that implement climate protection measures, the concrete benefit structure of climate protection effects is very far-reaching. It serves to encourage and drive the implementation of further measures and includes the following components:

- Reduced energy and resource consumption
  - Contribution to cost reduction
- Reduction in CO_2 emissions
  - Contribution to mitigating the impacts of climate change
  - Reduction of consequential costs incurred by the national economy
- Creating a climate-friendly and health-promoting environment for patients, employees and customers alike

- Positioning as a responsible healthcare organisation
- Increasing attractiveness as an employer
- Strengthening resilience and security of supply

2.3.6 Climate protection, climate change adaptation and climate resilience

Goals and measures taken in the context of climate protection, climate change adaptation and climate resilience are closely interlinked. Climate protection and climate change adaptation, for instance, are central pillars of resilience.

Climate protection measures

Climate protection encompasses all measures aimed at counteracting global warming caused by human activity. Climate protection measures seek to reduce greenhouse gas emissions. The central goal to be pursued in this context is implementation of comprehensive measures aimed at reducing emissions of greenhouse gases with a view to keeping global warming within the defined limits and thus minimising the detrimental consequences of climate change.

This Strategy for a Climate-Neutral Healthcare System focuses on fields of action and measures to reduce greenhouse gases and places a main emphasis on climate protection.

Climate change adaptation – measures and their institutionalisation in Austria

As the second pillar of climate policy, adaptation is becoming increasingly important. Climate change adaptation measures (forming part of climate-resilient development) can be launched reactively in response to climate change, in order to adapt to climate changes that have already occurred, and also proactively, i.e. in order to be prepared for expected changes, and can be sub-divided into three categories (Ecker et al. 2021):

- “grey”, i.e. purely technical measures (such as technical installations aimed at flood protection or slope stabilisation to prevent natural disaster events from occurring and thus to avoid personal injury)

- "green" measures that maintain, restore or improve the natural functions of ecosystems in order to mitigate the negative effects of climate change (on human health and infrastructure) such as greening measures, natural retention areas
- "soft" measures that contribute to raising awareness and fostering related skills and capabilities, or to developing a suitable framework for adaptation (such as brochures, training courses, early warning systems etc.)

In contrast to that, maladaptation refers to measures that are predominantly reactive and purely serve to deal with the symptoms and – at best – promise short-term success while proving counterproductive in the long term. Such maladaptation would, for instance, include initiatives that facilitate adaptation in the short term but at the same time run counter to other key objectives (such as climate protection and/or biodiversity conservation). The goal of avoiding maladaptation was therefore enshrined as one of the central objectives in the Austrian Adaptation Strategy, making it a key focus of activities now and in the future.

Adaptation in relation to healthcare and social care involves actions or processes that reduce mortality and morbidity associated with climate change, while strengthening the sector's capacity to (continue to) provide a high standard of care as the climate changes. Adaptation actions are often interlinked: for example, long-term adaptation planning often relies on accessible monitoring and climate projection tools, whereas the successful implementation of adaptation actions requires a healthcare workforce trained to respond to new challenges (NHS, 2021).

Central fields of action for climate change adaptation in the healthcare sector are therefore

- awareness-raising measures to increase climate literacy among the population at large and among healthcare professionals – in this respect the healthcare workers have a key role to play as multipliers,
- monitoring and early warning systems to develop a comprehensive data basis for further prevention and adaptation measures, and to warn people well in advance of heatwaves and extreme natural events so to enable them to adapt their behaviour,
- technical measures in healthcare facilities that on the one hand ensure patients' wellbeing (cooling, green spaces etc.) and on the other hand reduce healthcare facilities' greenhouse gas emissions,

- precautionary measures with regard to extreme natural events to ensure the provision of healthcare services to the population even in the event of a disaster, and
- maintaining food safety and a high-quality drinking water supply as the climate changes.

At institutional level, climate change adaptation actions in the Austrian healthcare system are enshrined especially in two documents. Firstly, the Austrian Strategy for Adaptation to Climate Change (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2024), which is the comprehensive guidance document for all of Austria's climate change adaptation activities, first adopted in 2012 and updated in 2017 and 2024. This strategy is aimed at avoiding and reducing the adverse effects of climate change on the environment, society and the economy, while tapping into related opportunities. It also addresses the topic of health as one of the 14 fields of activity – seeking to manage or avoid negative health effects that are both directly (for instance caused by heatwaves) and indirectly (for instance caused by the spread of allergenic plants and animals) attributable to climate change by both facilitating appropriate action as necessary and early implementation of precautionary measures. Secondly, climate change is dealt with under the Austrian Health Targets (Federal Ministry of Health and Women's Affairs, 2017) under Health Target 4 ("Securing sustainable natural resources, such as air, water, soil and healthy environments for future generations"). This health target contains a total of 43 measures aimed at achieving the impact goals. The impact goals and measures focus on a range of different sectors, including agriculture, transport and climate protection. The measures listed cover the implementation of the Austrian Strategy for Adaptation to Climate Change, the implementation of the Austrian Biodiversity Strategy 2020+, the development of an integrated energy and climate strategy, the continuation of the "klimaaktiv" funding and advisory programmes and a national heat protection plan (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2024). A measure set out in Health Target 4 is developing the APCC Special Report "Health, Demography and Climate Change", published in 2018.

Adaptation to climate change is an ongoing and long-term process that is to be guided by and based on the latest state of scientific knowledge and factual necessities. Systematic recording of implementation is a prerequisite for identifying further adaptation needs and avoiding maladaptation.

The Second Progress Report on the Austrian Strategy for Adaptation to Climate Change (Federal Ministry for Climate Action, 2021d) discusses and evaluates climate change

adaptation measures implemented to date. In the area of health, the report considers target achievement to be well advanced in the categories of natural hazards and disaster prevention as well as monitoring and early warning systems, while it identifies major need for action in the category of dealing with heat and drought.

One of the central, overarching recommendations is promoting interdisciplinary cooperation – at international, national and regional level – between relevant stakeholders from politics, administration, science, emergency services organisations, public crisis and disaster management organisations as well as civil society with a view to consistently and jointly promoting measures aimed at climate change adaptation in the healthcare sector.

Building on the findings set out in the Second Progress Report and the latest scientific findings, the Austrian Strategy for Adaptation to Climate Change will be further developed at regular intervals involving relevant stakeholders and institutions.

Climate resilience of healthcare systems

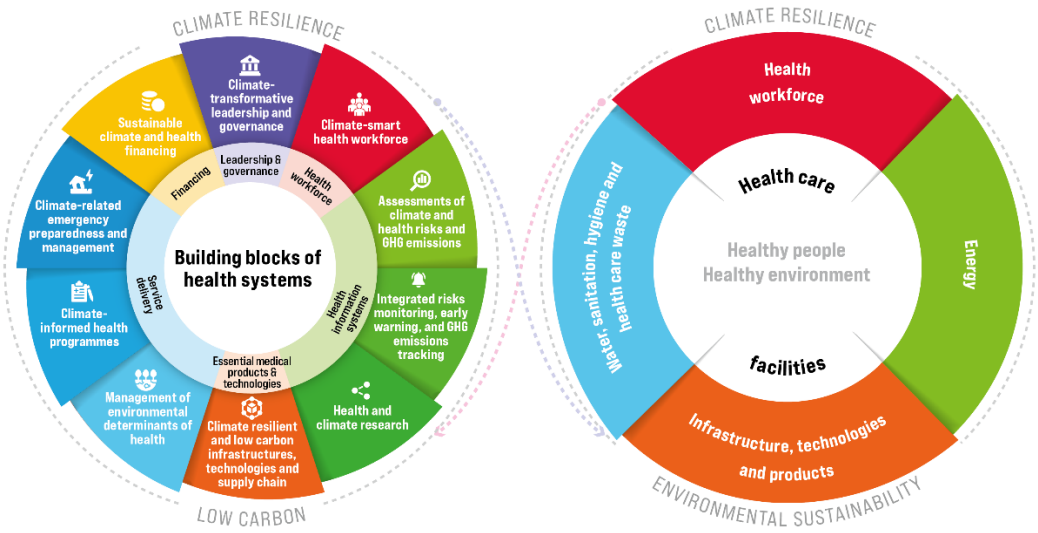
In the context given, resilience is defined as the ability to withstand shocks or stress factors. With respect to climate change, the Intergovernmental Panel on Climate Change (IPCC) defines resilience as the capacity of social, economic and environmental systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation.

With respect to health systems, the WHO and the European Observatory for Health Systems and Policies define resilience as the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during shocks and crises, reorganize if conditions require it (Thomas et al. 2020; WHO 2022).

Healthcare systems are made up of many actors and institutions at different levels. Climate resilience requires a systemic response that incorporates all of the healthcare system’s building blocks. In a Conceptual Framework, published in 2015, the World Health Organisation (WHO 2015) defines ten fields of action towards strengthening the

healthcare system's climate resilience and assigns these to the six building blocks of healthcare systems (see Figure 10, left).

Figure 10: Climate resilience and sustainability in the healthcare sector



Source: WHO (2023b)

The ten fields of action or components for building climate-resilient health systems defined by the WHO in its operational framework are

1. leadership and governance,
2. health workforce,
3. vulnerability, capacity and adaptation assessments,
4. integrated risk monitoring and early warning,
5. health and climate research,
6. climate-resilient and sustainable products, technologies and infrastructure,
7. multisectoral management of environmental health determinants,
8. consideration of climate-informed health programmes,
9. emergency preparedness and management,
10. climate and health financing.

For a more detailed analysis of the core statements under these ten fields of action, possible goals, targets and indicators for measuring target achievement, please see Schmidt/Spagl (2023). The Climate Resilience Framework Plan for the Austrian healthcare

system, which is currently being developed, addresses these ten fields of action with a view to developing specific measures and indicators (WHO 2022).

As outlined by the IPCC (2022), climate resilient development encompasses not only the ability to withstand and recover from climate-related shocks, but also not to contribute to such shocks. In this context, reference is made to maladaptation that creates additional emissions thus making climate shocks more likely, while also limiting the opportunity for developing climate-resilient systems. A highly illustrative example in this context is the installation of (additional) air conditioning systems in healthcare facilities in seeking to adapt to rising temperatures. As they are very energy intensive, these air conditioning systems cause additional emissions that only serve to exacerbate the health effects of climate change, thus undermining the goal of climate resilience. From the point of view of a comprehensive climate resilience concept that takes planetary boundaries (Rockström et al. 2009) into account, it is therefore imperative to integrate climate protection measures and to always examine adaptation measures aimed at developing a climate-resilient health system also focusing on associated detrimental emissions that may directly or indirectly harm the climate.

The fact is that key climate protection components need to be integrated when developing climate-resilient and ecologically sound, sustainable healthcare facilities was also recognised by the World Health Organisation (WHO, 2020), which subsequently expanded the Climate Resilience Framework to include four key requirements for resilient and sustainable healthcare facilities (see Figure 10, right):

1. suitable infrastructure and adequate technologies, products and processes to ensure efficient functioning of healthcare facilities
2. sustainable energy services
3. sustainable and safe management of water, sanitation, hygiene, wastewater and healthcare waste disposal
4. skilled and informed healthcare workforce that is able to cope with environmental challenges

Against the background of climate change, which exacerbates the risk of severe impacts on healthcare facilities and presents healthcare systems with complex, multi-faceted and unpredictable challenges and demands, the WHO recommends that all new healthcare system investments should contribute to strengthening the system's climate change resilience without fostering the climate crisis.

2.4 Climate and health target structures

A range of target structures have been defined at both international and national levels which, if considered and adhered to, implicitly require the healthcare system's climate neutrality, thus constituting a comprehensive framework for shaping the healthcare system.

2.4.1 International target structure

Under the Paris Agreement on Climate Change that was signed in 2015 and came into force in 2016, a total of 196 countries committed to pursue efforts "to limit the temperature increase to 1.5°C" and in any case "hold the increase in the global average temperature to well below 2°C above pre-industrial levels" (United Nations 2015a). The European Union is a party to the Agreement, which was ratified by all Member States.

Marking a major breakthrough in international politics, the 2015 Paris Agreement sets out the following targets:

- limiting global warming to a maximum of 2°C above pre-industrial levels and pursuing efforts to limit temperature increase to 1.5°C,
- reaching the peak in global greenhouse gas emissions as soon as possible and reducing them to (net) zero by the middle of the 21st century,
- supporting actions in developing countries (through capacity building, technology transfer and financing).

The European Climate Law enshrines the goal of climate neutrality in the EU by 2050 and raises the greenhouse gas emissions reduction target for 2030 to at least minus 55 per cent (compared to 1990). Additionally, the European Commission is mandated to propose an interim climate target for 2040, which is to be accompanied by indicative greenhouse gas budgets as well as indicative voluntary reduction roadmaps to be drawn up by sectors (European Climate Law 2021). In this spirit, in July 2021, the European Commission presented the "Fit for 55" legislative package that sets out adaptations to the corresponding regulations (such as the Effort Sharing Regulation).

In unison with all United Nations Member States, Austria has committed itself to working towards implementation of the UN 2030 Agenda for Sustainable Development including

its 17 Sustainable Development Goals (SDGs), and to enshrine them in law (United Nations, 2015b). These targets are to be considered when selecting and designing related tools, instruments and measures. The Strategy for a Climate-Neutral Healthcare System thus addresses in particular SDG 3, “Good health and well-being”, SDG 7, “Affordable and clean energy”, SDG 11, “Sustainable cities and communities”, SDG 12, “Responsible consumption and production”, and SDG 13, “Climate action”.

In the context of its 51st World Health Assembly, held in May 1998, the World Health Organisation (WHO) developed a policy framework under the heading of “Health21”, which seeks to ensure quality of life in 51 countries in the 21st century. “Health21” lays down targets for each member states’ health development policy. Under this policy framework Target 21 (policies and strategies for health for all) links climate protection and health policies with a view to ensuring that action at all policy levels is taken to implement both (WHO 1998).

By adopting the Ostrava Declaration on Environment and Health at the Sixth Ministerial Conference held from 13 to 15 June 2017 in the Czech Republic, WHO Member States in the European Region committed to foster and advance action to improve environment and health at international, national and subnational levels and to draw up tailored national portfolios for action on environment and health (Sixth Ministerial Conference on Environment and Health 2017).

2.4.2 National target structure

2.4.2.1 Climate

The Austrian “Government Programme 2020-2024 – Out of Responsibility for Austria” sets out inter alia the following target structures (Federal Chancellery 2020, pp. 72 [in the German version]):

- We take climate protection seriously: the public sector shows the way, what is demonstrated by the public sector can be more easily accepted by our people. Therefore, the public sector has to be a role model for climate neutrality. Building on initiatives in procurement, refurbishment and renovation of buildings as well as in

mobility management, the administration drives its transition towards 100% sustainability.

- Paris-compatible CO_2 budget and corresponding reduction pathways aimed at achieving climate neutrality in Austria by 2040 at the latest
- Joint examination and development of a modern framework of responsibilities (including the possibility of agreements between the federal and the province level under Art. 15a of the Federal Constitutional Act) to meet the climate goals
- Clear target definition aimed at increasing the share of renewable energies in total national consumption: 100% (on the national balance sheet) electricity from renewable energy sources by 2030.

As agreed under the current government agreement, the Austrian Federal Government seeks to achieve climate neutrality in Austria by 2040 and thus to play a pioneering role in climate protection in Europe. Austria sets out the pathway towards achieving its targets under the European Climate Law in the National Energy and Climate Plan (NECP). The proposal submitted in 2019 is based on a reduction target of 36 per cent – to be raised to 48 per cent for Austria following the update of the Effort Sharing Regulation (ESR) at EU level – which requires the NECP measures to be adjusted accordingly.

In close coordination with the Ministry of Finance and other line ministries affected, the Ministry for Climate Action is working on updating the NECP.

By 2030, Austria seeks to generate 100 percent of its electricity from renewable energy sources (on the national balance sheet). To this end, the Renewable Energy Expansion Act (Erneuerbaren-Ausbau-Gesetz – EAG 2021) was adopted in July 2021. Another priority defined in this context is phasing out the combustion of heating oil, coal and fossil gas for heating and cooling purposes. This priority was laid down in the Renewable Heating Act (Erneuerbare Wärme-Gesetz - EWG 2024), which came into force on 29 February 2024 and provides for a ban on fossil heating systems in new buildings. Responsibility for legal regulations relating to existing buildings remains with the federal provinces.

Another important building block that is to contribute to achieving Austria's climate protection targets is transformation of the Austrian economy and society into a comprehensively sustainable circular economy by 2050, as set out in the Austrian Circular Economy Strategy (Kreislaufwirtschaftsstrategie) (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, BMK 2022b). Also at EU level, circular economy is considered one of the key drivers for a sustainable Europe.

The Mobility Masterplan 2030 for Austria (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2021b) focuses on reducing greenhouse gas emissions in the transport sector, seeking to avoid, shift and improve transport and significantly increase the share of eco-mobility, i.e. walking and cycling, public transport and shared mobility.

The Federal Energy Efficiency Act (Bundesenergieeffizienzgesetz, EEffG) was adopted in 2014 to implement the EU Energy Efficiency Directive. With a view to achieving the higher EU energy efficiency targets, energy consumption is to be reduced by at least 32.5 per cent by 2030 compared to the 2007 forecasts (EU Energy Efficiency Directive, 2012). Under the new Energy Efficiency Directive, which came into force in October 2023, the EU tightened its energy efficiency targets, stipulating that consumption of primary and final energy at EU level must be reduced by 11.7 per cent by 2030 compared to the 2020 forecasts (EU Energy Efficiency Directive, 2023). Thus, a corresponding amendment to the Federal Energy Efficiency Act was adopted in June 2023. The law obliges large companies to conduct regular external energy audits and to prepare action plans based on the findings generated, or alternatively, to introduce a certified energy or environmental management system. This provision is also applicable to hospitals provided they are not directly owned by the public sector.

In addition to these requirements and provisions adopted at federal level, the federal provinces have introduced regional climate protection, energy and sustainability strategies and targets, some of which are supplemented by corresponding detailed programmes and action plans.

Despite its considerable carbon footprint, the healthcare sector has – as yet – not been directly addressed in these climate targets and strategies. This gap is now being closed by the Strategy for a Climate-Neutral Healthcare System, which builds on the targets and obligations outlined above and seeks to make a significant contribution towards achieving national and international climate targets – including in the healthcare sector.

2.4.2.2 Health

Health targets

In international health policy, the interconnection between climate and health enjoys high priority. In Austrian health policy, however, the impacts of climate change have so far received little attention. This is to be remedied by making enhanced use of the "Target-based Health Governance" platform and further Health Target implementation planning, with respect to Health Target 4.

The Austrian Health Targets aim at improving the quality of life of all people in Austria, thus seeking to contribute to greater wellbeing and health. Whatever people do, whether they live, learn, work or play, has a major influence on health. For this reason, close cooperation is in place between representatives from various organisations and policy areas. Developed in a broad-based, well-coordinated process involving a wide range of representatives from politics and society, the ten Health Targets define the **framework for action for a health-promoting policy framework** until 2032. Climate-related topics are especially reflected in the following Health Targets (Health Targets Austria, 2023):

- Health Target 1: Jointly creating health-promoting living and working conditions
- Health Target 2: Ensuring health equity for all people in Austria
- Health Target 3: Strengthening the population's health literacy
- Health Target 4: Safeguarding sustainable natural resources, such as air, water, soil and healthy environments for future generations
- Health Target 7: Providing access to healthy nutrition for all
- Health Target 8: Promoting healthy and safe physical activity in everyday life.

The additional health benefits of climate protection measures (see Chapter 2.3.5) reflect the high synergy potential inherent in climate protection and health promotion. At the same time, these Health Targets also contribute to achieving many of the SDGs. There remains some room for improvement with respect to necessary cooperation between health policy and climate policy actors, which also need to move into the focus of attention.

Target-based Health Governance

Target-based Health Governance (Zielsteuerung Gesundheit, ZS-G) was established in 2013 and sets financial, healthcare structure, healthcare process and healthcare outcome targets for public health. The Federal Target-based Governance Commission (Bundes-Zielsteuerungskommission, B-ZK) is the highest decision-making body for all matters relating to the healthcare system, bringing together representatives from the federal government, the federal provinces and social insurance institutions. The strategic and operational goals for the Austrian healthcare system's further development and the measures to be taken are defined in the Federal Target-Based Governance Agreement (Bundes-Zielsteuerungsvertrag).

In terms of content, the first Federal Target-Based Governance Agreement covering the 2013-2016 period focused primarily on pursuing health targets, strengthening prevention and health promotion, redesigning and strengthening primary care and shifting provision of care to the best point of service.

The second Federal Target-Based Governance Agreement covering the years 2017 to 2021 (extended to 2023 due to the COVID-19 pandemic) pursues three strategic objectives (Target-based Health Governance, 2017):

- strengthening outpatient care while at the same time relieving the burden on the acute inpatient sector and optimising the use of resources,
- ensuring the population's satisfaction by optimising care and treatment processes and
- increasing the number of healthy life years and improving the quality of life of those who are ill.

Negotiations on the latest Target-Based Governance Agreement were concluded in June 2024. Quite generally speaking, measures taken under the current healthcare reform focus on:

- strengthening the primary care sector
- structural reforms in hospitals
- expansion of digital services
- health promotion and prevention
- vaccination programmes
- medication supply.

2.5 The healthcare sector in Austria

One of the pillars of successful transition towards climate neutrality in the healthcare sector is cooperation between the relevant stakeholders and the efficient organisation of healthcare financing focusing on health protection, health promotion and the avoidance of consequential costs impacting the national economy (see Chapter 5.5.2).

2.5.1 Organisation of the Austrian healthcare system and key players

Sharing of responsibilities among diverse stakeholders and thus a very complex organisation are hallmarks of the Austrian healthcare system (Bachner et al. 2019). The main players are the federal government, the federal provinces and municipalities as well as the umbrella organisation of social insurance institutions (Federation of Social Insurances) as a self-governing body. Other relevant stakeholders include interest groups, such as the Austrian Medical Chamber and the Chamber of Pharmacists.

Responsibility for legislation and enforcement (e.g. for social insurance, healthcare professionals, medicines, medical devices, therapeutic aids etc.) is held by the federal level and is generally initiated by the Federal Ministry of Social Affairs, Health, Care and Consumer Protection (BMSGPK). With respect to hospitals, the federal government's legislative competence is limited to the setting of principles. Responsibility for enacting and enforcing laws as well as ensuring the provision of hospital services lies with the federal provinces (Bachner et al. 2019). The federal government is also responsible for supervising the social insurance funds and for the financing and the supervision of long-term care services, as well as for public health, pharmaceuticals and consumer health (including food safety, genetic engineering) (Public Health Portal Austria, Öffentliches Gesundheitsportal Österreichs 2019). The federal government assumes a decision-making role but also acts as a supervisory authority and has an important mediating function as a coordinator between the most important players in the healthcare system (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019).

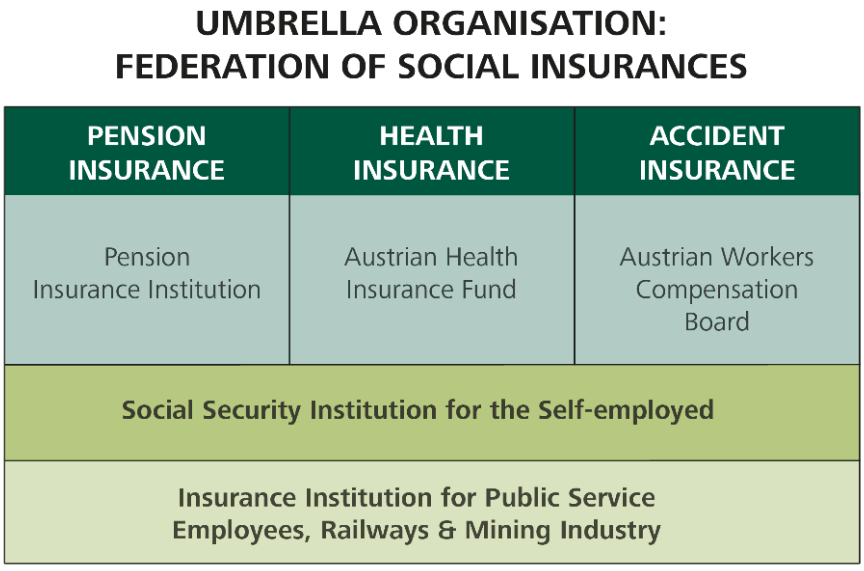
The central players at province level are the province parliaments (diets) and the province councillors responsible for health. Operational responsibility, i.e. ensuring adequate hospital capacities including outpatient hospital care, lies with the federal provinces. Together with the municipalities, the provinces are also responsible for pre-hospital emergency care. The federal provinces furthermore enact key social sector legislation and

are responsible for the provision of social services (including nursing care and long-term care) (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019).

The social insurance's scope of responsibility includes, in particular, the provision of care in primary care settings or GP (general practitioner) surgeries (contract services in the extramural sector), the provision of medicines, medical goods, therapeutic aids as well as inpatient and outpatient rehabilitation. Statutory social insurance is divided into three main branches, namely health, accident and pension insurance (see Figure 11). The social insurance system was reorganised in 2019 hand in hand with the nationwide merger of social insurance institutions responsible for health, pension and accident insurance in the context of which the number of social insurance institutions was reduced from originally 21 to five. Thus, the nine regional health insurance funds were merged into one Austrian Health Insurance Fund (Österreichische Gesundheitskasse, ÖGK) with regional offices. The social insurance institutions are subdivided into three health insurance institutions, one pension insurance institution and one accident insurance institution. The health insurance institutions comprise (Bachner et al. 2019):

1. the Austrian Health Insurance Fund (pure health insurance provider),
2. the Social Security Institution for the Self-employed
3. the Insurance Institution for Public Service Employees, Railways & Mining Industry

Figure 11: Organisation of the Austrian social insurance institutions



Source: Federation of Social Insurances (2021); illustration: GÖG/Austrian National Public Health Institute

Decision-making bodies and decision-makers

In Austria, decision-making bodies and organisations have an important role to play ensuring the joint financing of hospitals. In addition, management and planning of the healthcare system and health promotion also fall within the remit of the decision-making bodies and organisations. The most important such bodies and organisations include the Federal Target-based Governance Commission (Bundeszielsteuerungskommission, B-ZK), the Federal Health Agency (Bundesgesundheitsagentur, BGA), the Provincial Target-based Governance Commissions (Landeszielsteuerungkommissionen, L-ZK) as well as the health platforms at province level and the Provincial Health Funds (Landesgesundheitsfonds, LGF).

The Federal Target-based Governance Commission is a body that belongs to the Federal Health Agency and is the highest joint decision-making body in the health sector.

The Commission is made up of decision-makers from the three key players: representatives of the federal level, the social insurance and the federal provinces. As a rule, decisions within the Commission are based on agreement between the representatives of all three bodies. The Federal Target-based Governance Commission assumes an important function in implementing Target-based Health Governance at federal level and in particular in coordinating the Target-based Governance Agreement and in defining the annual work programme.

The Federal Health Agency is a fund under public law and holds key responsibility for supra-regional and cross-sectoral planning, management and financing of the healthcare system. The funds available to the Federal Health Agency are mainly used to finance the hospital system. The Agency itself is managed by the Federal Ministry of Social Affairs, Health, Care and Consumer Protection.

The Provincial Target-based Governance Commissions form the joint body at province level and are likewise made up of representatives from the federal government, the provinces and social insurance. Their main task consists in implementing the Target-based Health Governance agenda.

Another relevant health system body consists of the Province Health Platforms established in each of Austria's nine federal provinces. Composed of representatives from the provincial level, the social insurance institutions and the federal level, they also include representatives of the Medical Chamber, the municipalities, hospital operators and patient representatives. Apart from deciding on the use of the respective Province Health Fund funds, they are also tasked with deciding on province hospital financing (Bachner et al. 2019).

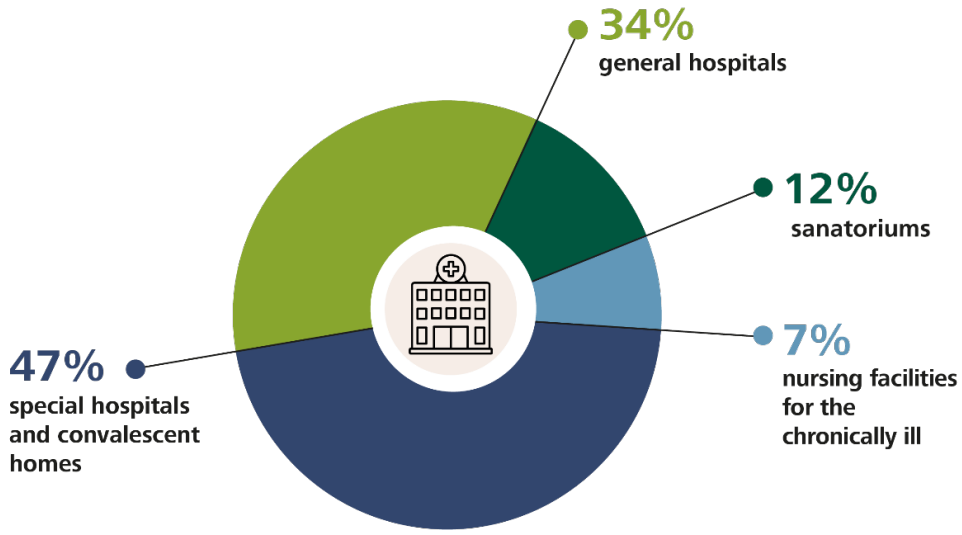
2.5.2 Healthcare facilities in Austria

In 2022, there were a total of 264 hospitals in Austria. This figure includes all facilities that are considered hospitals under the Hospitals and Health Resorts Act (Kranken- und Kuranstaltengesetz, KAKuG):

- General hospitals
- Special hospitals
- Convalescent homes
- Nursing homes for the chronically ill
- Sanatoriums

Figure 12 provides an overview of the shares made up by the different types of hospitals. Hospitals, special hospitals and convalescent homes account for the largest share. The 264 hospitals in total consist of 109 hospitals that are financed via the Provincial Health Funds and 155 hospitals that are not. In total, 58 per cent are acute/short-term hospitals, the rest are non-acute care facilities (Statistics Austria 2022).

Figure 12: Hospital types in 2022



Source: Statistics Austria (2022); illustration: GÖG/Austrian National Public Health Institute

In 2022, there were 177 service providers active in the mobile care sector and the number of inpatient care providers in Austria totalled 786. In 2022, the number of physicians in Austria totalled 47,722 (Austrian Medical Chamber, 2022).

In 2023, there were a total of 1426 public pharmacies and 32 branch pharmacies in Austria, alongside 42 hospital pharmacies whose primary task is to supply the respective hospital with medicines (Austrian Chamber of Pharmacists 2024).

2.5.3 Financing the healthcare system

Health expenditure

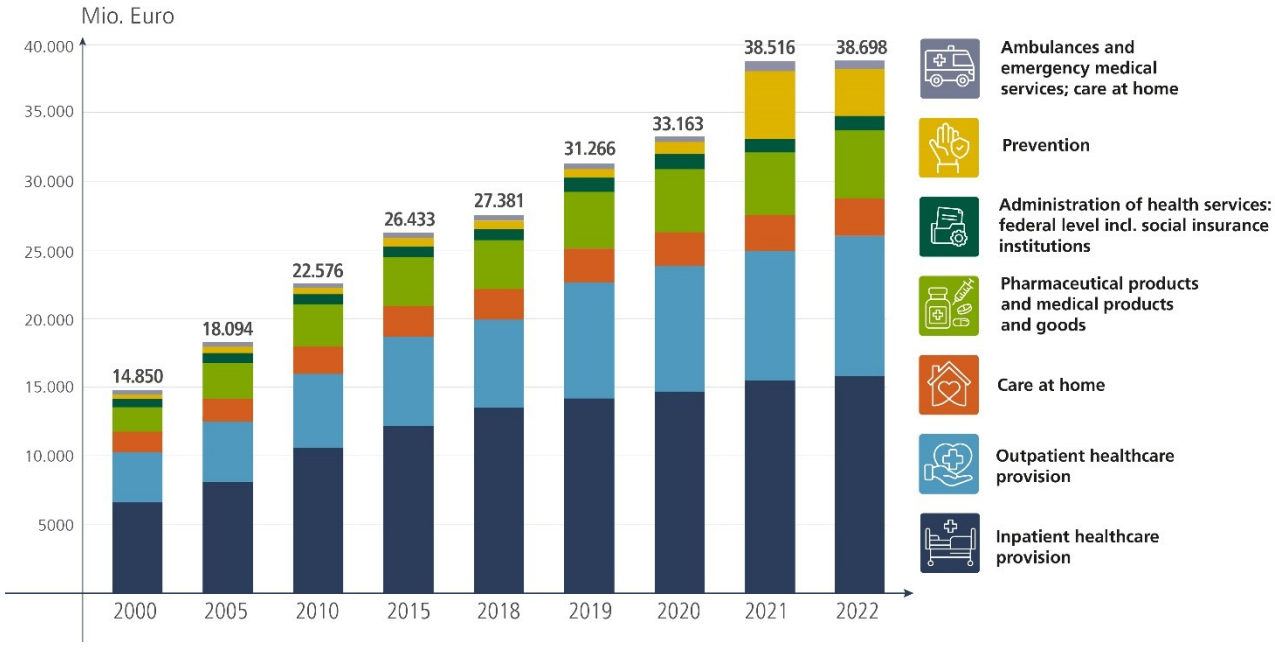
In Austria, the healthcare sector plays an important role for both society as a whole and the economy. In 2022, total healthcare expenditure amounted to around 52.58 billion euros (GDP). Current expenditure in the healthcare sector ranged at around 49.90 billion euros or 11.2 per cent of gross domestic product (GDP). Compared to 2021, nominal expenditure on healthcare services and goods increased by 0.6 billion euros or 1.1 per

cent. In recent years, GDP growth rates tended to be lower than average healthcare expenditure increases. With a view to curbing this trend in healthcare expenditure, a spending cap was introduced on healthcare spending by the federal level, the statutory health insurance institutions and the federal provinces in the context of the healthcare reform (Statistics Austria 2023). Compared to other countries, healthcare expenditure in Austria ranges above the EU average; only Switzerland and Germany, for instance, report higher healthcare expenditure (Bachner et al. 2019).

Source of funds

Around 77.6 per cent of total Austrian healthcare expenditure in 2022 was covered by public funding, including expenditure from social insurance institutions, the federal government, the federal provinces and local authorities/municipalities. The remainder of around 22.4 percent is private healthcare expenditure and includes deductible out-of-pocket expenditure by private households, spending by private insurance companies and private non-profit organisations as well as for services provided by occupational physicians (Statistics Austria 2023).

Figure 13: Current healthcare expenditure by healthcare services 2000 to 2022



Source: Statistics Austria (2023); illustration: GÖG/Austrian National Public Health Institute

Figure 13 provides an overview of the development of the breakdown of current public healthcare expenditure by healthcare services for the period from 2000 to 2022. The largest share of current public healthcare expenditure is spent on inpatient healthcare, followed by the outpatient sector.

Pharmaceutical products and medical devices, consumables and supplies also make up relatively large expenditure items (Statistics Austria 2023).

Financing the healthcare system

The Austrian healthcare system is funded through a mixture of different revenue sources: income-related social insurance contributions, tax revenue (VAT, income tax and tobacco tax) and individual co-payments. Health insurance contributions, which are based on income, represent the largest source of revenue. In 2015, these contributions covered 44.8 per cent of current healthcare expenditure and 60 per cent of public current expenditure (Bachner et al. 2019).

In 2022, the contribution rate for the majority of the contributing population amounted to 7.65 per cent of income earned from activity (Austrian Health Insurance Fund 2024), and for pensioners only 5.1 per cent (Pension Insurance Institution 2024). In special cases (such as for unemployed individuals), general tax revenue is used to cover health insurance contributions.

The second most important source of revenue is tax funding, which covered 30.8 per cent of total expenditure and 40 per cent of public expenditure in 2015. General, non-earmarked tax revenue covers the majority of the federal provinces' healthcare expenditure. A further earmarked share of taxes is distributed to the regional authorities via a financial equalisation mechanism to finance healthcare and is used to fund hospitals, health promotion and prevention as well as research and project planning. In line with the provisions under the Financial Equalisation Act (Finanzausgleichsgesetz, FAG 2024), distribution of funds is not based on risk or need, but primarily on negotiations held at federal, provincial and municipal level. Tax revenues for the healthcare system are pooled and distributed by the Federal Health Agency at federal level and at province level by the nine Provincial Health Funds (Bachner et al. 2019; Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019).

The third most important source of revenue is individual co-payments on the part of patients. Such payments either consist of fixed amounts (e.g. prescription fees for medication) or cover a certain percentage of the costs for using services (e.g. deductible out-of-pocket payments for services covered by the insurance that are provided in the primary care sector).

Hospital funding

Funding of hospitals in Austria is very fragmented and therefore characterised by complexity (see Figure 14). Hospital funding is ensured via several different sources, the main one being (national and regional) taxes as well as lump-sum contributions from social insurance providers. A much smaller proportion comes from patients and private health insurance companies, which play a subordinate role in Austria. The Federal Health Agency is a public fund that pools earmarked and fixed shares of tax revenue (VAT, tobacco tax, income tax) as well as lump-sum contributions from health insurance providers at federal level. For the purpose of hospital funding, the Federal Health Agency distributes fixed amounts of funds to the Province Health Funds.

In each of the nine federal provinces there is a Province Health Fund, which is funded by the federal government, the respective federal province or municipality and the social insurance providers; the amount of their allocation is determined in the context of the financial equalisation negotiations. The Federal Health Agency (BGA) distributes the funds on a fixed percentage basis to the nine federal states. The Province Heath Funds also plan, control and finance most of the public and private acute inpatient and outpatient intramural care.

The Province Health Funds' funding sources include:

- funds from the Federal Health Agency,
- a fixed share of the federal provinces' and municipalities' VAT revenue,
- (tax-based) funds provided under the Health and Social Services Benefits Act (Gesundheits- und Sozialbereich-Beihilfengesetz, 1996),
- agreed lump sums from the health insurance funds
- additional funds from the federal provinces and municipalities (to cover operational deficits),
- reimbursement for treatment of foreign patients by foreign insurance funds and

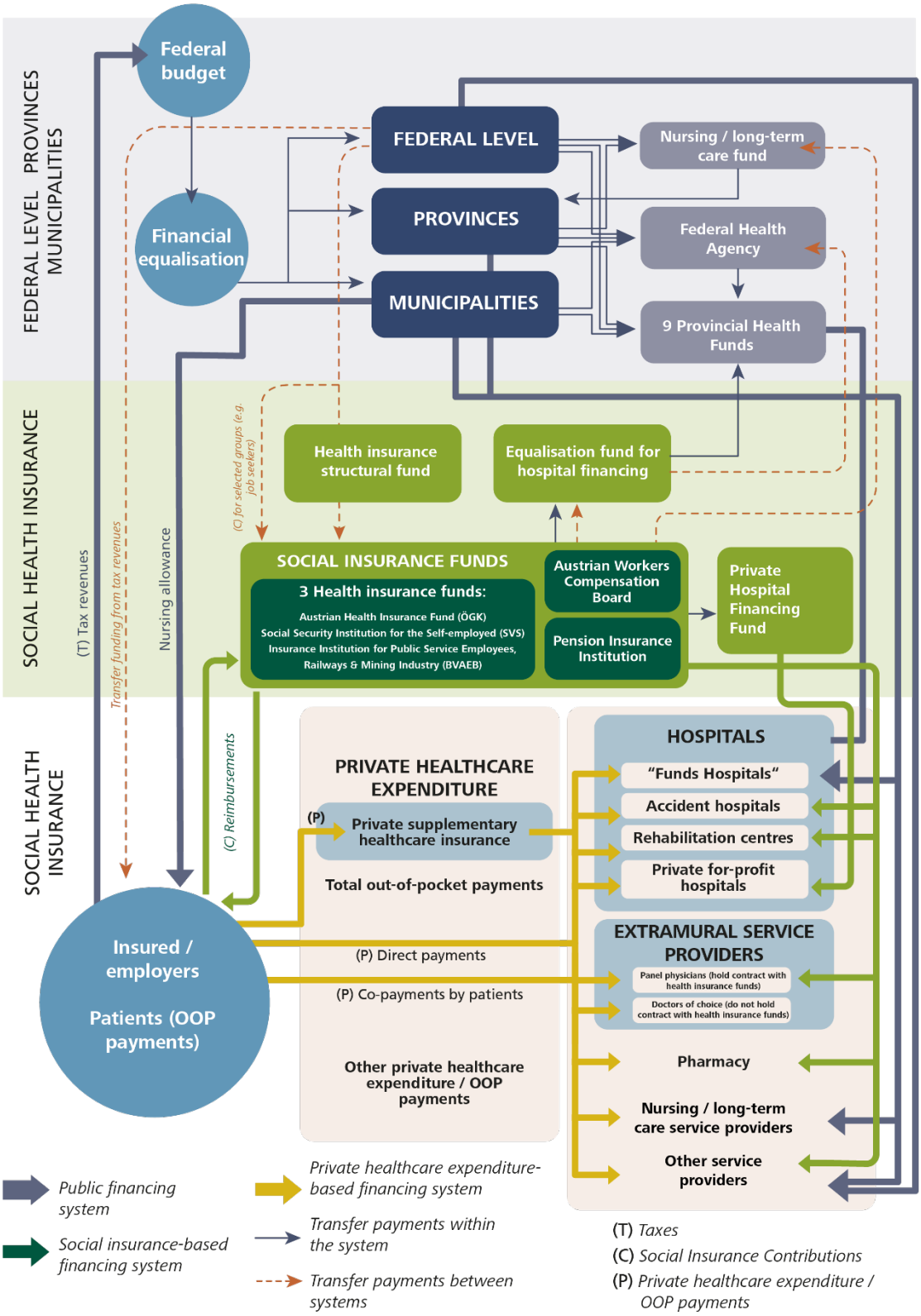
- co-payments by patients (such as out-of-pocket costs/deductibles, patients' contributions).

Some of the hospitals also receive direct payments from their local province governments, which are not channelled through the Province Health Funds. Those hospitals that are financed by the Province Health Funds are public and non-profit acute hospitals, called "Funds Hospitals". In Austria, hospital stays are funded by the Province Health Funds based on the performance-oriented hospital financing system (leistungsorientierte Krankenanstaltsfinanzierung, LKF), introduced in 1997. Hence, financing of inpatient services was switched from flat rate per diem financing to financing based on the services provided and the diagnosis. Private hospitals receive funding via the Private Hospital Financing Fund (Privatkrankenanstaltenfinanzierungsfonds, PRIKRAF), which in turn is financed by flat-rate contributions from all health insurance providers and co-payments from patients hospitalised in private hospitals.

Financing of the extramural sector, long-term care and rehabilitation centres

Public extramural healthcare providers such as general practitioners, specialists and dentists are financed exclusively via health insurance providers. In contrast to that, long-term care is financed by tax revenue, with benefits in kind being covered by the provinces and municipalities and the federal government assuming the nursing allowance costs. Costs of rehabilitations centres are generally covered by pension, accident and health insurance funds. Exceptions are costs of rehabilitation following an accident at work, which are assumed by accident insurance funds, and costs of rehabilitation for pensioners and for those in gainful employment who are unable to work are covered by the pension insurance institution. In all other cases, costs are covered by health insurance (Bachner et al. 2019; Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019.

Figure 14: Financing flows in the Austrian healthcare system



Source: Bachner et al. (2019), illustration: GÖG/Austrian National Public Health Institute

3 Strategy for a Climate-Neutral Healthcare System

The Austrian healthcare sector causes considerable greenhouse gas emissions. It is thus an important contributor to focus on and address in the context of the Austrian Government's efforts towards achieving the goal of "climate neutrality by 2040" and meeting Austria's international greenhouse gas reduction commitments. Acting out of a sense of responsibility, a number ofseveral healthcare facilities have already launched individual climate protection measures. Generally speaking, however, such activities are still in their initial stages and only relate to certain areas.

To date, the healthcare sector has not been considered in climate action strategies, nor has a concrete strategy for a climate-neutral healthcare system been prepared. The climate crisis' multiple negative impacts, the challenges of protecting health and meeting the nationally and internationally defined binding target structures as well as implementing the experts' recommendations in the Austrian Special Report on Health, Demography and Climate Change (APCC 2018), however, call for drafting and drawing up a strategy aimed at a net-zero healthcare system.

In this spirit, the Strategy for a Climate-Neutral Healthcare System was developed to lay the foundations for reaching the entire healthcare sector and significantly accelerating its broad-based transformation towards climate neutrality – seeking to ensure that healthcare services are provided in a climate-friendly and resource-conserving manner.

Achieving the climate targets requires transformation on an unprecedented scale, and within a timeframe that is indeed very narrow for such a huge task. This Strategy therefore defines key points of reference, sets clear goals and outlines guiding principles for action, framework conditions as well as fields of and options for action.

A key element of the Strategy's implementation process is ongoing evaluation, adaptation and further development, relating both to the strategy and to the specific options for action.

3.1 Vision

Austria is making an all-out effort and is active across all sectors, setting the necessary framework conditions and structures for achieving a significant greenhouse gas emission reduction in line with the Paris Agreement and the EU climate targets within the next few years, at the same time taking account of and ensuring equal opportunities and sustainability, in order to reach its goal of climate neutrality by 2040.

A key pillar of this transformation process is the healthcare sector, which is taking comprehensive climate protection measures to ensure rapid structural implementation of greenhouse gas reduction. Greenhouse gas emissions are being reduced in line with the specified climate targets and the consumption of raw and other materials, energy and water as well as waste generation are being cut back massively.

Out of a sense of responsibility for people's health and health protection, the healthcare sector is assuming a key role in tackling the climate crisis and its impacts, while at the same time acting as a role model seeking to preserve and/or restore planetary health.

People who work in the healthcare sector have valuable knowledge and enjoy a high level of trust, which makes them important multipliers in efforts directed at climate action, climate change mitigation and adaptation.

3.2 Objectives, starting points, approaches and tools

3.2.1 Goals

The overarching objectives pursued are achieving climate neutrality in the healthcare sector and providing top quality healthcare services across all sectors with the lowest-possible burden on people, the environment and society.

Climate neutrality is a state in which human activities result in no net effect on the climate system. Achieving such a state would require massive reduction in greenhouse gas emissions caused by human activity and balancing of residual emissions by removing an equal amount of greenhouse gases from the atmosphere (net zero emissions). The term

CO_2 (carbon dioxide) neutrality or net-zero CO_2 emissions refers to a situation where only emissions caused by the greenhouse gas CO_2 are considered (IPCC, 2018).

Low climate and environmental impact means (Ostertag et al. 2021):

- emitting only low levels of greenhouse gases,
- releasing only few pollutants into the air, water and soil,
- producing less waste and retaining residual waste largely in the product and material cycle,
- using only few new materials and products,
- using only products made from recycled (secondary) and renewable raw materials.

The related target definition is thus guided by and consistent with the objectives set out in the Government Programme and the Paris Agreement.

In the context of strategic objectives, the following quantitative targets are defined:

- net zero greenhouse gas (GHG) emissions for all healthcare facilities under Scope 1 and 2 by 2040
- net zero GHG emissions for the entire healthcare sector in Austria for Scope 1 and Scope 2 by 2040
- binding interim targets to be defined in cooperation with the relevant stakeholders
- net zero GHG emissions under Scope 3 by 2050

In addition to these strategic goals, quantitative goals are also to be defined. Currently, however, the necessary database is not yet available and/or no longer up to date.

For the definitions and specifications of Scope 1, 2 and 3, please see Chapter 5.2.1.3.

This Strategy for a Climate-Neutral Healthcare System aims at developing and addressing framework conditions and actions to facilitate the provision of necessary healthcare services in a resource-efficient and climate-friendly manner.

3.2.2 Starting points, approaches and tools

A key element for achieving climate neutrality in the healthcare sector is a paradigm shift with regard to health promotion (see Chapter 3.3). This concept is also being increasingly fostered within the Austrian healthcare system. It is a fact that healthier people need fewer healthcare services and therefore have a smaller carbon footprint. Consequently, climate action efforts in the healthcare system must go hand in hand with strategies aimed at reducing the incidence and severity of diseases, thereby reducing both scope and intensity of the necessary treatment and care. At the same time, it is necessary to ensure adequate care and avoid unnecessary examinations and treatments (MacNeill et al. 2021).

The most important starting point in the existing healthcare structure, which is at the same time the key focus of the Strategy for a Climate-Neutral Healthcare System is reduction of emissions generated in the context of healthcare service provision and optimisation of the services' efficiency and climate-friendliness. The Strategy sets out the options for action and framework conditions available or necessary to ensure that healthcare services are provided in a climate-friendly manner.

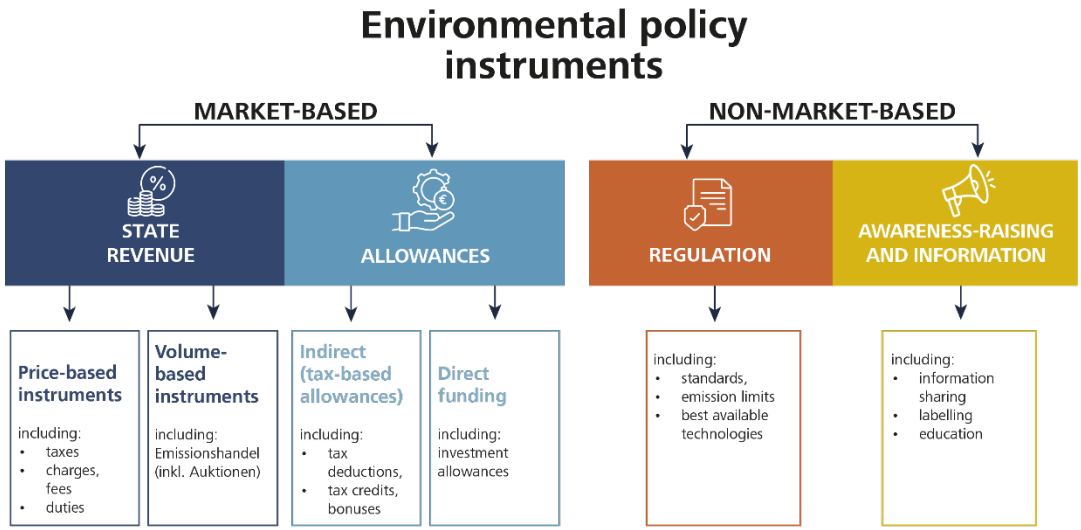
According to science and research, the following starting points, approaches and instruments may facilitate achieving the goal of climate neutrality.

CO_2 reduction starting points and approaches (Friesenbichler et al. 2021):

- Energy efficiency in the production or use of existing technologies
- Material efficiency and substitution along the value chain
- Substitution of fossil fuels with renewable energy sources, for instance though electrification of existing processes using "green electricity"
- Replacement of fossil materials used as input (substitutability of CO_2-intensive inputs or feedstock)
- Process innovation

Furthermore, a framework made up of a range of harmonised, innovative and targeted policy instruments composed of market and non-market-based instruments is required. Figure 15 provides an overview of the various instruments.

Figure 15: The environmental policy instrument mix



Source: Friesenbichler et al. (2021)

Please note that those instruments that are related to government revenue and affect all climate-relevant areas of the economy and society do not form the focal point of this Strategy. These instruments were dealt with in very relevant key papers (Schnabl et al. 2021) by the Institute for Advanced Studies.

3.3 Sustainable healthcare and climate action

The impacts of the climate crisis present the healthcare sector with the dual challenge of on the one hand reducing emissions, while on the other hand continuing to ensure health-promoting and high-quality healthcare services for all. Thus, a central approach aimed at promoting both climate action and health consists of integration measures that contribute equally towards people's health and climate protection.

The actions listed below are aimed at fostering population health, the associated reduction in the use of healthcare services and the reduction of oversupply and improper treatment have already, and for various reasons, been a focus of related healthcare system action and are being addressed by other projects and the corresponding measures.

The goal pursued under this Strategy for a Climate-Neutral Healthcare System is to develop framework conditions and measures for providing necessary health services in a climate-friendly way.

The paradigm shift – often called for but still rarely effected – from the prevailing system focused on treating the ill to a prevention-oriented and health-promoting system, is one of the key levers for climate protection. Healthier people need fewer healthcare services, medicines and medical products. Each healthcare service that does not have to be provided saves the required energy and resources and avoids the associated climate and environmental impact (APCC 2018). Effective measures aimed at reducing the Austrian healthcare system's future carbon footprint must therefore focus on the system's primary services i.e. medical treatment. Consequently, it is necessary to focus investment on disease prevention and health promotion so as to prevent or delay diseases, avoid their detrimental effects and thus reduce the volume of healthcare services and their environmental impact (Nansai et al. 2020; Tennison et al. 2021). This requires cross-sectoral framework conditions that help people make healthy choices. Key areas for action include nutrition and mobility, which – if properly designed – have the potential to make an important contribution to both health and climate protection (please also see Chapter 2.3.5).

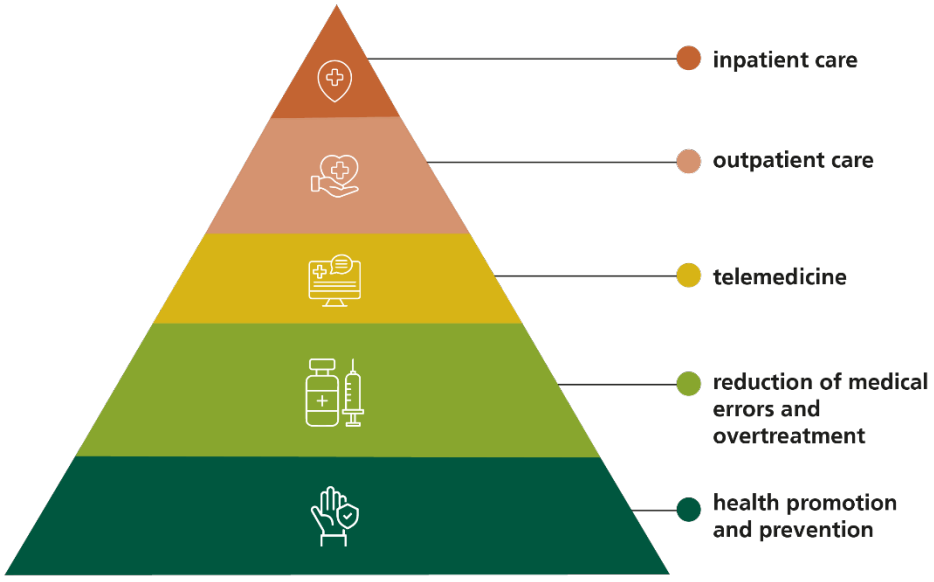
Another important topic for action in this respect is avoidance of inefficient treatment, i.e. multiple examinations, incorrect (hospital) referrals, excessive use and misuse/wrong supply (medication). Any increase in the effectiveness of healthcare services generally reduces the number of services provided and the associated use of resources and energy. An important building block in this connection is reduction of incorrect treatment and overuse of medication (Thorpe et al. 2015). In particular, inadequate medication (Gogol/Siebenhofer 2016; Richie 2022) in the form of polypharmacy in older and multimorbid people or medication that was prescribed but is not taken, is cost-intensive and harms the climate (APCC 2018). The international Choosing Wisely initiative, also represented in Austria since 2017 under the heading of "Gemeinsam gut entscheiden"[5], addresses the topics of overuse and over-prescription of medication. Choosing Wisely is a growing international campaign, currently represented in over 20 countries worldwide. Based on awareness-raising, information campaigns and recommendations, the initiative draws attention to excessive and/or superfluous medicalisation and medical services to

[5] https://gemeinsam-gut-entscheiden.at/bereich/empfehlungen/allgemeinmedizin [in German only]

avoid overuse. In a project launched in Austria, five recommendations on medical services in the care of geriatric patients were, for instance, identified that have little to no demonstrable benefit, in some cases even have an increased potential for harm, and may also entail high costs (Glechner 2019).

Another key area for action in promoting climate-friendly healthcare is provision of care at the best point of service, which was already formulated as a goal in the 2013 Target-based Health Governance Agreement. Health service provision in hospitals is the most cost- and greenhouse gas emission-intensive form of care and patient treatment. By avoiding inpatient care and effecting a shift from hospitals to more cost-effective and less greenhouse gas-intensive types of care, provided for instance in outpatient departments or in primary care units, it is possible to cut down on both costs and healthcare sector emissions. Furthermore, services such as telephone health counselling in Austria (for instance www.1450.at) and telemedicine services (including email counselling, video consultations with a doctor) can contribute to more targeted patient navigation and thus to reducing the carbon footprint of healthcare (Holmner et al. 2014; Purohit et al. 2021).

Figure 16: Climate-friendly healthcare



Source: GÖG/Austrian National Public Health Institute

Based on the options for action for more effective services in the healthcare system, the hierarchical pyramid of climate-friendly healthcare targets shown in Figure 16 was developed. Providing guidance and serving as a point of reference for prioritising healthcare options, it is explained in detail in the following section.

4 Fields of Action and Transformation

There is urgent need for timely implementation of comprehensive measures in a wide range of areas to achieve the ambitious climate and environmental protection targets. Highly relevant fields of action in the context of the healthcare system's transformation towards climate neutrality are transport and mobility, energy supply, buildings and green spaces as well as the food system. What is also required to achieve this goal is a holistic approach that includes further healthcare areas that demonstrate a great potential for avoiding detrimental environmental impacts, such as pharmaceuticals and medical products as well as waste and resources.

Some of these fields of action are closely interlinked. Due to the volume of medical products available and the pharmaceutical waste generated, the field of waste, for instance, is closely linked to medical products and pharmaceuticals as fields of action. Likewise, there are significant interactions between waste and resources on the one hand and food on the other due to the issue of food waste.

In the following chapters, an overview of the current situation, climate relevance, necessary options for action, recommendations for action derived from the stakeholder process and good practice examples are presented for each of the fields of action.

The results outlined are based on (a) a comprehensive literature review, (b) initial results produced by the pilot project "Klimafreundliche Gesundheitseinrichtungen" (climate-friendly healthcare facilities) (Lichtenecker et al. 2022) and (c) expert discussions and exchange. The recommendations for action were developed in (d) a process involving stakeholders and experts (Schanes/Lichtenecker 2022). A special focus was placed on hospitals, pharmaceuticals and medical products, as these areas contribute most to the healthcare system's carbon footprint. One of the workshops conducted in this connection also dealt with the topic of "Emergency services and climate protection".

4.1 Energy, buildings and green spaces

Healthcare facilities – from doctors' surgeries and pharmacies to primary care units, hospitals, nursing and care facilities – require energy to operate reliably and safely. Energy

consumption depends on the type of healthcare facility, its equipment, systems and appliances, the quality of the building as such and the level of utilization. The energy consumed by healthcare facilities still largely stems from heating oil, natural gas, petrol and diesel, which generate the corresponding greenhouse gas emissions. Hospitals account for the highest direct energy consumption by far, which make them the most energy-intensive and thus also CO_2 emission intensive form of healthcare. In 2015, a total of 31 per cent of Austrian hospitals' greenhouse gas emissions was attributable to direct energy consumption (Weisz et al. 2020).

The first key lever for reducing energy-related CO_2 emissions is thus cutting down on energy requirements. The lower the energy consumption, the lower the greenhouse gas emissions – besides, every kilowatt hour of energy saved also saves costs. This is particularly relevant as energy prices – especially those for energy from fossil fuels – have risen sharply in recent years and are most likely to continue to rise. Efforts aimed at energy reduction also need to focus on the quality of buildings as energy requirements for heating, cooling and ventilation account for the largest share of energy consumption. This demand can be substantially reduced by ensuring that building shells meet high thermal quality standards.

Essential in this respect are also the building and other materials used, construction methods and construction site management. Furthermore, the lighting, systems used, devices and equipment of all kinds (such as medical equipment, building services, IT) offer further potential for increasing energy efficiency.

As the range and number of services offered by healthcare facilities is continuously increasing, the range of medical services provided, as well as space and levels of comfort offered to patients, are continuously being expanded and due to new healthcare locations and buildings, it has become increasingly challenging to reduce energy consumption not only specifically per service unit, but also in absolute terms for each facility as a whole.

The second key lever in climate protection is decarbonisation of energy supply, i.e. the switch from fossil fuels such as oil and natural gas to renewable energy sources.

The transition of the energy system to renewable energies is not only pivotal to mitigating climate change but could also contribute to affordable and clean energy supply, curb air pollution, reduce dependence on international markets and thus strengthen security of supply (Romanello et al. 2021).

For healthcare facilities, this field of action includes

- phasing out use of fossil fuels in healthcare by converting fossil fuel-operated systems and vehicles to renewable energy sources,
- constructing own plants to facilitate and accelerate the use of renewable sources (such as photovoltaics, solar thermal energy, ambient heat and near-surface geothermal energy),
- purchasing electricity, district heating and cooling as well as fuels (i.e. HVO (hydrotreated vegetable oils), H_2 (hydrogen) and gas [biogas]) from renewable energy sources,
- making use of renewable energy a procurement criterion for suppliers and external service providers, who would also be required to provide evidence for their trajectory towards successful decarbonisation by 2040.

In this respect it is essential that reduction in energy consumption goes hand in hand with switching to full energy supply from renewable sources, since the lower facilities' energy demand is, the easier it can be covered by renewable sources.

Furthermore, climate-friendly design of green spaces may also contribute to countering climate change or mitigating its impacts.

4.1.1 Status quo

Although significant and ongoing reduction would be required to meet energy and climate policy targets, energy consumption in Austria today is still largely at the level of 2005 and the energy mix is still dominated by fossil fuels. In terms of final energy consumption, electricity is the second most important energy source after oil products (heating oil, petrol, diesel), followed by gas and biogenic energy sources.

In 2021, the growing share of renewable energy in final energy consumption stood at 36.4 per cent, and in electricity generation at around 79 per cent (Federal Ministry for Climate Action 2023b). Meeting the 2040 climate neutrality target means effecting a de facto 100% switch to renewables by that year; in the electricity sector, this transition must be achieved as early as 2030.

Just under half of final energy consumption is used for heating and thus primarily for space heating and hot water supply in buildings. Although service buildings show slightly better energy efficiency than private residential buildings, their consumption is currently only just slightly below 2005 levels (Federal Ministry for Climate Action 2023b).

The healthcare system is one of the major service sector energy consumers. Its direct energy consumption includes operation of all types of inpatient healthcare facilities, mobile onsite services at patients' homes, as well as patient transport and transport induced by inpatient facilities (please also see Chapter 4.4). Detailed energy consumption data is, however, not yet available for the Austrian healthcare sector. Latest publications of energy data relate merely to environmental and sustainability reports published by hospital operators as well as individual hospitals and nursing homes.

For many years now, efficient use of energy has ranked high on hospitals' agendas. Healthcare facilities in publicly accessible buildings require an energy performance certificate, the preparation of which may also be used to identify energy-saving potential and related actions. Hospitals with more than 250 employees that do not directly report to the Austrian public administration are, as business entities, covered by the Energy Efficiency Act and are therefore subject to introducing an external energy audit, an energy or environmental management system or another recognised management system in accordance with the Energy Efficiency Act, and are required to comply with the resulting documentation obligations. Further drivers are rising energy costs and efforts aimed at making an active contribution to climate protection. Although a wide range of measures have already been implemented, they relate in many cases only to individual actions and projects.

Although various measures have already been implemented, it may be assumed that overall, there is still considerable potential for energy savings. Significant room for improvement has also been identified with respect to ongoing energy controlling. Furthermore, the technical opportunities offered by modern building technology systems installed are often not or not fully tapped into. However, for some time already some hospitals and hospital operators have been using an energy/environmental management system and/or ongoing energy accounting. Others have already implemented energy performance contracting to introduce efficiency-enhancing measures.

As previously mentioned, thermal quality of buildings and sustainable construction offer substantial energy-saving potential. Today, general building energy standards for new

buildings, extensions and major refurbishments are much more ambitious than they used to be. Hospital operators such as KAGes (the Styrian Hospital Association) and WiGeV (the Vienna Health Association) have developed their own internal guidelines for sustainable and energy-efficient hospital buildings, which consider the building's entire life cycle and include greenhouse gas emissions from upstream and downstream processes. This also applies to building standards such as the "klimaaktiv" Austrian climate protection initiative (klimaaktiv, 2024) and the "ÖGNI" (Austrian Sustainable Building Council) standards (ÖGNI, 2024), which have already been applied in the planning of some hospitals.

Heating (for heating systems, hot water, air humidification, steam generation for sterilisation, kitchen ovens etc.) and cooling requirements account for the largest share of healthcare facilities' energy consumption and in many cases, natural gas and heating oil are still used to generate heat. However, processes have already been changed, for instance by switching to decentralised and electric steam generation, or by using electric cookers and heat pumps. A considerable number of healthcare facilities are connected to district heating networks, whose greenhouse gas emissions vary depending on their suppliers' energy mix, and some hospitals source heat from biomass district heating networks.

In terms of electrical energy, some large hospital operators (for instance KAGes, KABEG/Carinthian Hospital Operating Association, Vinzenz Group) and some individual hospitals have switched to electricity from renewable sources and certified green electricity (UZ46 eco-label). The UZ46 eco-label guideline sets very high-quality standards, and UZ46 electricity, for instance, must contain a certain minimum share from photovoltaics and the rest from biomass, geothermal, solar, wind or hydropower sources. Green electricity is sold exclusively by green electricity traders to prevent any mixing with energy from non-renewable sources (Austrian Ecolabel 2024). Furthermore, the electricity mix supplied by many Austrian electricity companies already features a high share of renewable energy and the respective lower level of greenhouse gas emissions.

Many have also started to produce their own renewable energy. Some hospitals have, for instance, installed photovoltaic systems to generate their own green electricity – although this share is mostly still in the single digit percentage range of these hospitals' overall electricity consumption. In new buildings and extensions, increasing use is also being made of ambient heat and geothermal energy employing heat pumps.

In recent years, cost-effectiveness and economic efficiency of technologies for tapping into the potential of renewable energy sources has improved significantly – especially in the field of photovoltaics as well as in the case of stationary battery storage systems – and continues to increase, also in response to the sharp rise in energy prices. These improvements are also driven by public subsidies, from which healthcare facilities may also benefit. The timely transition to renewable energies is further promoted by the Federal Government's related legislative projects, including the Renewable Energy Expansion Act and the Renewable Heat Act.

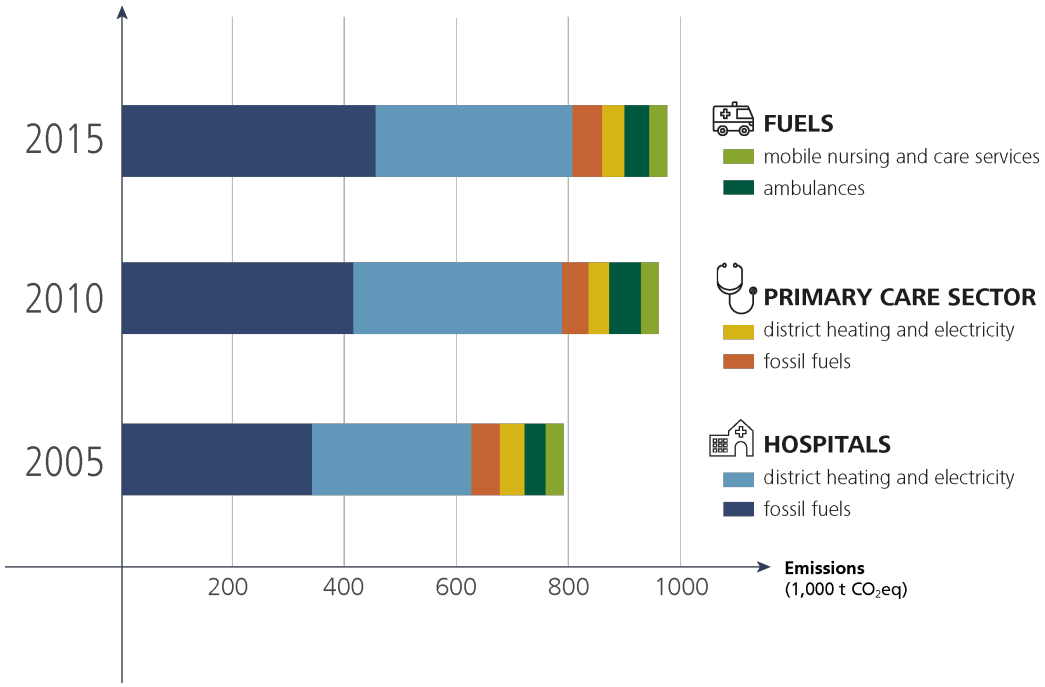
Currently, measures aimed at fostering climate protection and biodiversity as well as mitigating the impact of the climate crisis do not yet play a key role in designing green spaces in healthcare facilities. Furthermore, there is hardly any data available on the share made up by green spaces in healthcare facilities. Yet only EMAS-certified healthcare facilities are required to disclose the share of green spaces via the Biodiversity Core Indicator in environmental statements they are required to publish.

4.1.2 Climate relevance

Around 10 to 15 per cent of all climate-relevant emissions in the healthcare sector are attributable to healthcare facilities' direct on-site energy consumption (combustion of fossil fuels, Scope 1) or caused by facilities' electricity and heating energy suppliers (in power and heating plants, Scope 2). In 2015, direct energy-related CO_2 emissions generated by Austria's healthcare facilities totalled some 768,000 tonnes of CO_2, thus accounting for around twelve percent of the Austrian healthcare sector's total carbon footprint.

Of these, hospitals contributed 83 per cent, doctors' surgeries and mobile care 12 per cent and patient transport 5 per cent (see Figure 17). In hospitals, which are responsible for around a third of all greenhouse gas emissions in the healthcare sector (2.5 million tonnes), direct energy consumption (Scope 1 and 2) accounts for around 30 per cent of emissions. Since 2005, CO_2 emissions from energy consumption in hospitals have been declining (Weisz et al. 2020).

Figure 17: Emissions attributable to the healthcare sector's energy consumption



Source: Weisz et al. (2019), illustration: GÖG/Austrian National Public Health Institute

This shows that reduction of energy consumption, for instance through comprehensive renovation and refurbishment of existing buildings, the highest standards for new buildings, and the rapid phase-out of fossil fuels are highly relevant to the climate. Buildings emit greenhouse gases not only during operation (e.g. air conditioning and lighting), but also during construction and demolition, in particular through Scope 3 emissions from production, transport and disposal of building materials as well as from construction site operation.

Creation, preservation and adequate design of green spaces have a positive effect both on the climate and people's wellbeing. Vegetation of all kinds has many relevant climate-effective functions, the main one being CO_2 sequestration and cooling.

Grassland absorbs 2.4 kg of CO_2 per m² and year, a tree such as a beech absorbs 12.5 kg of CO_2 annually (KAGes 2020).

Green spaces contribute to reducing air and surface temperature by producing shade and through evapotranspiration (Demuzere et al. 2014). The latter is a combination of water evaporating from land and water surfaces (evaporation) and water vapour released

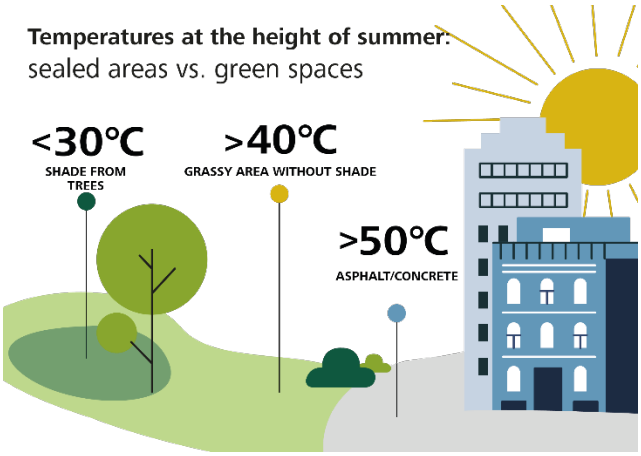
through the leaf openings of plants (transpiration) (Spektrum 1999). Green open spaces and vegetation thus act as fresh air corridors, by creating cold air ventilation areas and improving the microclimate around buildings. The actual effect plants may have on a microclimate, however, depends on the type of green space. Densely vegetated areas already generate cooling effects during the day, while in open green spaces cool air is rather felt at night and released to surrounding areas depending on the prevailing conditions (Rößler 2015).

Natural surfaces tend to absorb less solar radiation than sealed surfaces and therefore do not heat up as much. In this respect, evaporative cooling and shading effects play an essential role (Rößler 2015).

Green roofs provide effective thermal insulation for buildings, thus reducing the building's heating/cooling load and energy consumption and may therefore contribute to improving air quality (Shafique et al. 2018). In summer, plants generate a cooling effect and in winter they act as insulation. Façade greening also generates both heating and cooling effects. Temperature differences between greened and non-greened walls can even be in the double-digit range (Besir/Cuce 2018). Furthermore, green spaces contribute to promoting biodiversity and improving the local water balance thanks to better rainwater infiltration, while also providing places for recreation and socialising, and thus make a positive contribution to health and wellbeing.

In urban areas temperatures on asphalt surfaces without any shade may rise to up to 58°C in midsummer, while temperatures on natural green spaces remain at 28°C (KAGes/Styrian Hospital Association, 2020).

Figure 18: Temperatures in midsummer: green spaces vs. other spaces



Source: KAGes/Styrian Hospital Association (2020)

4.1.3 Options for action

A wide range of options for action have been identified for "energy and buildings" and can be implemented both in existing buildings as well as in the context of refurbishments, extensions, annexes or construction activities for new buildings. It is largely the healthcare facilities themselves that are responsible for and in full control of such activities. Over the last few years, many options have been put into practice, albeit often in the form of individual flagship projects. Hence, it is high time for rolling them out across the entire healthcare system.

Zero-emission buildings

The new EU Energy Performance of Buildings directive stipulates that by 2050 the EU's building stock is to be transformed into zero-emission buildings, i.e. buildings whose very low energy requirements are covered entirely by energy from renewable sources, subject to technical feasibility. This standard applies to new buildings from 2030 and to public buildings as early as 2028. From 2028 on, it will become mandatory for all new buildings larger than 1,000 m² to calculate and report the global warming potential based on a life cycle assessment (LCA). What is more, a refurbishment obligation is to be introduced for those non-residential buildings that report the worst values. Extensive renovation activities are to be launched aimed at transforming the EU's existing building stock as

quickly as possible into zero-emission buildings. It is thus necessary to implement corresponding zero-emission building standards as quickly as possible for healthcare facilities, based, for instance, on the “klimaaktiv” or “ÖGNI” building standards, which reflect the EU requirements accordingly (EU Energy Performance of Buildings Directive, 2024).

Thermal renovation of buildings

Thermal building renovation encompasses various measures aimed at reducing energy consumption for heating, hot water and cooling. In addition to insulating the exterior walls, roof and windows, related activities usually include switching from oil and gas heating systems to climate-friendly heating alternatives.

Thus, thermal renovation at the same time serves to increase the building’s value and extend its useful life. This makes it very clear that comprehensive thermal renovation of all healthcare facilities using green insulation materials is to be striven for.

Circular economy, sustainable construction methods and use of climate-friendly building materials and products

Sustainable construction ensures efficient use of resources in developing buildings with a long useful life. It needs to be highlighted in this context that renovation of building stock instead of new construction makes an important contribution to implementing circular economy principles in the healthcare sector.

Construction method choices (for instance solid concrete or timber construction) affect not only the type and quantity of materials required for the shell but also its longevity and – at the end of its lifecycle – the ability to dismantle and recycle the building. A key prerequisite for ensuring that the construction meets circular requirements across the building’s entire lifecycle (construction – use – re-use – demolition) is using recyclable building materials and products for new buildings, extensions and conversions. By choosing green building materials – i.e. recyclable and natural materials such as wood, low carbon concrete, recycled concrete or green alternatives to cement – it is possible to reduce indirect CO_2 emissions by up to 30 percent across the building’s entire lifecycle (Chastas et al. 2018).

Futhermore, repair, reuse and further use of existing furnishings is preferable to recycling or disposal.

Energy management

The term energy management covers all organisational activities that ensure the healthcare facility's energy-efficient operation and the ongoing reduction of energy requirements. Some key options for action are listed below:

- Development of an environmental or energy management system
- Development of digital energy information systems for energy flow analysis and monitoring, systems monitoring, detailed energy consumption recording used especially for high volume consumers, involving also the use of artificial intelligence
- Renewal of the building management system (BMS) by also including peak load management and automatic data recording, regular analyses of measurement data, establishing regular energy benchmarking that includes detailed analysis of differences and annual preparation of an energy report
- Internal guidelines for cost-efficient system operation (covering demand-based operation, reducing the power level of air conditioning at night, setting maximum temperatures for certain areas of use, switching off appliances and systems), implementation of measures based on ongoing monitoring and user training
- Making better use of existing equipment through optimised control, operating time models or reinvestment in existing systems to be equipped with more efficient technology
- Developing modern digital maintenance systems, including predictive maintenance
- Developing internal planning specifications, circular construction processes (i.e. construction, operation, demolition and recycling/reuse) for buildings' thermal/energy quality and energy consumption, participation in building certification programmes (klimaaktiv, ÖGNI), new facilities constructed as net-zero buildings
- Developing procurement criteria for high efficiency equipment of all kinds, in particular medical devices, and targeted procurement of high efficiency devices and systems (including replacing old heating circulation pumps with speed-controlled high-efficiency pumps, switching from existing cooling systems to optimally dimensioned air-cooled water chiller systems)
- Preparing site-specific energy-based development concepts

- Awareness raising campaign on saving energy through correct user behaviour directed at staff, patients, residents and visitors
- Training and further education directed at in-house specialist staff and provision of the necessary human resources for effective energy management
- Promoting exchange and sharing of information, experience and lessons learned between healthcare facilities, using and expanding established platforms, such as the Austrian Federation of Hospital Engineers (ÖVKT). The latter, for instance, set up a dedicated environment and energy working group to foster exchange of information on sustainability issues and learning from each other.
- Using contracting to implement energy efficiency measures

Making optimal use of floor space

According to experts, experience shows that effective utilisation of usable floor space in core medical facility areas ranges at around 30 to 40 per cent. Even when they are not in use, these areas nevertheless consume resources and energy. Efforts should therefore focus on preparing organisational concepts aimed at stepping up capacity utilisation.

Standards for usable floor space, duty hour models, a corresponding legal framework, rules of conduct and simulation tools may facilitate and structure enhanced utilisation of usable floor space. In the context of constructing new buildings or conversion activities, flexibly designed building structures may facilitate most diverse use cases, thus also promoting capacity utilisation. Based on modular design elements, different groups of rooms can be developed and may either be interconnected or separated as required.

Optimised ventilation and air conditioning systems

A key option for action is optimising ventilation and air conditioning systems as they consume huge amounts of electricity and heat in hospitals.

Potential for action covers a wide range of options, including optimised operating times, air exchange rates, times when the systems operate at reduced power, definition of maximum room temperatures, efficient humidity recovery systems, reduced internal heat loads, shading systems, passive and adiabatic cooling, cooling ceilings, surface cooling, component activation, central cooling generation, switch to district cooling, use of highly

efficient electric motors, pumps and fans or installation of frequency converters in pumps and fans for speed and flow rate control.

In this context it is necessary to scrutinise and adapt currently applicable standard specifications.

Coolants featuring the lowest possible greenhouse gas potential

When procuring new cooling systems or converting existing ones, the focus must be placed on choosing a coolant that features the lowest possible greenhouse gas potential.

Optimising existing heating systems

Optimisation of existing heating systems mainly covers insulation, hydraulic balancing and boiler refurbishment. A building's heat supply may also be optimised by switching from central circulation systems to decentralised hot water supply and steam generation systems and by replacing inefficient system components (mainly in the context of conversion and renovation activities).

Heat recovery and innovative heat networks

Heat recovery enables capturing and utilising thermal energy (heat) that is generated as a byproduct in another process, for instance, to heat fresh air. A range of different technical systems are available for this purpose. In the healthcare sector, waste heat may be recovered from large medical devices, chillers, ventilation systems, server rooms or from wastewater using heat exchangers. With a view to making the best possible use of waste heat, it may be necessary to switch to a low-temperature heat supply system and to develop or connect to local (low-temperature, anergy) heat networks.

Optimising the lighting system

Although LEDs have by now become the standard in lighting, the building stock has not yet been fully switched to this form of lighting – which therefore needs to be promoted. Alongside replacing the lighting equipment, care must be taken to ensure provision of

demand-driven, efficient lighting control – either manually or automatically, as required – using sensors and learning systems.

Using electricity from renewable energy sources

Electrical energy that is generated 100 per cent from renewable sources is widely available on the market and offered by many energy suppliers. Meeting the Austrian "Ecolabel" criteria, the highest quality standard is offered by the company Ökostrom. Furthermore, many – mainly smaller – electricity companies supply electricity exclusively from renewable energy sources. More detailed information on the share of renewables and greenhouse gas emissions per kilowatt hour supplied broken down for each of the Austrian electricity companies is provided in the "Strom- und Gaskennzeichnungsbericht" (electricity and gas labelling report) prepared by E-Control Austria (Urbantschitsch/Haber 2022). A more recent option is to set up or join an energy community in which decentralised energy producers and consumers supply each other with the green electricity they generate themselves and set and agree their own prices. Green electricity from renewable sources can thus be easily procured, quickly implemented, andhas very low greenhouse gas emissions, although it generally involves additional costs.

Switching to district heating/cooling

Austria has numerous district heating networks that operate using renewable energy from biomass and are mostly located in smaller towns and municipalities. Where available and technically feasible, connecting healthcare facilities to district heating is a good option for replacing fossil-based thermal energy. In larger urban district heating grids, the share of renewables currently varies and depends on the demand for heat during the respective heating period. Nevertheless, the GHG emissions footprint of district heating is generally far better than that of fossil-fuelled in-house systems. In addition, district heating suppliers are required to increase the share of renewable energy sources on an ongoing basis. If district heating is available, switching is possible in the short to medium term, with a medium to high reduction of greenhouse gas emissions depending on the respective energy mix.

In-house generation from renewable energy sources

Establishing and expanding in-house power plants using renewable energy sources is not only an important contribution to climate protection and to Austria's energy system of the future but also strengthens healthcare facilities' security of supply and reduces cost pressure resulting from massive fluctuations in energy prices.

Costs for the necessary infrastructure, which have in some cases fallen sharply, combined with public subsidies, make decentralised generation and storage technologies not only affordable, but at the same time increasingly more cost-efficient than fossil fuels. From the national economy point of view, they furthermore generate a high level of added value in Austria. When procuring such systems, it is pivotal to also apply ecological criteria as it is essential to ensure sustainable raw material extraction (critical minerals), sustainable production, longevity, reparability and recycling at the end of their service life. From a technical point of view, such plants can be set up relatively quickly, although one needs to account for potential delays due to supply bottlenecks in global supply chains.

The following technologies can be used for autogeneration from renewable energy sources:

- Photovoltaics (PV): Photovoltaic power generation based on solar cells has been booming for several years now. Increasing to over 700 MW in 2021, PV power generation doubled compared to the previous year, which is mainly due to the sharp decrease in plant/system costs, combined with sometimes very high subsidies. With a certain time lag, this trend also applies to battery storage systems where massive demand from car manufacturers has significantly reduced prices. Electrification of mobility, electricity-based heating systems and digitalisation have entailed constantly increasing demand for as well as consumption of electricity (sector coupling). This also applies to healthcare facilities, where the yield from PV systems can generally be utilised in full. Hospital buildings, clinics and senior citizens' and care facilities often feature flat roofs, which generally lend themselves very well to the installation of PV systems. Solutions that are integrated in the façade further increase the yield and can be installed on new buildings and in the process of renovations. Furthermore, funding for the expansion of PV systems and storage facilities has been significantly increased (totalling 240 million euros in 2022). The Renewable Energy Expansion Act (Erneuerbaren-Ausbau-Gesetz, EAG) has simplified the legal framework for connecting renewable energy plants to the grid, thus supporting the accelerated expansion of PV at all healthcare facilities.

- Solar thermal energy: The direct use of solar heat has been pushed into the background by the photovoltaic boom, although it is technically mature, features comparatively high efficiency levels and can be easily combined with other technologies such as heat pumps and PV. As hospitals' have year-round high heating requirements, they are well suited for the use of solar heat generated by solar collectors, which can replace natural gas and heating oil. Currently, the Climate Fund (Klimafonds) funds up to 50 percent of the investment costs incurred for large-scale solar plants. As a preliminary stage, feasibility studies, whose outcome serves as a decision-making basis for an investment, are fully (up to 97,500 euros) funded by the state. This makes investments in solar thermal energy currently a financially attractive option.
- Ambient heat and near-surface geothermal energy: combined with internal waste heat, ambient heat from the ground, groundwater and ambient air, can be used by means of heat pumps to heat and cool buildings. In combination with green electricity and/or the PV system installed on the building, this facilitates a heating system that is powered entirely by renewable energy. This technology is particularly suitable for new buildings and extensions; in existing buildings the heating and cooling system may have to be modified. The installation of heat pumps in new buildings or as a replacement for existing fossil-fuelled heating systems is subsidised for businesses by the federal government, federal provinces and some cities.
- Wind energy: For efficiency reasons, wind turbines have become increasingly large over the last few years, which, however, means that they are currently unsuitable for installation on healthcare buildings or at healthcare facilities. This could change with the launch of innovative new small wind turbines, which are, however, still at the development stage. Electricity from wind energy can be used through direct participation in a wind farm or be sourced via an energy community.

Further options for action related to renewable sources of energy

- Switching to biogas for combined heat and power plants (CHP) owned by the healthcare facility
- Freecooling for cooling systems
- Using external sources of waste heat, for instance from nearby industrial operations
- Using renewable energy sources for emergency power generators (hydrogen, biogas, biofuels)
- Using biomass

Greening of outdoor areas

- Trees and shrubs:
  - Increasing the numbers of trees and shrubs using tree and shrub species that are well-adapted to both the location and climate change
  - Ensuring proper care of trees and shrubs
- Increasing the proportion of low-maintenance green areas that sequestrate CO_2 such as wildflower meadows; using plants that are well-adapted to the location and climate change
- Facade greening
- Green roofs
- Wall greening, greening of interior space

4.1.4 Recommendations for action – stakeholder process

As part of the stakeholder process initiated by the Health and Climate Competence Centre aimed at developing a Strategy for a Climate-Neutral Healthcare System, three workshops were held in which participants developed numerous recommendations for action on energy, buildings and green spaces. Table 2 provides an overview of the recommendations for action developed in the workshop on "Pharmaceuticals, medical devices, climate and resilience". Table 3 lists the recommendations for action that were developed on "Hospitals, climate and resilience" focusing on energy, buildings and green spaces (Schanes/Lichtenecker 2022). Table 4 provides a summary of the recommendations for action developed in the workshop on "Emergency medical services and climate protection" that placed a focus on transport and mobility.

Table 2: Overview of the recommendations for action developed in the workshop on "Pharmaceuticals, medical devices, climate and resilience" with respect to "energy"

Field	Action	Brief description
Production	**greening the energy sources used in production**	Using sustainable energy sources in production
Distribution and logistics	**using renewable energies**	Using renewable energies in delivery and storage

Source: GÖG/Austrian National Public Health Institute

Table 3: Overview of the recommendations for action developed in the workshop on "Hospitals, climate and resilience" with respect to "energy, buildings and green spaces"

Field	Action	Brief description
Energy, buildings, green spaces	**Optimising technical building equipment**	Making more energy-efficient use of and upgrading existing building equipment
	Optimising the net usable floor space	Increasing utilisation of existing floor space
	Designing and managing green spaces	Replacing lawns by planting green spaces with climate-friendly bushes, shrubs and trees

Source: GÖG/Austrian National Public Health Institute

Table 4: Overview of the recommendations for action developed in the workshop on "Emergency medical services and climate protection" with respect to "energy, buildings and green spaces"

Field	Action	Brief description
Energy, buildings, green spaces	**Focusing on preservation of green spaces in the context of new construction and refurbishment**	Measures such as construction on sealed surfaces, green roofs, green facades, and the creation of infiltration areas
	Climate-friendly heating and cooling	Installation of energy-friendly heating and cooling options
	E-charging infrastructure for employees	Setting-up e-charging stations for staff close to ambulance stations or accident & emergency departments at hospitals

Source: GÖG/Austrian National Public Health Institute

4.1.5 Good practice examples

Halving energy consumption through general refurbishment

The general refurbishment of the Schwaz District Hospital enabled energy consumption to be reduced by half, with 90 per cent of remaining consumption now being covered by

renewable energy. In total, this has led to a reduction in CO_2 emissions of 392 tonnes per year. This was achieved by implementing the following measures: conversion from gas to heat pump (previously approx. 3.15 MW, now approx. 1.2 MW); central heat recovery using outside air/exhaust air ("Konvekta" system), V = 60,000 m^3/h; construction of a new well system (total max. 60 l/s) by combining it with the existing well (pendulum/duplex system) for the multi-stage use of ambient energy and waste heat; renewal of the hot water preparation system by converting it to highly efficient low-temperature systems in compliance with all hygiene requirements (thermal disinfection); hydraulic balancing of the existing distribution systems, façade renovation; decommissioning of the central steam network; demand-driven air volumes; conversion to electric steam, installation of photovoltaic system on the roof (165 kWp) (model refurbishment, 2020).

Passive House standard in new hospital building

The newly built hospital Klinikum Frankfurt Höchst ("varisano" network) in Germany is a maximum care provider constructed to Passive House standards, making it the first hospital in the world to be awarded the Passive House certificate. Due to good thermal insulation installed in constructing the Klinikum Frankfurt Höchst building, it is possible to cover higher room temperatures with a lower energy requirement, thus saving 90 per cent of heating costs (Haßler et al. 2022; New Frankfurt Höchst Hospital building, 2023).

New hospital building meets "klimaaktiv Gold" building standard

The new Department of Psychiatry and Psychotherapy at Klagenfurt Hospital in Carinthia, Austria, was built to meet the "klimaaktiv Gold" building standard. Alongside energy efficiency, particular attention was paid to ease and comfort, and hence to patients' wellbeing in planning the new building. In the summer months, this is to be achieved through external shading, high storage masses and cooling ceilings. Further project optimisation measures during planning and construction included comprehensive building product management to achieve excellent indoor air quality. The ambitious planning efforts were honoured with the award of the klimaaktiv planning certificate in gold (klimaaktiv, 2019).

A hospital modernisation project involving a PV system, geothermal energy and a biodiversity garden

The Döbling Private Hospital in Vienna, Austria, is currently being comprehensively updated and retrofitted, with work due for completion by 2026. The centrepiece is a five-storey extension that is to be directly connected to the existing building and will meet the "klimaaktiv Gold" building standard. A photovoltaic system will be installed on the roof to generate additional electricity; geothermal energy will be utilised and the clinic's garden – a recreational oasis for patients – will be expanded to include a biodiversity garden. The hospital's flat roof and parts of the façade will be greened. The garage located in the extension will be equipped with charging stations for both e-vehicles and e-bikes (Döbling Private Hospital/Privatklink Döbling, 2023).

Doubling the share of renewable energy sources

The Styrian Hospital Association KAGes has succeeded in increasing the share of renewable energy sources from 23 per cent (2005) to 52 per cent (2019). This was achieved primarily by procuring 100 per cent renewable electrical energy since 2008. Other essential factors were the switch to organic district heating at six of its hospital locations, the conversion to decentralised electrical steam generation, the use of external waste heat sources and near-surface geothermal energy. The Hospital Association was thus able to reduce direct greenhouse gas emissions by 43 per cent, from 56,200 tonnes (2005) to 23,400 tonnes in 2019 (KAGes, 2020).

Three hospitals equipped with new photovoltaic systems

In line with the objectives laid down in the Vienna Climate Roadmap, the Vienna Hospital Association WiGeV has launched a photovoltaic expansion programme under which new systems were commissioned and put into operation at Floridsdorf Hospital (603 kWp), the Baumgarten nursing home (418 kWp) and the Liesing nursing home (345 kWp) (WiGeV 2021). Likewise, in accordance with the Climate Roadmap, WiGeV has published its own catalogue of criteria for renewable and sustainable construction.

Renewable energy supply

Photovoltaic systems (57 kWp) were installed on the provincial hospital in Hall and on the Tyrolean Province Nursing Hospital operated by Tirol Kliniken, the Tyrolian Hospital Association. Heat supply is ensured using a solar thermal system (336 m² of collector area). The district heating system is powered by biomass and heat consumption is optimised using a demand-based continuous hydraulically controlled heating system. A total of 95 per cent of the hospital's cooling requirement is covered by well water cooling from three wells. Electric vehicles are used for transport. Energy consumption is being reduced through a range of energy-saving activities being implemented on an ongoing basis (Tirol Kliniken, 2017).

Using geothermal energy for hospital extensions

A new wing added to the Göttlicher Heiland Hospital in Vienna operated by the Vinzenz Group is heated using exclusively geothermal energy. A total of 36 probes were drilled 200 metres deep into the ground. Using a brine-water heat pump, the soil's thermal energy is brought to temperature to ensure that the building is properly heated and cooled. Total thermal power amounts to 230 kW and total cooling power to 460 kW. The same system is used for the extension built at the St. Josef Hospital site in Vienna (SANTESIS Technisches Gebäudemanagement & Service GmbH, 2016).

Hospital garden designed close to nature

The gardens surrounding the Baden Province Hospital operated by the Health Agency of Lower Austria (NÖ Landesgesundheitsagentur) were awarded the "Nature in the Garden" plaque. During the new construction, individual elements and sculptures from the existing garden were restored and incorporated into the current landscape design. The natural garden around the hospital is a visible symbol of sustainable gardening and diverse, ecologically valuable, naturalistic garden design. Natural meadows, trees and a wide range of other plants contribute to fostering biodiversity, CO_2 sequestration and cooling (Landesklinikum Baden-Mödling, 2019).

Extensive tree planting

Around two thirds of the total site of the newly built Floridsdorf Hospital operated by the Vienna Health Association (Wiener Gesundheitsverbund) consist of landscaped outdoor areas. In total, some thousand trees were planted on the site and the outdoor area also boasts five therapy gardens (Wiener Gesundheitsverbund Klinik Floridsdorf, 2023).

Facades and green roofs

In the context of the "GREEN: cool & care" research project, the Tulln Nursing and Care Centre operated by the Provincial Health Agency of Lower Austria, implemented vertical greenery in the cafeteria's outdoor area, vertical indoor greenery in the central entrance area, a mobile green wall, a mobile room divider covered with plants, roof greening and raised garden planter boxes with trellis for climbing plants. As part of this project, to which several nursing and care centres operated by the Provincial Health Agency of Lower Austria contributed, the effect of plants on the ambient microclimate, air quality, comfort and acoustics was analysed and in cooperation with the University of Vienna positive and negative effects on residents investigated (Climate and Energy Fund 2023; Provincial Health Agency of Lower Austria, 2020).

4.2 Pharmaceuticals and medical devices

According to recent studies, the pharmaceutical industry is one of the largest industries in the world and is a sector that contributes to climate change (Belkhir/Elmeligi 2019). The production, use and disposal of medical goods also generate a significant environmental impact (Unger/Landis 2016). Due to the increasing social and economic relevance of the global medical supplies and pharmaceuticals market, its impact on the climate and environment as well as its products' sustainability is being recognised as relevant and significant by all stakeholder groups (customers, investors, employees, society, politics) (Milanesi et al. 2020). Against this background some companies have therefore already taken measures towards reducing their carbon footprint (Okereke 2021). Currently, however, only a few companies publish their direct and indirect greenhouse gas emissions and thus there remains a lack of data on emissions caused by pharmaceuticals and medical devices (Okereke 2021; Sousa et al. 2021).

4.2.1 Status quo

Pharmaceuticals

The pharmaceutical supply system is an area that is undergoing particularly dynamic development, with numerous new medicines being launched on the market every year.

In total, retail pharmaceutical expenditure (excluding medicines used during hospital treatment) in the EU amounted to some 190 billion euros in 2018 (OECD/European Union 2020).

In Austria, some 239 million packs of medicinal products with a total value of 5.7 billion euros were sold in 2022, around eight per cent of this total was sold to hospitals (institutional pharmacies) and around 92 per cent to pharmacies in the extramural sector. Although sales have remained relatively constant in recent years, turnover with pharmaceuticals has increased significantly.

The most commonly prescribed drugs according to the WHO's Anatomical Therapeutic Chemical (ATC) classification system are

- substances that affect the renin-angiotensin system (e.g. against high blood pressure),
- psychoanaleptics (to treat mental illnesses, such as depression) and
- substances that influence the lipid metabolism.

Almost 29 per cent of all drug prescriptions relate to these three indication groups that account for the highest number of prescriptions (Pharmig, 2023). A total of 11,588 prescription medicines and 5,096 non-prescription medicines were authorised on the Austrian pharmaceutical market in 2022.

Medical devices

According to the Medical Devices Regulation (EU), a medical device means “means any instrument, apparatus, appliance, software, implant, reagent, material or other article intended by the manufacturer to be used, alone or in combination, for human beings [...] (Medical Devices Regulation 2017). The definition also lists the specific medical purposes

(such as diagnosis, examination). The term medical device furthermore includes medical devices for in-vitro diagnostics, meaning “any medical device which is a reagent, reagent product, calibrator, control material, kit, instrument, apparatus, piece of equipment, software or system, whether used alone or in combination, intended by the manufacturer to be used in vitro for the examination of specimens, including blood and tissue donations, derived from the human body,” (Regulation on In Vitro Diagnostic Medical Devices, 2017).

According to estimations by the WHO, there are an estimated two million different kinds of medical devices on the world market, categorized into more than 700 generic devices groups (WHO 2023a). The term medical devices covers a wide range of items from simple needles, plasters, bandages, tongue depressors and bedpans to complex programmable pacemakers and closed-loop artificial pancreas systems.

The rising prevalence of chronic diseases is one of the key drivers of the medical devices market. In 2021, IVDs, cardiovascular devices, diagnostic imaging, orthopaedic and dental products accounted for the largest market share worldwide (Fortune Business Insights 2022). In 2017, the Austrian medical devices industry generated an annual gross value added of 2.6 billion euros, which corresponds to 0.79 per cent of Austria's total value added (Czypionka et al. 2019).

Procurement of pharmaceuticals in Austria

Public procurement of pharmaceuticals in Austria is organised in a decentralised manner. For the intramural sector, decisions are taken by the individual hospitals or hospital operators (Zimmermann et al. 2010). In the community-based sector, prices for pharmaceuticals are regulated by the Federation of Austrian Insurances (Reimbursement Code) and allocated to public pharmacies via pharmaceutical wholesalers. No information is available on the procurement of medical devices.

Austria has 264 hospitals. Of these, 42 have their own hospital pharmacy (Austrian Chamber of Pharmacists 2024). Hospitals that do not include a hospital pharmacy have set up pharmaceutical depots, which are supplied by hospital pharmacies or the 1,4266 public pharmacies.

In Austrian hospitals, the organisation of procurement processes is based on various models, and responsibility for sourcing pharmaceuticals lies either with specialised bodies or individuals:

- Purchasing departments or purchasing committees at the level of the hospital operators
- The head of hospital pharmacy services in individual hospitals (manages the hospital pharmacy or pharmaceutical depot)
- Joint sourcing by several hospital pharmacists for hospitals belonging to the same operator (such as the lead buyer system applied in Lower Austria) (Zimmermann et al. 2010).

In most cases, hospitals source pharmaceuticals directly from the manufacturers and negotiate the prices or procure based on a tender process. Although the number of tenders has increased, they are still rarely used by hospitals, as the administrative effort involved is quite high – the only exceptions being legal tender obligations or unsuccessful procurement negotiations (Zimmermann et al. 2010).

Generally, the hospital's procurement department or the hospital's head pharmacist source pharmaceuticals directly from the pharmaceutical companies. In the inpatient sector, purchasing via wholesalers plays a rather less important role.

Negotiations and the selection of suppliers are based on several criteria:

- Prices for similar, replacement or alternative products
- Medical and therapeutic benefit (based on scientific and evidence-based criteria)
- In-house demand for the pharmaceutical
- Economic considerations (such as discounts granted etc.) (Zimmermann et al. 2010)

In the context of the 2023 healthcare reform, an evaluation board (Bewertungboard) was established to standardise the procurement of medicines in the intramural sector between the individual hospitals and hospital operators.

Price is not necessarily the main award criterion; in the tendering process other award criteria may be considered, including promotion of small and medium-sized enterprises, regional producers, sustainability and innovation.

Sustainable and climate-friendly procurement of pharmaceuticals and medical devices is key to the Austrian healthcare system's climate neutrality. According to the EU Public Procurement Directive, contracts are to be awarded to the "most economically advantageous tender" (MEAT) (EU Public Procurement Directive, 2014). Alongside price, MEAT award criteria also include other aspects that may be relevant for procurement, such as environmental and social award criteria. Section 20 (5) of the 2018 Federal Procurement Act (Bundesvergabegesetz, BVergG) highlights that the environmental impact of service must also be considered (Federal Procurement Act, BvergG, 2018). This principle includes the consideration of ecological aspects (such as energy efficiency, material efficiency, waste and emission avoidance, soil protection) and animal welfare. However, it is still possible to make price the sole award criterion. In the context of procurement of pharmaceuticals and medical devices, consideration of environmental criteria is not yet a widely used criterion in Austria. However, in some – especially Scandinavian – countries, relevant pilot projects are currently being implemented (see Chapter 4.2.5).

In November 2020, a new pharmaceutical strategy for Europe was adopted, based on which the European Commission presented a proposal for a new directive and a new regulation aimed at revising the current, quite general, pharmaceutical legislation. In this respect, the EU attaches central importance to developing high-quality, safe, effective and environmentally sustainable medicines (European Commission 2020).

4.2.2 Climate relevance

On the path to a climate-neutral healthcare system, pharmaceuticals and medical devices play a major role in the healthcare facilities' sustainability management.

Overall, medical devices and pharmaceuticals account for around 38 per cent of the Austrian healthcare sector's carbon footprint. Of these, some 20 per cent are attributable to medical devices and pharmaceuticals dispensed in the outpatient sector, while 18 per cent are caused by pharmaceuticals and medical devices dispensed in hospitals and other healthcare facilities (Weisz et al. 2020).

Overall, it can be said that there is some room for improvement with respect to data on greenhouse gas emissions generated by the production, use and disposal of medical consumer products and pharmaceuticals. Under the HealthFootprint project, exemplary

calculations were performed using macroeconomic top-down and product-specific bottom-up data: the production of medical gloves used in hospitals, for instance, contributes more than 10,000 t CO_2 per year to greenhouse gas emissions (average value 2008- 2015) (Weisz et al. 2020). Direct emissions generated by greenhouse gas-active anaesthetic gases (nitrous oxide, des- and sevoflurane) declined in the period under review (2015: 21,000 t CO_2e), while those from metered dose aerosols inhalers doubled (2015: 26,000 t CO_2) and overtook emissions from anaesthetic gases in 2015 (Weisz et al. 2020).

Pharmaceuticals and medical devices emit greenhouse gases along their entire value chain – from research and development, to production, packaging, distribution and storage, dispensing to patients and disposal. Where and how many emissions are generated along the value chain varies depending on the medicinal products' active ingredients, excipients and formulation. In terms of environmental impact, pharmaceutical excipients used in medicinal products play just as important a role as the active ingredient itself (Wang et al. 2021). Therefore, pharmaceutical research and development also needs to consider the environmental impact of the various excipients. In the case of ibuprofen, for instance, the production phase accounts for the largest share of its environmental impact (Siegert et al. 2020). The environmental impact of ibuprofen tablet production is determined by the energy consumption at process level, in particular, the electrical energy used for drying (Wang et al. 2021). The CO_2 footprint of a "typical" active pharmaceutical ingredient amounts to 67.7 g CO_2e/g API, with emissions varying widely between different pharmaceuticals (Wernet et al. 2010).

The range of medical devices is as broad as the variety of pharmaceuticals and ranges from simple latex gloves and respiratory masks, which are produced and consumed in very large quantities, to highly complex medical instruments. Accordingly, information on medical devices' emission intensity and environmental friendliness is only available for a fraction of products. The greenhouse gas intensity of sterile surgical gloves made of latex, for instance, amounts to 0.078 kg CO_2 per pair (Jamal et al. 2021), and according to a study conducted by Ji et al. (2022), performing a COVID-19 PCR test generates greenhouse gas emissions of 0.613 kg CO_2e. A catheter for an electrophysiological examination accounts for 1.75 kg CO_2 (Schulte et al. 2021), while a magnetic resonance tomograph generates greenhouse gas emissions of 20 kg CO_2e per examination performed (Picano 2021).

The carbon footprint generated by pharmaceuticals and medical devices along the value chains is very complex and still not very transparent. Currently, there are just a few studies available on medical devices (Rodríguez et al. 2021; Schulte et al. 2021; Sousa et al. 2021) and pharmaceuticals that examine the impact of individual active ingredients in detail (e.g. McAlister et al. 2016; Sharma et al. 2020; Siegert et al. 2020). In the last few years, however, a growing number of related studies has been conducted resulting in an increasing level of knowledge about the environmental impact attributable to pharmaceuticals and medical devices. Complete life cycle assessments, which are based on a "cradle to grave" approach and evaluate pharmaceuticals' and medical devices' entire environmental performance are very helpful tools in comparing the effects caused at the individual stages along the value chain. Such assessment can be used to optimise use of materials and/or process design along the value chain, to avoid environmental impact shifts along the product's life cycle and to compare different products or alternative manufacturing processes (Sharma et al. 2020; Siegert et al. 2020). This approach enables identification of less environmentally harmful product alternatives.

4.2.3 Options for action

This chapter presents various approaches on the path towards more efficient and climate-friendly pharmaceuticals and medical devices, as there is still considerable potential for implementation that has not yet been tapped into. What is called for in this context is a combination of measures along the entire value chain aimed at pushing climate neutrality in both sectors. At the same time, the necessary legal framework must be developed, and the requirements of sustainability and environmental protection are to be established in a legally binding manner to ensure enhanced climate action in the pharmaceutical sector (Baltruks et al. 2023).

Further pivotal strategies on the path towards emission reduction are recycling and remanufacturing of medical devices and reduced waste generation. As these options for action are connected to the field of action "waste", they are dealt with in more detail in Chapter 4.3.3.

Reduced consumption of medicines

The most effective approach towards reducing the need for pharmaceuticals and medical devices is investing in disease prevention and health promotion. This enables preventing or delaying the onset of ill health and/or avoiding the impacts of disease and thus also costs and the necessity for greenhouse gas-intensive healthcare services (Nansai et al. 2020; Tennison et al. 2021). At the same time, the avoidance of inefficient medical treatment such as multiple examinations, incorrect referrals and/or admissions, overuse and misuse (of medicines) constitute important starting points for action (please see Chapter 3.3). Non-pharmacological intervention, i.e. doctors recommending a healthy lifestyle, offers great potential for reducing consumption of medicines. To date, however, prescribing a healthy lifestyle is an option doctors may only use in very exceptional cases (rehabilitation sports, nutritional counselling). If a person covered by health insurance wishes to attend healthy lifestyle courses (involving sports and relaxation, for instance) they have to do so on their own initiative and may – upon application – only get a small contribution to costs from their social insurance institution (Ostertag et al. 2021).

Introduction and mandatory consideration of sustainable procurement criteria

The Austrian Action Plan for Sustainable Procurement (Aktionsplan nachhaltige Beschaffung, naBe) was published to support public authorities in procuring sustainably. To this end, it defines specific requirements for 16 specified procurement groups (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2021a). All Austrian federal ministries, including downstream departments, and the Federal Procurement Agency (Bundesbeschaffung GmbH, BBG) are required to source in line with the Sustainable Procurement Action Plan. For all other contracting public authorities subject to the Federal Procurement Law (primarily the federal provinces, municipalities, public law organisations, contracting authorities responsible for a special sector), adherence to the Action Plan is recommended but not mandatory. Currently, the Sustainable Procurement Action Plan does not yet include criteria for the sustainable procurement of pharmaceuticals and medical devices.
Hence, efforts should be undertaken to define binding award criteria to be applied in related contracting procedures.

Environmental compatibility as criterion for authorisation

Currently, environmental compatibility does not play a role in the authorisation of medicinal products for human use. With a view to the links between chemicals and pharmaceuticals legislation, it becomes clear that their environmental impact needs to be included in the authorisation of medicinal products for human use and/or their active substances.

Climate friendliness as a criterion in discount agreements

One opportunity for introducing climate protection into discount agreements is revising the procurement law on discount agreements between health insurance institutions and pharmaceutical companies in such a way that alongside purely cost-efficiency-driven considerations, other award criteria – such as climate protection and environmental compatibility – be also considered. When awarding discount agreements, health insurance institutions may contractually agree with pharmaceutical manufacturers that more climate-friendly and/or environmentally benign pharmaceuticals at prices above the specified fixed amount are available at no additional cost to the insured.

Reshoring and nearshoring

With a view to ensuring security of supply in Europe and especially in Austria and to gain more room for manoeuvre with regard to production conditions (climate and environmental impact), it is recommended that production of medicinal products be promoted in Europe through targeted support mechanisms.

Labelling and information system

A standardised labelling and information system on the climate and environmental impact of pharmaceuticals and medical devices (in the form of a traffic light system, for instance) can contribute towards raising healthcare providers' and patients' awareness of climate relevance and environmental impact, and support selection and procurement of products based on environmental criteria.

Environmentally friendly manufacturing processes for pharmaceuticals and medical devices

By developing resource-efficient and climate-friendly manufacturing processes, manufacturers can contribute to reducing the environmental impact of the production of pharmaceuticals and medical devices. Alongside sustainable procurement processes applied along the entire value chain and conversion to renewable energy sources, optimisation of climate-impacting and energy-intensive heating, thermal insulation and cooling processes can reduce emissions during production.

More efficient logistics and transport processes also harbour potential for savings. Furthermore, placing a research and development focus on the substitution of environmentally harmful substances used in production can also make a significant contribution to climate protection along the value chain.

Climate-friendly anaesthetic gases and recycling of anaesthetic gases

Inhalation anaesthetics have a considerable greenhouse potential. With a view to climate protection, options to be considered in this respect are avoiding nitrous oxide and desflurane as far as possible and focusing in some surgical interventions on targeted numbing of individual body regions (regional anaesthesia procedures). Apart from choosing the optimal anaesthetics, low and minimal-flow techniques (low fresh gas consumption during anaesthesia) and recycling of anaesthetic gases play a key role.

Product life cycle design of medical devices

When seeking to reduce the carbon footprint, one needs to start at the product development design stage (Barbero et al. 2017). The concept of product life cycle design takes account of all stages along the value chain, including concept development, material selection, design and construction, manufacturing, packaging, transport, sale, use and disposal. Aspects such as service life, ease of repair, reusability and recyclability are already considered as part of product development (Kadamus 2008).

4.2.4 Recommendations for action – stakeholder process

In the stakeholder process aimed at developing a Strategy for a Climate-Neutral Healthcare System, initiated by the Health and Climate Competence Centre, recommendations for action on "pharmaceuticals and medical devices" were elaborated in cooperation with experts and stakeholders. Table 5 provides an overview of the recommendations for action derived from the "Pharmaceuticals, medical devices, climate and resilience" workshop. Table 6 lists all the recommendations for action developed with respect to the field of pharmaceuticals and medical devices in the "Hospitals, climate and resilience" workshop (Schanes/Lichtenecker 2022).

Table 5: Overview of the recommendations for action developed in the "Pharmaceuticals, medical devices, climate and resilience" workshop on the topic of pharmaceuticals and medical devices

Field	Action	Brief description
Cross-sectoral	**Sustainable procurement criteria**	Development of sustainable procurement criteria for purchasing
Research and Development	**Sustainable by design**	Firmly establishing environmental sustainability in product design
	From single use to reuse for medical devices	Mapping the opportunities for multiple rather than single use of medical devices
	Optimising clinical studies	Digitalisation and decentralisation of clinical trials to reduce emissions
Production	**Reshoring und Nearshoring**	Relocating production back to Austria and Europe
	Using greener energy sources in production	Using sustainable energy sources in production
	Circular systems	Creation of circular value chains
Distribution and logistics	**More efficient delivery**	Reduction of travelling distances in delivering pharmaceuticals and medical devices
	Optimisation of packaging sizes	Use of bulk goods in centralised dispensing and small packs when dispensing to patients (unit dose) to reduce packaging waste and pharmaceutical waste
	Using renewable energies	Use of renewable energy sources in delivery and storage

Field	Action	Brief description
Usage, preparation, processing and disposal	**Reprocessing of medical devices**	Re-processing of used medical devices (comparable to from single use to reuse for medical devices)
	Medication analysis (clinical pharmacy)	Increasing patient safety and reducing hospital stays by analysing and optimising all medicinal products patients take
	Optimal use of pharmaceuticals	Reduction of pharmaceutical waste through optimized processes in hospitals

Source: GÖG

Table 6: Overview of the recommendations for action developed in the "Hospitals, climate and resilience" workshop on the topic of pharmaceuticals and medical devices

Field	Action	Brief description
Pharmaceuticals and medical products	**Increased use of reusable products**	Multiple instead of single use of medical devices
	Recycling of disposable products	Recycling the components of disposable/single use products
	Needs-based supply using pharmaceuticals as an example	Needs-based prescription of medication to avoid over- and under-medication
	Environmental labelling of medical devices and pharmaceuticals	User-friendly labelling of pharmaceuticals and medical devices specifying their greenhouse gas emissions

Source: GÖG/Austrian National Public Health Institute

4.2.5 Good practice examples

The following section presents good practice examples relating to pharmaceuticals.

Firmly establishing environmental criteria in the procurement of pharmaceuticals

Some individual initiatives aimed at integrating sustainability criteria into tendering procedures have already been launched. One such initiative was taken by Amgros, a

Danish procurement agency, founded in 1990 to ensure Danish hospitals' supply with medicines at the best possible prices. Amgros is the central purchasing/procurement centre that sources and conducts price negotiations for medicines for inpatient use on behalf of the five Danish regions. Consequently, almost all (98%) pharmaceuticals used in public hospitals are procured through tenders organised by Amgros. In 2020, Amgros, in cooperation with the Nordic Pharmaceuticals Forum, launched the first national Danish tendering procedures in which, alongside price and quality, the focus was also placed on environmental criteria. In developing these environmental criteria for hospital procurement, Amgros also relied on experts from the Technical University of Denmark and engaged in dialogue with pharmaceutical suppliers. The environmental criteria defined range from environmental management to packaging and transport (Amgros, 2021).

In Norway, the Norwegian Hospital Procurement Trust included environmental criteria – which account for 30 per cent of the award criteria – into the procurement of antibiotics (Sykehusinnkjop 2019). Experience from Nordic tenders indicates that it is possible for suppliers to fulfil selected environmental criteria, as the number of bids submitted has not declined since the inclusion of environmental criteria (Vogler et al. 2022).

Recycling of anaesthetic gases

Villach Provincial Hospital was the first hospital in Austria to recycle anaesthetic gases. The anaesthetic gas patients inhale and subsequently exhale, is collected using a carbon filter, recycled and used to produce new anaesthetic gas. Staff were also trained to prevent the waste of anaesthetic gases (Austrian Broadcasting Corporation, ORF, 2022).

Development of site-specific strategies for a CO_2-neutral pharmaceutical industry in Austria

Under the "DekarbPharm" project concrete, site-specific strategies for decarbonising the pharmaceutical industry in Austria are being developed with a view to achieving CO_2 neutrality. The project started in July 2022 and will run until June 2024. PHARMIG, as the Association of the Austrian Pharmaceutical Industry, submitted the project, which is being implemented by the Austrian Institute of Technology (AIT). The industry partners involved are Takeda (with its production sites in Vienna and Orth), Pfizer (Orth), Boehringer-Ingelheim (Vienna) and Novartis/Sandoz (with its research, development and production

site in Kundl/Schaftenau). The project is financed with funding from the Austrian Research Promotion Agency (FFG) as well as financial and individual contributions provided by the project partners (Gerfertz-Schiefer 2022).

4.3 Waste and resources

Large quantities and different types of waste are generated within the healthcare system as a whole – and especially in hospitals. Only a small proportion of the waste generated in the healthcare sector is hazardous medical and non-medical waste that requires special collection and treatment. The largest share (excluding municipal waste) consists of medical waste which, according to Austrian Standard (ÖNORM) S 2104, may “only pose a risk of infection or injury within medical institutions", and includes dressings, swabs, cannulas, hypodermic needles, syringes or nappies. These are collected separately from other municipal waste (“residual waste”). All recoverable waste materials such as glass, paper, metal, plastics and biogenic waste are also collected separately.

Treatment and disposal of waste impact the climate and the environment. Most medical and mixed municipal waste is “thermally recovered” in waste incineration plants after having been removed. This generates usable heat and electricity, while at the same time generating substantial amounts of greenhouse gas emissions.

The primary goal of the circular economy is to reduce waste as much as possible – also in healthcare facilities. First and foremost, this means reducing the consumption of medical and non-medical goods based on a variety of measures and using products for as long as possible. If they are no longer usable and cannot be reused, they are to be subjected to material recycling and recycled as comprehensively as possible.

Major need for action has been identified with respect to both efficient use of resources in line with circular economy principles and proper as well as environmentally friendly disposal of any residual waste.

4.3.1 Status quo

The volume of waste generated in Austria is recorded on an ongoing basis and annual status reports provide an overview of the quantity, recycling and disposal of the various

types of waste generated in Austria. In 2021, for instance, the total amount of waste generated in Austria amounted to some 77 million tonnes. In the same year, the volume of waste from the medical sector (excluding municipal waste and used material) stood at 50,260 tonnes, having risen by 30 percent since 2015. The volume of medical waste increased by 23.7 per cent between 2015 and 2021, which is primarily due to improved separate collection of waste in medical facilities. Around 2.2 per cent of medical waste produced in hospitals and other healthcare facilities is infectious waste, which according to Austrian Standard (ÖNORM) S 2104 may "prove hazardous inside and outside medical institutions", because it contains, for instance, dangerous pathogens. Medical waste that "may only pose a risk of infection or injury within medical institutions", such as wound dressings, plaster casts, nappies and disposable items, hypodermic needles and scalpels (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2023a), account for the largest share. Table 7 provides an overview of waste generated by the medical sector.

The amount of municipal waste generated in the healthcare sector is not reported for Austria, nor is other hazardous waste or the collected quantities of used materials. Currently, relevant data is only available for individual facilities and organisations based on their environmental statements and reports. According to a meta-analysis of international studies, 67 per cent of the total waste generated in the health sector consists of general waste, which mainly contains food, paper, but also plastics (Singh et al. 2022).

Table 7: Waste generated by the medical sector in Austria (2019-2021)

Code no.	Waste designation	Volume [tonnes] 2019	Volume [tonnes] 2020	Volume [tonnes] 2021
97101	Waste which may prove hazardous inside and outside medical institutions, e.g. waste containing hazardous pathogens as per ÖNORM S 2104 – hazardous	890	1,070	1,100
97102	Disinfected waste, with the exception of hazardous waste	930	1,030	1,090
97103	Anatomical substances	60	50	50

Code no.	Waste designation	Volume [tonnes] 2019	Volume [tonnes] 2020	Volume [tonnes] 2021
97104	Waste that may only pose a risk of infection or injury within medical institutions, as per ÖNORM S 2104	43,960	42,420	46,510
97105	Hypodermic needles and other potentially injurious pointed or sharp objects such as lancets, scalpels and suchlike, as per ÖNORM S 2104	1,190	1,1170	1,470
97102 77 97103 77 97104 77 97105 77	diverse medical waste – dangerously	< 1	<1	40
Total		47,030	45,740	50,260

Source: Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (2023a)

In addition to the 50,260 tonnes of hazardous and non-hazardous medical waste generated in Austria, 6,260 tonnes were imported and treated in Austria in 2021. The medical waste listed in Table 7 (2021) was treated mainly thermally, 1,690 tonnes were exported. The medical waste listed is treated in nine different waste incineration plants in Austria (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022a). This means that thermal recovery is the most common method of disposal.

In Austria and Europe, the handling of waste is governed by comprehensive legislation. For every operating facility with more than 20 employees, companies are required to draw up a waste management concept that is to be updated at least every seven years. In the event of waste-relevant changes, the waste management concept must be adapted earlier, and companies with more than 100 employees are required to appoint a professionally qualified waste management officer. These regulations also apply to healthcare facilities.

Furthermore, companies that ship, transport, fill, pack, load or unload hazardous goods (with the exception of unloading at the final destination) in accordance with ADR, RID or ADN regulations are required to appoint one or more qualified persons who, with their consent, act as safety advisors for the transport of hazardous goods (hazardous goods safety advisors).

4.3.2 Climate relevance

In the context of the implementation of the National Energy and Climate Plan (NECP) (Federal Ministry for Sustainability and Tourism, 2019), the waste management sector has an important role to play, as it is one of the six sectors covered by the Climate Protection Act (Klimaschutzgesetz, KSG). In 2022, the waste management sector accounted for around three per cent of Austria's total greenhouse gas emissions (including greenhouse gas emissions from emissions trading in the energy and industrial sectors). Compared to 1990, emissions from the waste management sector decreased by 52.4 per cent (2.5 million tonnes of CO_2 equivalent) in 2022, although the volume of waste has increased. This decrease in emissions is attributable to sorting and separate collection of waste (e.g. biogenic waste, waste paper) and the introduction of the Landfill Ordinance (Deponieverordnung) (Federal Environment Agency, 2024c).

Currently, there is no scientific research available on the greenhouse gas emissions attributable to waste generated in the Austrian healthcare sector. A study by Health Care Without Harm on the healthcare sector's global footprint puts the proportion of emissions caused by waste at three per cent (Karliner 2019).

The carbon footprint of waste generated by the healthcare system depends on the one hand on its composition and on the other hand mostly on the disposal method used. A study on NHS waste disposal in the UK estimates that the carbon footprint per tonne of hospital waste is lowest when it is recycled (21-65 kg CO_2e), followed by low-temperature incineration using energy from waste (172-249 kg CO_2e) and highest when it is disposed of using high-temperature incineration (1074 kg CO_2e/t) (Rizan et al. 2021).

In Austria, thermal recovery is the most used method for treating medical waste, which means that the disposal method that generates the largest CO_2 footprint is still being applied and that valuable materials which might otherwise be used as secondary raw material are lost.

4.3.3 Options for action

With respect to waste, a wide range of diverse options for action aimed at reducing greenhouse gas emissions is available to healthcare facilities.

The various principles of the circular economy form a framework for the options for action with respect to waste (see also Figure 19)

According to the "waste hierarchy", set out in the Waste Framework Directive, the first priority is waste prevention (Refuse, Rethink, Reduce) (EU Waste Framework Directive, 2018), which includes all measures that prevent waste from being generated in the first place or at least reduce it. As everything that ends up as waste was previously purchased, waste prevention not only reduces the environmental impact, but also translates into lower procurement and disposal costs.

First and foremost, waste prevention means consuming less products and materials. The related options for optimisation depend on the various services' respective needs (medical, nursing, healthcare) with respect to processes, procedures and product quantities used, even including the type of products used.

Wherever possible, resource-saving reusable products are to be purchased, even if their cleaning, disinfection or sterilisation and transport might also have an environmental impact. Reusing well-functioning products for as long as possible is the second priority after waste avoidance (reuse). This is followed by the reconditioning, fixing and upgrading of components (repair, refurbishing). If this is no longer possible, parts from products that fulfil the same or new functions can be reused (remanufacture, repurpose).

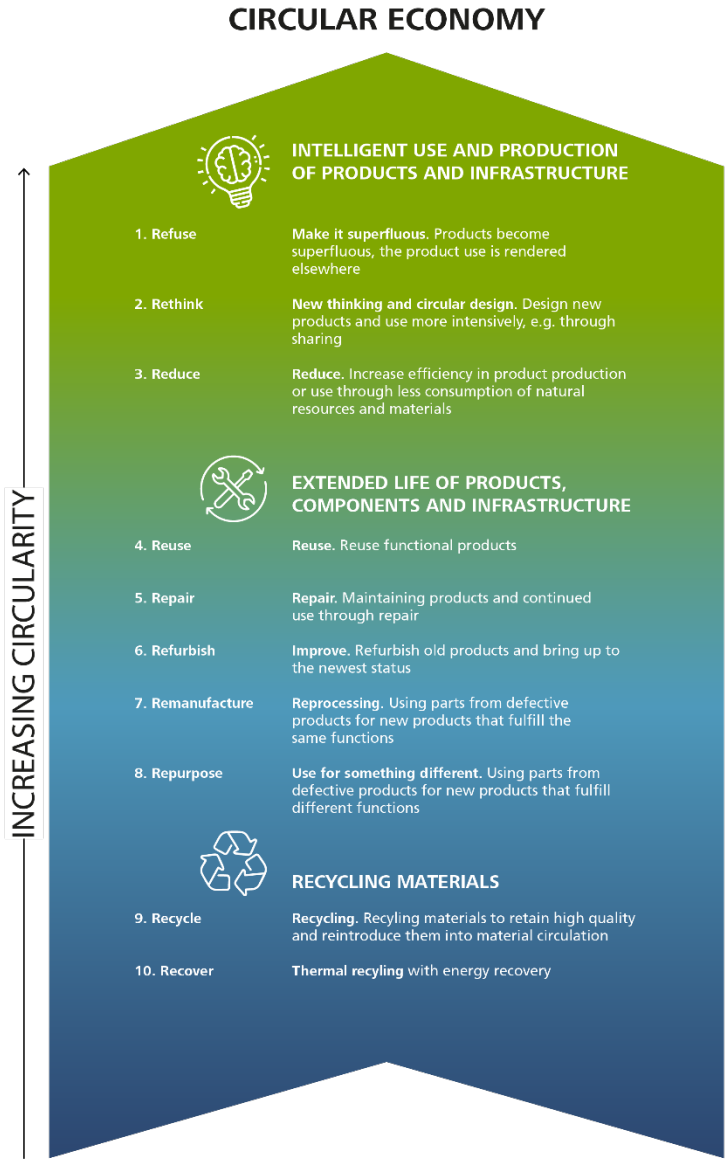
If products are no longer usable, the materials they contain must be recycled and returned to the material cycle as far as possible as secondary raw materials (recycle). Only then may the energy inherent in these materials be used (recover).

It is essential that all these options be considered as early on as at the product design stage to enable low-waste, efficient and long-lasting usage and recycling in the material cycle.

However, even in a circular economy, there can be no such thing as a completely closed system. Food and energy are inherently linear. The physical increase in entropy means that things will eventually become waste, even if they are used carefully. Therefore, there will be demand for new raw materials also in the future. In accordance with the Austrian Circular Economy Strategy, future demand for raw materials is to be covered primarily from secondary sources (recycling), followed by materials from sustainable renewable sources with only the remainder coming from non-renewable sources (Federal Ministry

for Climate Action, 2022b). These priorities must be enshrined in the procurement criteria for products of all kinds.

Figure 19: Circular economy principles in Austria (“R principles”)



Source: Federal Ministry for Climate Action (2022b)

An exemplary selection of options for action – especially regarding climate protection – in accordance with the principles outlined above is discussed in the following.

Transition to reusable products

In recent years, the use of reusable products has declined for various reasons, which is also due to the fact that especially manufacturers have greatly reduced the supply of such products. Healthcare facilities, however, have the power to reverse this trend by creating a corresponding demand. It is thus necessary to define requirements and adapt or create the respective internal and external processes and logistics structures accordingly. Where possible, medical facilities are to prioritise the use of reusable systems to reduce their waste volumes and extend products' life cycles by reusing them. This also applies in particular to packaging for products of all kinds that are regularly sourced and supplied, which can be converted to reusable systems in cooperation with suppliers.

Reuse and reprocessing of medical devices

An important action aimed at reducing the amount of waste generated is promoting the reuse of medical devices. In the context of direct reuse and reprocessing, products are cleaned after use, checked for function, disinfected, sterilised and made available for reuse. When reprocessing a medical device, a distinction is to be made between the reprocessing of reusable products and that of products that are labelled as disposable.

Reprocessing of reusable medical devices in hospitals or by external service providers has already become common practice. A trend that has been observed in recent years, however, is that reusable products tend to be increasingly replaced by disposable ones. Favourable prices for single-use products, strict hygiene requirements defined by authorities, some manufacturers' practices that make reuse difficult or impossible (for instance by using thermolabile materials) and the user-friendly single-use products that are easy to handle by medical staff are among the major obstacles to using reusable products (Ostertag et al. 2021). From a technical point of view, there are basically no major differences between reprocessing a medical device labelled as a single-use product and one that is labelled as reusable. While reusable devices may be reprocessed, reprocessors themselves become manufacturers when reprocessing single-use devices. Thus, the reprocessor shall assume responsibility for the reprocessed product's legal conformity and guarantee its safety and efficacy. Otherwise, reprocessing shall be prohibited (Austrian Economic Chamber Organisation, WKO, 2022). An alternative to direct reuse is refurbishment. This involves dismantling the used product into its individual parts, checking and cleaning the individual components and, if necessary, repairing or

replacing them. The product is then reassembled, tested, cleaned and sterilised in accordance with medical standards. As required, hardware and software components are updated. The outcome of a review shows that reusable medical devices have a lower environmental impact and higher economic benefits than single-use versions (Sousa et al. 2021).

A recently published study that compares refurbished cardiac catheters with newly manufactured ones showed that it was possible to reduce the carbon footprint by more than 50 per cent and resource consumption by more than 28 per cent through refurbishment (Schulte et al. 2021).

Nevertheless, it is indispensable to check which medical devices lend themselves to refurbishment and perform individual, case-by-case assessments. It is, of course, above all essential to focus on and guarantee patient and user safety.

The medical industry already makes wide use of refurbishing medical devices, and related processes are well-regulated and governed by international quality standard guidelines for refurbished medical devices (Kane et al. 2018). Three of the largest medical device manufacturers – Siemens (Ecoline), General Electric (GoldSeal) and Philips (Diamond Select) – have introduced return/take-back systems for their medical devices, set up specialised refurbishment facilities and sell their refurbished devices with a full warranty. Devices that are refurbished in this way include CT, MRI, ultrasound, mammography or X-ray devices that no longer correspond to the state of the art (Ostertag et al. 2021). Despite the many positive examples, large-scale refurbishment is, however, far from having been established in the medical sector.

Recycling of medical devices

In recycling, used products are treated (disassembled, shredded, separated based on materials) in a way that the materials they contain or are made up of (such as plastic, steel or other alloys) can subsequently be used to manufacture new products. Whether a product is suitable for this type of recycling depends largely on its components – some are more suitable for effective breakdown and recovery than others. The main factors limiting recycling are the difficulties associated with sorting the waste on the one hand and the risk of transmitting potential infections on the other (Joseph et al. 2021).

A major hurdle that needs to be overcome are the costs associated with recycling. It is pivotal to promote economically viable solutions for recycling medical devices and to create framework conditions that support recycling in the medical sector (Joseph et al. 2021). As set out in the waste hierarchy, products are only to be recycled when other preferred hierarchy solutions are not feasible, i.e. for instance for single-use products.

Reducing single-use linen and clothing items

Hospitals are faced with a huge amount of laundry that requires cleaning, which in turn requires a lot of energy, water and cleaning agents that pollute the wastewater. Reducing bed linen and clothing consumption as well as optimising laundry cleaning processes therefore play a very relevant role in mitigating detrimental effects on the climate and environment. Furthermore, there are still many disposable products such as disposable undersheets, disposable bibs, disposable aprons, disposable mattress protectors and plastic bags for collecting dirty laundry that end up as waste although they could be replaced with reusable products.

Reducing paper consumption and promoting digitalisation

Healthcare facilities, and especially hospitals, generate a lot of wastepaper. Digitalisation has progressed to varying degrees. Regulations in place for both in-house and external partners, often still require paper printouts. A comprehensive digitalisation strategy, including the introduction of digital patient files, and its consistent implementation would enable substantial reductions in paper consumption. The necessary prerequisites are secure data exchange, the provision of suitable hardware and the reorganisation of internal and external processes, including intensive training measures. Thanks to electronic patient records it would also be possible to avoid multiple examinations and the associated use of resources.

The consumption of paper and cardboard used for packaging could also be reduced by, for instance, switching to reusable or bulk packaging. Furthermore, well-known measures such as changing printers' default settings to double-page instead of single-page printing also contribute to reducing paper consumption.

Reducing pharmaceutical waste

Pharmaceutical waste is generated both in hospitals and in private households. By providing different pack sizes, both pharmaceutical waste and packaging waste can be reduced. Manufacturers are free to determine their products' expiry date, which is often well below their actual shelf life, especially for solid medicines. An important step towards avoiding pharmaceutical waste could be adjusting the expiry date to the actual shelf life and stability of the active ingredient (Ostertag et al. 2021).

Installing Waste Management Officers

In Austria, a professionally qualified waste management officer must be appointed in companies with more than 100 employees. The mandatory appointment of a waste management officer in smaller companies (for instance with 50 employees) could be an option for further optimising waste management in healthcare facilities.

Waste separation and waste volume reduction

The introduction of a standardised, structured and simple sorting concept in healthcare facilities will not only enable better sorting quality, thus promoting the separation of valuable materials, but will also result in higher recycling rates. There is considerable potential for further improving waste separation, especially in larger facilities, for example by introducing a labelled separation system in several languages including illustration with icons or a consistent colour coding system at hospital wards' reception desks and in public areas. This makes it easier for staff, patients and visitors to separate waste correctly.

The volume of waste generated has a direct impact on the collection intervals: the larger the volume, the more often the waste has to be collected. Every collection trip saved, saves greenhouse gases. Waste compactors contribute to reducing the volume of waste, which in turn reduces collection intervals. Healthcare facilities already use waste balers for cardboard and plastic packaging or can crushers for metal cans and plastic containers.

Raising staff's awareness

Rasing staff's awareness of the importance of waste management is key across all healthcare facilities. Alongside training seminars on the topics of waste separation and waste avoidance, information can also be shared via clearly visible posters or info flyer folders made available for free. Whenever a project is launched, it is essential to first reach out to employees, inform them and enter a dialogue. Involving staff is pivotal, as they have valuable expert knowledge on options for adapting framework conditions and implementing them in waste management. If hospitals use external companies for cleaning services, it is recommended that external cleaning staff also participate in the training sessions.

4.3.4 Recommendations for action – stakeholder process

During the stakeholder process aimed at developing a Strategy for a Climate-Neutral Healthcare System, initiated by the Health and Climate Competence Centre, recommendations for action relevant to the field of waste were developed in two workshops. Table 8 provides an overview of the recommendations for action developed in the "Pharmaceuticals, medical devices, climate and resilience" workshop. Table 9 lists all recommendations for action that were developed in the "Hospitals, climate and resilience" workshop with reference to the topic of waste (Schanes/Lichtenecker 2022).

Table 8: Overview of the recommendations for action developed in the "Pharmaceuticals, medical devices, climate and resilience" workshop on waste

Field	Action	Brief description
Use, preparation and disposal	**Reprocessing of medical devices**	Reprocessing of used medical devices
	Medication analysis (clinical pharmacy)	Increasing patient safety and reducing hospital stays by analysing and optimising all medicines a patient takes
	Optimal use of pharmaceuticals	Reduction of pharmaceutical waste through optimised processes in hospitals

Source: GÖG/Austrian National Public Health Institute

Table 9: Overview of the recommendations for action developed in the "Hospitals, climate and resilience" workshop on the topic of waste

Field	Action	Brief description
Pharmaceuticals and medical devices	**Enhanced use of reusable products**	Multiple instead of single use of medical devices
	Recycling disposable products	Recycling of disposable products' components

Source: GÖG

4.3.5 Good practice examples

Recycling of disposable instruments

In a pilot project, the Asklepios Hospital in Harburg, Germany is testing a digitallyassisted return/take-back system for recyclable endocutters and circular staplers in the operating theatre. After use, the instruments are disinfected in the operating theatre, collected separately and picked up regularly. Then they are sterilised, disassembled and recycled. The system is based on a cooperation between Ethicon, a company that belongs to the Johnson & Johnson Medical Devices Companies, Remondis, a German recycling company that specialises in the disposal of medical waste, and the recycling software start-up Resourcify. After use, most hospitals currently dispose of endocutters and circular staplers, which are then incinerated. This generates costs, CO_2 emissions and results in the loss of valuable raw materials. According to project partner Resourcify, the project has enabled a reduction in CO_2 emissions by around 2,500 kg annually at Harburg Hospital alone (Presseportal 2020).

A similar project was launched in Tirol Kliniken hospitals in cooperation with Johnson & Johnson. Here too, disposable products (such as endocutters) that are used for certain surgical interventions are being recycled. In total, some 80 per cent of the materials are recycled, which means that valuable raw materials which had been previously lost are now available for further use (Procurement department at Tirol Kliniken, 2021).

“Gloves are off” campaign

In 2018, the NHS launched the “Gloves are off” campaign in the UK. Guidelines were updated, training events were organised for several staff groups and resources developed in order to reduce the use of disposable gloves. Within a year, single-use glove consumption was reduced by 4.3 million, equalling 21 tonnes of waste. Acquisition costs were reduced by 100,000 pounds (approximately 120,655 euros) and disposal costs by 1,500 pounds per tonne (approximately 1,810 euros). These measures did not impact the incidence of infection but rather served to improve hand hygiene (HCWH, 2021).

4.4 Transport and mobility

After the energy and industry sectors, the transport sector is the second largest source of greenhouse gas emissions in Austria, with the highest share in transport sector emissions being attributable to road transport, and in particular car traffic (Environment Agency Austria/Umweltbundesamt, 2024c). This makes the transport sector a key area of action in terms of greenhouse gas reduction.

Measures implemented in the “transport & mobility” field of action also harbour great potential for promoting both climate protection and strengthening health (climate-relevant co-benefits[6] in the form of health promotion). Typical examples include changing from motorised private transport to active mobility (walking, cycling), which leads to a reduction in emissions, helps to improve health through exercising and reduces costs, as well as switching to e-mobility, which produces fewer emissions, mitigates air pollution and as a result reduces the incidence of respiratory diseases.

A key factor that distinguishes the healthcare sector from others is that security of supply and quality of care shall always be taken into account when implementing measures. Converting ambulance and patient transport services to e-mobility, for instance, is currently a critical issue in terms of security of supply, as in contrast to vehicles running on internal combustion engines, e-vehicles have shorter ranges and require longer idle times for their batteries to be recharged. Thanks to ongoing improvements and developments in

[6] Co-benefits are the positive effects a measure may have on other goals and objectives, thereby increasing the overall benefit for society (Workman et al. 2019).

battery technology, these disadvantages will gradually decrease within the foreseeable future.

It should also be noted that it is mainly people in poor health and with mobility issues who visit healthcare facilities. Therefore, accessibility plays a central role in providing mobility services.

The points highlighted above are to emphasise the particular challenges faced by the healthcare sector but in no way should they detract from the healthcare sector's urgent need for action in terms of mobility and transport.

There is great potential for savings in the fields of both staff and patient mobility as well as logistics and transport, which can be tapped into with measures that would be quite easy to implement.

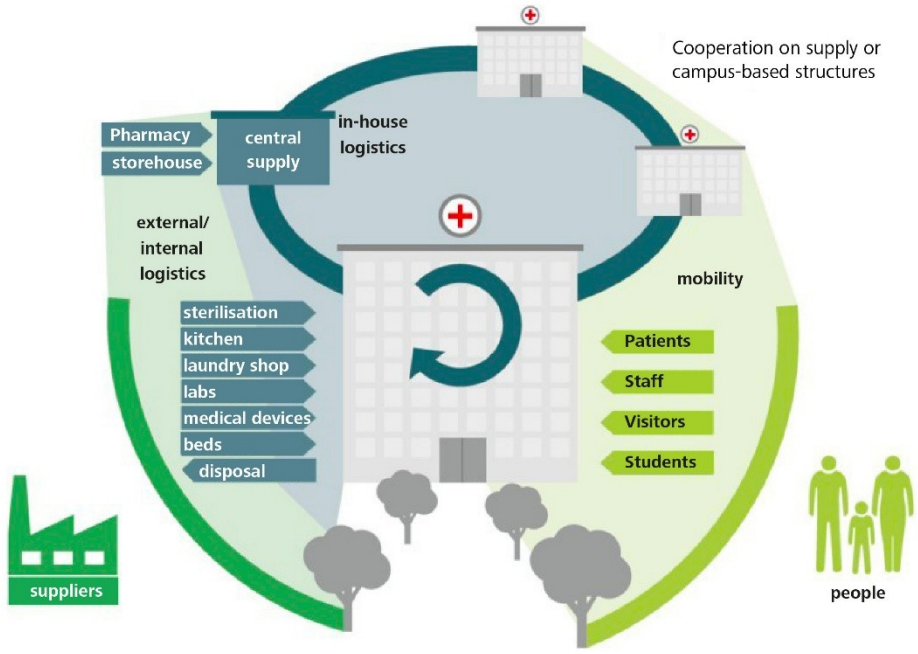
4.4.1 Status quo

The field of action "transport & mobility" in the healthcare sector can be roughly divided into (up to) three categories, depending on the type and size of the healthcare facility:

1. Induced mobility of employees, patients and visitors
2. External logistics, which includes the delivery of the products required and the disposal of any waste generated
3. Internal logistics, which serves to distribute goods within the healthcare facility.

Figure 20 below illustrates these mobility and logistics flows using a hospital as an example. There is a range of potential approaches towards emission reduction, depending on the respective area.

Figure 20: Mobility and logistics in hospitals



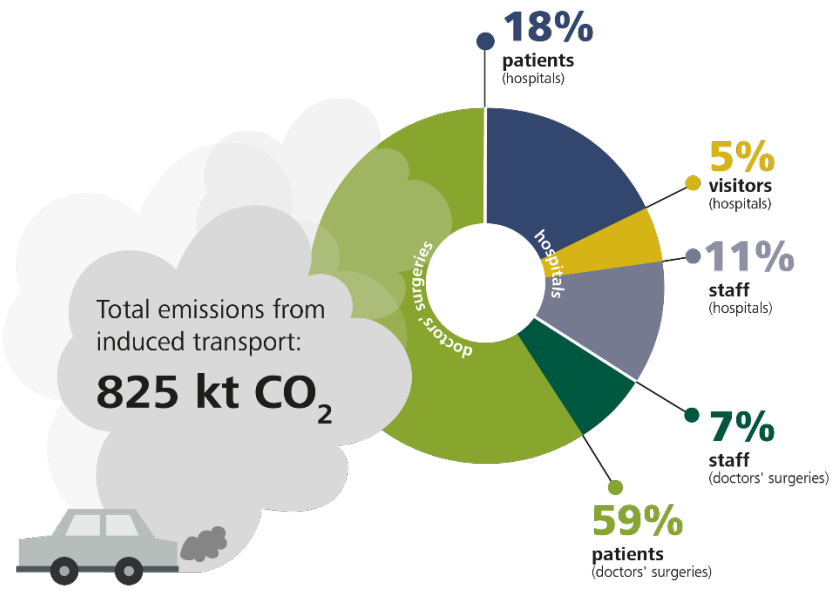
Source and illustration: Wibbeling et al. (2022)

Currently, there are no comprehensive statistics available on the traffic volumes generated within and by the healthcare sector. In 2015, patients treated in inpatient facilities covered some 1.6 million kilometres travelling to and from hospital, while the induced traffic volume generated in the outpatient sector amounted to some 3.2 billion kilometres (Weisz et al. 2020). No data is, however, available on the mileage covered by freight logistics in the medical sector.

4.4.2 Climate relevance

CO_2 emissions generated by passenger transport induced by the healthcare sector have been rising continuously since 2005 and in 2015, with an absolute value of 825 kt CO_2 (+15% compared to 2005), reached the same order of magnitude as the CO_2 emissions generated by the healthcare sector's entire energy consumption (Weisz et al. 2020). Such trips therefore represent an important starting point for emission reduction actions. The largest share of greenhouse gas emissions from healthcare-induced mobility, namely some 60 per cent, is attributable to patients seeing doctors in their practices – i.e. patient mobility necessary to travel to and from doctor's appointments, for example (see Figure 21).

Figure 21: Mobility induced by the Austrian healthcare sector



Source: Weisz et al. (2020); illustration: GÖG/Austrian National Public Health Institute

With respect to greenhouse gas emissions generated directly in the healthcare sector in the area of mobility, emergency medical and patient transport services play a particularly significant role.

No data on kilometres travelled or greenhouse gas emissions are available for internal and external goods logistics in the healthcare sector, so it is not possible to quantify the relevant effects. It may, however, be assumed that this area is also highly climate relevant.

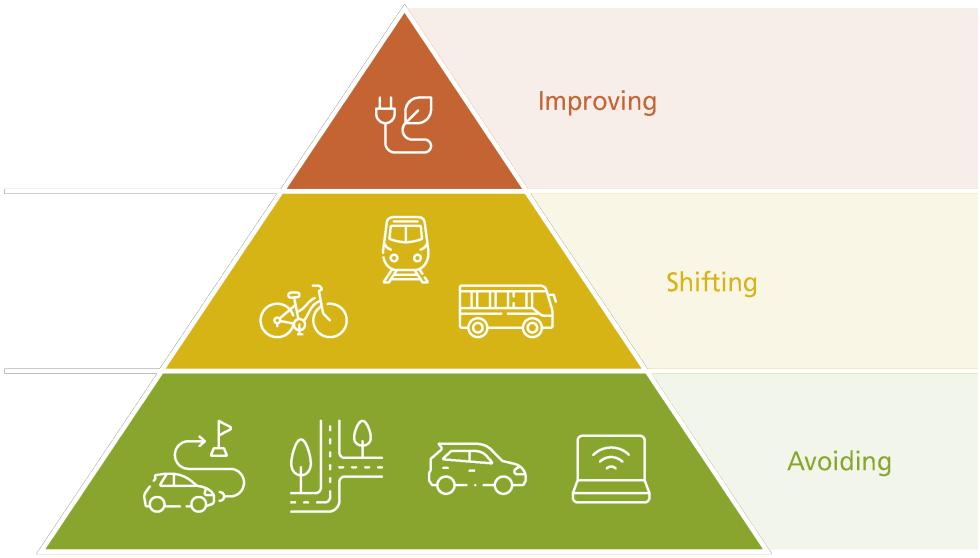
4.4.3 Options for action

Options for action aimed at reducing transport emissions in the healthcare sector must be guided by the overarching goal of climate neutrality in Austria by 2040. This goal implies reducing emission across all areas towards net zero. For the transport sector as the second largest contributor to greenhouse gas emissions, this goal is furthermore explicitly set out in the "Austria's 2030 Mobility Masterplan 2030a" (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2021b) and the respective trajectory (target pathway) defined.

As is the case for the transport sector in general, the goal of climate neutrality in the healthcare sector's field of mobility & transport is to be achieved through a transport transition ("avoiding", "shifting") and an energy transition in transport ("improve"). Based on these principles, the hierarchical target pyramid of climate-friendly mobility and climate-friendly transport shown in Figure 22 was developed and serves as guidance for prioritising options for action:

1. Avoidance
   Transport is most climate-friendly when it is avoided altogether. Options for avoiding transport include sustainable site planning, using of telemedicine services or carpooling and sourcing regional products thus benefiting from short haulage distances.
2. Modal shift
   Transport that cannot be avoided is to be shifted to climate-friendly means of transport (bicycle, bus, train etc.).
3. Improvement
   Remaining transport is to be organised in a better and more efficient manner. This involves switching from fossil fuels to sustainable drive technologies.

Figure 22: Target pyramid for climate-friendly mobility



Source and illustration: Federal Ministry for Climate Action (2021b)

A number of options that could contribute to emission reduction with a view to reaching the above goals have been identified for both the Austrian healthcare sector and for individual healthcare facilities. A brief selection of climate protection actions in the categories “avoiding, shifting and improving” is presented and discussed in the following.

Avoiding

Expansion of telemedicine services

The expansion of digital healthcare services offers huge potential for emission reduction. Even when emissions caused by the necessary technical infrastructure are compared with emissions not generated, as the respective distance was not travelled, online consultations with doctors result in an emission reduction by a factor of 40 to 70 compared to on-site consultations (Holmner et al. 2014).

With a view to tapping into this potential, it is essential to consider the following action areas:

- Maintaining the practice of sickness notification and medication prescription by telephone, introduced during the COVID-19 pandemic,
- Expanding and raising people’s awareness of the importance of the “1450 health hotline” for initial contact to clarify whether an intervention is necessary,
- Expanding the service of online consultation hours offered by general practitioners and specialists
- Expanding telemonitoring services, which enables monitoring and automatic transmission of important vital parameters (for instance blood pressure, blood sugar, heart rate etc.).

Bundling medical services in one location

By bundling various medical services (general practitioners as the first point of contact, specialists, therapy services, pharmacies etc.) in one location – as is already being implemented in the context of the expansion of the primary care unit system – it is possible to avoid numerous trips undertaken by patients, while at the same time

increasing quality of care. It is, however, essential to ensure that this bundling of services does not lead to the dismantling of decentralised medical care in rural areas – which could even translate into increased transport volumes if patients have to travel to the nearest conurbation whenever they need to access medical services.

Shifting

Improving local public transport connections at existing locations

Shifting staff and patient mobility from motorised individual transport to public transport can only succeed if healthcare facilities are well connected to the public transport network.

This includes the creation of dedicated stops (i.e. on site), the adjustment of operating times and journey intervals (if possible increased frequency) to the opening hours of the healthcare facilities and the use of barrier-free vehicles only.

Public transport connections as a criterion for the choice of location

Similar to the improvement of public transport connections to existing healthcare facilities, the quality of public transport connections is to be used as a mandatory decision-making criterion for choosing the location of new healthcare facilities.

Making active mobility more attractive

Measures aimed at making active mobility more attractive for employees may include improvements to the cycling infrastructure, for instance by providing covered, well-lit and secure cycle parking spaces or rental bikes, but also by creating (attractive) incentive systems such as competitions on “cycled kilometres per ward” or giving employees a grant towards the cost of buying a bike. What is also important for visitors are both traffic-related and structural measures to increase road safety along routes in the surroundings of healthcare facilities, for instance, by raising certain sections of the road level (like extended speed bumps), introducing 30 km/h zones, safe pedestrian crossings or ensuring

that traffic light phases are sufficiently long. This is particularly important for people with limited mobility.

Making public transport more attractive for employees

Possible measures aimed at making public transport more attractive primarily include incentive systems, in particular making available public transport tickets at reduced cost ("Job Ticket") or contributing a share of the costs of a "climate ticket" travel pass, if staff use public transport for commuting to work or for business trips, or introducing changes to company guidelines for business trips (for instance by promoting usage of "night train instead of plane").

Use of (e-)cargo bikes for (small) transports (on the facilities' premises)

Another option is the acquisition of (electric) cargo bikes for transporting smaller loads, for instance on the premises of healthcare facilities. E-cargo bikes can also be used by pharmacies to deliver pharmaceuticals.

Improvement

Converting the vehicle fleet to climate-friendly drive technologies

The acquisition of vehicles powered by climate-friendly drive technologies for healthcare facilities' own fleets and the development of the necessary infrastructure (charging stations etc.) are important levers. Specialised vehicles (emergency and ambulance vehicles, refrigerated vehicles etc.) should be converted or at least the feasibility of such a switch (from the security of supply point of view) considered.

Choosing logistics partners based on sustainability criteria

Making climate-friendly transport an award criterion when choosing logistics partners or in procurement is another important area for action.

4.4.4 Recommendations for action – stakeholder process

In the context of the stakeholder process aimed at developing a Strategy for a Climate-Neutral Healthcare System, initiated by the Health and Climate Competence Centre, recommendations for action related to "transport & mobility" were developed in three workshops. Table 10 provides an overview of the recommendations for action developed in the "Pharmaceuticals, medical devices, climate and resilience" workshop. Table 11 lists the recommendations for action developed in the "Hospitals, climate and resilience" workshop in relation to the topic of transport & mobility (Schanes/Lichtenecker 2022). Table 12 provides a summary overview of the recommendations developed in the "Emergency medical services and climate protection" workshop regarding transport and mobility.

Table 10: Overview of the recommendations for action developed in the "Pharmaceuticals, medical devices, climate and resilience" workshop relating to "transport & mobility"

Field	Action	Brief description
Distribution and logistics	**More efficient delivery**	Reduction of travelling distances in delivering pharmaceuticals and medical devices
	Optimisation of packaging sizes	Use of bulk goods for centralised supply and small packs when dispensed to patients (unit dose) to reduce both packaging waste and pharmaceutical waste
	Use of renewable energies	Use of renewable energies in the delivery and storage of pharmaceuticals and medical products

Source: GÖG/Austrian National Public Health Institute

Table 11: Overview of the recommendations for action developed in the "Hospitals, climate and resilience" workshop relating to "transport & mobility"

Field	Action	Brief description
Mobility	**Holistic mobility concept**	Development of a holistic mobility concept that includes both employee and patient transport

Source: GÖG/Austrian National Public Health Institute

Table 12: Overview of the recommendations for action developed in the "Emergency medical services and climate protection" workshop relating to "transport & mobility"

Field	Action	Brief description
Transport and mobility	**Fleet conversion to e-mobility**	Purchase of e-vehicles and expansion of the charging infrastructure
	Route optimisation in patient transport	Route optimisation and reduction of patient transport journeys through better patient flow management

Source: GÖG/Austrian National Public Health Institute

4.4.5 Good practice examples

Job tickets, e-vehicles and company bikes for Styrian hospitals

With around 18,000 employees, 920,000 outpatients and 270,000 inpatients, KAGes (the Styrian Hospital Association) is a key contributor to transport volumes in Styria. In order to mitigate its climate impacts, KAGes has already implemented a range of transport emission reduction measures under its "PROKlima+" climate and energy strategy (KAGes, 2020). According to the Styrian Hospital Association, this enabled emissions of 1,800 tonnes of CO_2 per year to be avoided. However, the measure that boasts the greatest savings effect is the provision of public transport tickets at reduced costs ("Job Ticket") – an offer, which has already been taken up by some 3,000 KAGes employees. Other measures implemented include e-vehicles for the fleet, the installation of charging stations at 14 locations and the purchase of around 200 company bicycles. The extension of tram line 7 to LKH Graz (University Hospital Graz), supported by KAGes and implemented by the City of Graz, has also made a significant contribution to improving public transport connections and thus creating climate-friendly travel options.

Seeking to further reduce its CO_2 footprint in the field of mobility, KAGes has set itself additional targets, going beyond those implemented today. These goals that are to be achieved by 2025 include developing a mobility management concept and establishing a mobility coordinator at each site, a zero-emission vehicle fleet, reducing the emissions generated on hospital premises by installing a climate-friendly freight transport logistics system, raising the share of employees who commute to work either by public transport,

by bike, using carpooling or on foot by five per cent, and a ten per cent increase in the share of climate-friendly modes used by patients and employees for trips to hospital.

Electrification of the UK health system's vehicle fleet

The National Health Service (NHS), responsible for public healthcare facilities in the UK, is regarded a pioneer in climate protection in healthcare. Under its climate strategy "Delivering a 'Net Zero' National Health Service" (NHS, 2020), emissions from transport and mobility were quantified in detail and actions and targets for achieving climate neutrality were specified. In this respect, the NHS, which also includes ambulance and patient transport services, placed an emphasis on electrification of its vehicle fleet seeking to effect the transition of its entire vehicle fleet to "low or zero emission" vehicles by 2028. Under this strategy, the NHS is also developing and testing the world's first hydrogen-powered ambulance vehicle for its suitability. With respect to transport of pharmaceuticals, medical devices and supplies, the NHS also placed a focus on innovative and climate-friendly alternatives: for transport of some items to the remote Isle of Wight it uses electric drones, in Oxford medicines are delivered by bicycle courier and in Newcastle cargo bikes are increasingly being used for transport.

4.5 Food system

In meeting its mandate to promote prevention and recovery, every care facility, nursing home and hospital in Austria is to be a role model on health-promoting and sustainable nutrition. Greenhouse gas emissions are generated to varying degrees during the production, processing, transport, consumption and disposal of food. In this respect, it needs to be stressed that a plant-based diet, high in fibre and fresh food is beneficial to health (Rocha et al. 2019) and has the least impact on the environment (González-García et al. 2018).

A healthy, health-promoting, and sustainable diet is key to preventing illness and contributes to supporting patients' recovery process. Adequate nutrition can therefore contribute to avoiding hospitalisation and/or shorten the length of hospital stays and thus towards reducing the volume of services required. Fewer services used in hospitals inter alia lead to fewer medicines required, less hospitalisation-related patient travel, and thus to lower greenhouse gas emissions.

Furthermore, the food system is a central field of action in the context of workplace health promotion, as high-quality food contributes essentially to healthcare facilities' staff wellbeing, positively impacting their motivation and energy levels (Wanjek 2005).

4.5.1 Status quo

Every year, the 264 hospitals in Austria with their around 60,700 beds handle some 2.24 million inpatient stays, with the majority of patients being provided with some or all meals (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2023). Furthermore, catering services at healthcare facilities are also used by facilities' staff during working hours. Some hospitals have their own kitchens, while others are supplied by external kitchens (e.g. cook and chill). A fact that also determines the respective facilities' options for influencing and organising in-house catering services as well as the procurement of food, which hospital operators often source centrally for all their facilities.

Decision-making on catering systems and menu design is influenced by a wide range of factors. A key role is played in this respect by the individual facility's economic conditions. Large public facilities, for instance have a budget of some 3.55 euros for five meals per day per person in their care (Gruber/Holler 2017). In addition to nutritional and physiological requirements, qualitative specifications (e.g. fulfilment of organic quotas) and the expectations of residents and patients must also be met.

Another influencing factor are dietary and nutritional requirements. In institutional care facilities, dieticians and/or kitchen managers are generally responsible for planning patients' menus. In hospitals as well as in residential and care facilities, a range of different nutritional requirements must be taken into account, i.e. usually different types of diets.

There is limited data available on current food procurement practices and approaches in Austrian healthcare facilities. According to a study prepared by Bio Austria, an average of at least 30 per cent of organic products are used in Austrian communal catering (Gruber/Holler 2017). The study does, however, not include any specific data on healthcare facilities. The Styrian Health Fund (Gesundheitsfonds Steiermark) has published its own minimum standards for catering provided to senior citizens. An evaluation study on the degree of these standards' fulfilment conducted in 2017 showed that care and nursing facilities prefer local and regional products, but do not place a specific focus on

sourcing fair trade or organic food (Fuchs-Neuhold et al. 2018). Concrete figures and analyses are, however, not available.

Due to tight budgets and cost constraints, procurement of healthy and sustainable food is quite an issue for healthcare facilities and related difficulties call for creativity in menu design. However, when it comes to planning meals and menus in healthcare facilities there is a lack of concrete and binding specifications as well as quality standards for health-promoting and climate-friendly food procurement.

As a rule, catering systems consume different levels of energy. In the context of the SUKI (Sustainable Kitchen) study, six communal catering facilities took part in a joint Austrian-Czech project (Daxbeck et al. 2011). Energy consumption and corresponding CO_2 emissions generated by the preparation of average meals in commercial kitchens were analysed, and the CO_2 emissions calculated per meal averaged 2.08 kg (fluctuation range between 1.36 and 2.77 kg CO_2 emissions). In calculating these values, heat and cold generation, ventilation and lighting were considered.

Sample calculations from the commercial canteen kitchen at the Otto Wagner Hospital in Vienna show that this kitchen's energy consumption structure is broken down as follows:

- 39 per cent room space heating
- 24 per cent cooking and serving meals
- 20 per cent ventilation
- 17 per cent others (such as washing dishes, lighting)

A more detailed analysis of energy consumption in the catering sector of Austrian healthcare facilities is currently not available and the topic is also not properly addressed in current quality standards.

The amount of avoidable food waste produced in Austrian hospitals ranges at between 15,000 and 25,000 tonnes every year. According to an analysis conducted by the University of Natural Resources and Life Sciences in Vienna in collaboration with the "United Against Waste" initiative, the average loss rate[7] generated by commercial kitchens stands at some 22 per cent while the loss rate in the restaurant sector, for example, amounts to 14 per cent (Hrad et al. 2016). A considerable overproduction of

[7] As the ratio of food served to food returned.

soups and starchy side dishes was recorded in commercial/canteen kitchens, which were either not served or returned. Often only entire menus may be ordered rather than individual courses, or a lot of food is ordered just to be on the safe side and is often automatically recorded in the IT system (Hrad et al. 2016).

4.5.2 Climate relevance

In Austria, the agricultural sector accounts for around 10.8 per cent of national greenhouse gas emissions (Anderl et al. 2022). This, however, only relates to production without taking into consideration the food system's other dimensions. Overall, the food system contributes around 20 to 30 per cent to Austria's greenhouse gas emissions (de Schutter et al. 2015).

If food consumption is adjusted to a healthy level, it would be possible to reduce greenhouse gas emissions by 20 per cent, with a vegetarian diet by around 48 per cent and with a vegan diet by around 70 per cent (Schlatzer/Lindenthal 2020).

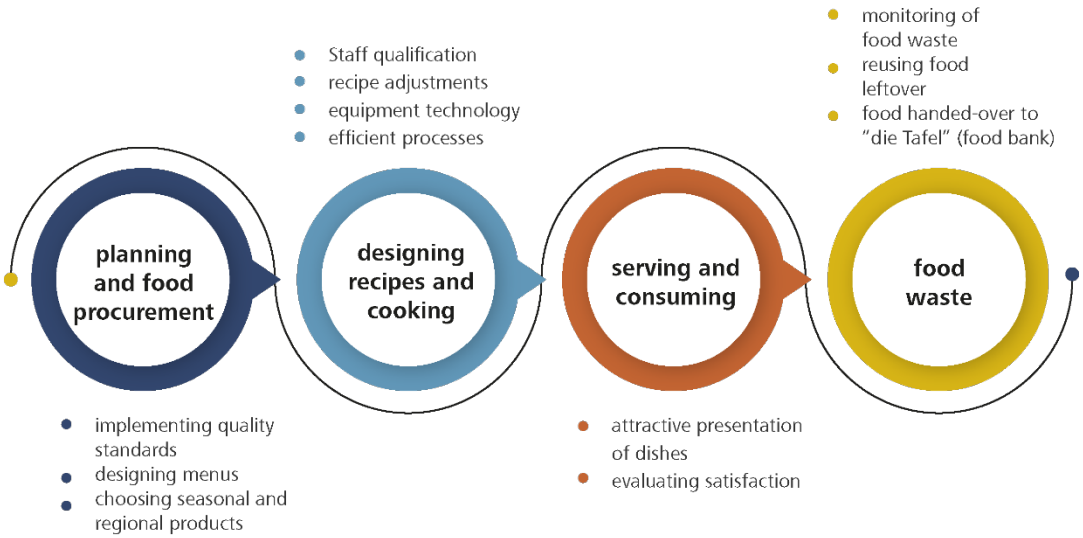
In Austria, the healthcare sector accounts for 6.7 per cent of national greenhouse gas emissions, of which 32 per cent are attributable to hospitals. Of these, some two to three per cent are from "food and catering". Note should be taken of the fact that hospitals often outsource carbon-intensive non-medical services such as laundry, waste management and catering services, and hence this area's contribution may be underestimated (Weisz et al. 2020).

A recent calculation of the potentially underestimated contribution from "food and catering", conducted for 33 hospitals in Switzerland, shows that a share of 17 per cent of greenhouse gas emissions are attributable to this field (Keller et al. 2021).

An Austria-wide survey conducted in 2018 showed that 63 per cent of CO_2 emissions in commercial kitchens are a result of the food used. This includes the energy necessary to produce, trade and process food. The use of regional and seasonal food can reduce CO_2 emissions by up to 50 per cent, and by sourcing organic food up to 40 per cent (Daxbeck et al. 2013). Further exemplary calculations show that it is possible to cut down on greenhouse emissions by one quarter per serving by changing recipes, inter alia by replacing beef with spelt, for example (Speck et al. 2022).

4.5.3 Options for action

Figure 23: Options for action along the climate-relevant process chain in community catering



Source and illustration: GÖG/ Austrian National Public Health Institute

Climate-friendly menu planning and food procurement

Harmonised standards prove helpful in the planning and provision of health-promoting, therapeutic and climate-friendly meals. In 2020, the German Nutrition Society (Deutsche Gesellschaft für Ernährung, DGE) published the first guidelines for catering in hospitals, which cover health promotion aspects for employees, the health of patients as well as sustainability aspects (German Nutrition Society, 2020).

Mandatory implementation of sustainable procurement criteria

The most effective way to reduce nutrition-related greenhouse gas emissions is to reduce the consumption of animal-based foods, especially meat from ruminants. In order to further avoid greenhouse gas emissions, preference should be given to organic food and

account should be taken of seasonality and regionality[8] aspects. The most sustainable diet is plant-based, organic, seasonal and local, and precisely in that order (Hünninghaus Kristin et al. 2022). As the combination of regionality and seasonality is beneficial for the climate footprint, coupling these two aspects is essential (Reinhardt et al. 2020).

These aspects are also recommended in the Austrian Action Plan for Sustainable Procurement (naBe Action Plan) and should be considered as far as possible when procuring food in healthcare facilities. Other core criteria in the naBe Action Plan include, for instance, increasing the minimum proportion of organically produced food to 55 per cent by 2030 and consideration of high animal welfare standards when procuring food of animal origin (Federal Ministry for Climate Action, 2021a).

An important supporting step towards promoting climate protection and sustainability to be taken by healthcare facilities is mandatory implementation of the naBe Action Plan. In this context it should be noted that the planning of such a step must always take into consideration the facility's economic possibilities, its level of adaptation as well as security of supply in Austria.

In addition, it would make sense to expand cooperation in procurement between community catering facilities and regional organic or sustainable agricultural producers, for instance by promoting local/regional organic farms (Alliance of Sustainable Universities in Austria, 2021).

Increasing the share of organic products

Communal catering facilities are under severe economic pressure, which is often cited as an argument against increasing the share of organic food. The findings generated by a related study have, however, shown that it is possible to increase the share of organic food in a commercial canteen kitchen to 30 per cent by reducing the amount of meat by 20 to 30 grammes and using seasonal fruit and vegetables without incurring significantly higher costs (Holler 2001). Note should be taken of the fact that this calculation dates

[8] The term regionality refers to geographical proximity. There is no standardised, universally valid definition for this term. The basic principle is: the closer, the better.

from 2001 and would have to be reassessed in the light of price developments seen in recent years.

Health-promoting and climate-friendly meal option management

Innovative meal options can motivate people to make health-promoting and climate-friendly food choices. Canteens in healthcare facilities can also contribute to increasing acceptance of certain foods and drinks by making small changes to the presentation of dishes. In this respect, the following options for action can be implemented:

- Instead of using the traditional approach to meal options management i.e. meal option 1, “home-style cooking”, and meal option 2, “light & healthy cuisine”, it is recommended that customers be encouraged to break with their usual routines by alternating vegetarian dishes with purely plant-based dishes and dishes containing meat.
- Giving dishes attractive names
- When positioning dishes on a buffet, for instance, care can be taken to ensure that vegetarian and purely plant-based dishes are placed at the beginning of the buffet. Particularly attractive, appealing presentation (for instance nice tableware) emphasises the dishes’ attractiveness.
- By obtaining feedback from customers when serving food, the offer can be adapted and further developed, which can significantly increase both acceptance of and satisfaction with the food on offer.

Introduction to plant-based recipe design

A key lever in reducing greenhouse gas emissions and promoting health is adapting existing, popular recipes by increasing the share of plant-based ingredients and/or introducing plant-based recipes. This measure essentially focuses on the nutritional competence, including cooking skills, of kitchen staff. In this context, establishing and expanding training as well as further education on the topic of sustainable and health-promoting nutrition for specialised chefs are considered necessary measures.

Optimising energy efficiency in kitchens

The following options for action in the fields of cooking, baking, refrigerating and dishwashing contribute to conserving energy and thus to reducing greenhouse gas emissions:

- Using efficient cooling, refrigeration and cooking appliances and dishwashers
- Storing items correctly in cooling appliances (e.g. refrigerators)
- Avoiding energy losses during cooking
- Energy-efficient baking
- Rinsing dishes before putting them into the dishwasher
- Regular descaling

Reduction of food waste

The following options for action contribute to avoiding food waste:

- Enabling consumers to select individual dishes or components instead of having to choose between full menu options
- Enabling consumers to actively select serving sizes
- Restricting automatic repeat orders and reducing the volume of food ordered “just to be on the safe side”
- Regular training on the meal ordering system
- Further development of the meal ordering process to enable daily (ideally IT-based) meal orders

4.5.4 Recommendations for action – stakeholder process

In the context of the stakeholder process initiated by the Health and Climate Competence Centre aimed at developing a Strategy for a Climate-Neutral Healthcare System, recommendations for action were developed on “food/nutrition” in cooperation with stakeholders and experts. Table 13 lists all recommendations for action developed in the “Hospitals, climate and resilience” workshop on the topic of “nutrition/the food system” (Schanes/Lichtenecker 2022).

Table 13: Overview of the recommendations for action developed in the "Hospitals, climate and resilience" workshop on the topic of "nutrition/the food system"

Field	Action	Brief description
Nutrition/ Food system	**Promote plant-based food**	Promotion of vegetarian and plant-based diets in hospitals
	Reduce food waste	Reduction of food waste in hospitals
	regional, seasonal, organic	Increasing procurement of regional, seasonal and organically grown food

Source: GÖG/Austrian National Public Health Institute

4.5.5 Good practice examples

Quality standards for communal catering

In 2022, the Federal Ministry of Social Affairs, Health, Care and Consumer Protection published quality standards for communal catering focusing on various target groups. Alongside standards for company/communal catering and catering in kindergartens, the ministry also developed nutritional standards for catering in residential and care facilities for senior citizens. The target group, these standards focus on, is all those who are in one way or other involved in catering. Self-evaluation based on checklists enables identification of areas with potential for improvement and supports implementation. In addition to background information, instructions for implementing related measures are provided (Roller-Wirnsberger/Lampl 2022). With a view to promoting further development and roll-out, it would be beneficial to implement such standards in other healthcare facilities. Mandatory implementation of related documents, developed in cooperation with experts, would represent another positive step in this direction.

Monitoring food waste

Another good practice example is the "Moneytor" project launched by the United Against Waste initiative, under which a tool was developed that enables canteen kitchens and caterers to continuously monitor their own food waste and identify areas with major potential for savings. The model also lends itself to benchmarking and comparison with

other institutions. Support in implementing reduction measures is provided to participating kitchens. Of the 159 institutions currently taking part in the project, a total of 44 are hospitals and 33 are care homes (United Against Waste 2018).

5 Framework Conditions for Transformation

Designing framework conditions that enable a climate-friendly and healthy life is key to avoiding greenhouse gas emissions. Compiled by 80 renowned scientists from a wide range of disciplines, reviewed by more than 180 experts and accompanied by an extensive stakeholder process, the APCC Special Report “Structures for climate-friendly living” was presented in November 2022 (APCC 2023). The starting point of the analysis is that it is currently difficult to lead a climate-friendly life in Austria. What is therefore required are structures that enable and promote such climate-friendly living. In this context structures are defined as framework conditions and circumstances for daily life, including, for instance, spatial planning and the tax system. All in all, climate-friendly living requires a fundamental and far-reaching transformation that includes the deconstruction of structures that are detrimental to the climate and developing climate-friendly structures. The goal pursued under the Strategy for a Climate-Neutral Healthcare System is to define central framework conditions specifically for the healthcare system. This analysis places a particular focus on the following areas: governance, monitoring, strategic and legal framework conditions, funding, research and innovation, awareness-raising and communication as well as digitalisation.

5.1 Governance

5.1.1 Status quo

Successful implementation of the Strategy for a Climate-Neutral Healthcare System requires appropriate governance structures and processes that encompass the central areas, relevant stakeholders and players at the various levels.

Other key factors include interdisciplinary cooperation among all relevant stakeholders and government ministries, while further promoting networking between organisations and associations (such as the Austrian Network of Health-Promoting Hospitals and Healthcare Institutions (ONGKG), the Austrian Federation of Hospital Engineering (ÖVKT),

the Austrian Forum on Waste and Environmental Management (Österreichisches Abfall- und Umweltforum), and the Austrian Association of Green Hospitals).

5.1.2 Options for action

Responsibility for the Strategy and its implementation should rest with the Federal Ministry of Social Affairs, Health, Care and Consumer Protection in close coordination with the Federal Ministry for Climate Action, other relevant federal government departments, the social insurance institutions and the province governments. At this level, a steering group is to be set up and tasked with monitoring the Strategy's implementation.

Another essential prerequisite for integrating and firmly establishing the topic of "climate" in the healthcare sector is the focused and comprehensive development of skills and competencies within the relevant departments and institutions on this topic of vital importance to our future. In this connection it would make sense to establish a Climate, Environment and Health Department or a corresponding staff unit at the Federal Ministry of Social Affairs, Health, Care and Consumer Protection.[9]

With a view to supporting, monitoring and accompanying this transformation and the implementation of the Strategy, a platform for climate and health equipped with a clear political mandate could be established and involve the Federal Government, the federal provinces, municipalities, social insurance institutions, insurance providers, NPOs and other important players in the healthcare system.

With respect to implementation of the Strategy for a Climate-Neutral Healthcare System, the Competence Centre Climate and Health at the National Public Health Institute could take on the role of national coordination, competence and support centre on behalf of the Federal Ministry of Social Affairs, Health, Care and Consumer Protection.

[9] In Germany, the organisational unit "Division 622 – Environmental Health Protection, Climate and Health" is established at the in the Federal Ministry of Health – in terms of ministries' organisational structure, divisions in Germany are comparable to the departments in the Austrian ministries.

A monitoring system that is fit for purpose is to be developed and implemented as an important tool for governance that covers both the Strategy as a whole and the individual actors, fields of action and framework conditions.

In the medium term, efforts are to be undertaken to ensure the firm legal and structural establishment of environmental and climate protection obligations for healthcare facilities and their coupling to financing and funding systems.

The necessary groundwork for successful implementation of the Strategy for a Climate-Neutral Healthcare System is to be prepared based on the following measures:

- Defining the organisational structures, processes and procedures for strategy management and control
- Establishing the “Climate and Health” steering group composed of the following members: competent departments at the Federal Ministry for Social Affairs, Health Care and Consumer Protection, at the Federal Ministry of Climate Action, as well as at other affected departments, at the Austrian National Public Health Institute, the Federation of Social Insurances and representatives of the federal provinces
- Establishing a Climate, Environment and Health Department or a corresponding staff unit at the Federal Ministry for Social Affairs, Health Care and Consumer Protection that is to assume the necessary coordination and control functions
- Development, specification and implementation of the “Platform for Climate and Health”
- All relevant organisations, disciplines and stakeholders commit to the “Zukunftspakt Klima und Gesundheit” (Climate and Health Pact for the Future")
- Developing the roadmap for a “Climate-Neutral Healthcare Sector”
- Involving healthcare system representatives, employees, and patients (including young people, young adults, vulnerable groups) in the process of specifying the measures and their implementation as well as in the Strategy’s further development
- Involving the relevant economic players in the preparation of a roadmap
- Establishing a digital platform to inform the population at large and to promote and encourage wider involvement
- Building on the Health Footprint Study, the process for analysing the healthcare sector’s climate footprint is to be updated and expanded, both top-down for the entire sector and bottom-up by looking more specifically into individual products, services and the associated supply chains

- Developing a system to monitor the actions taken in the respective fields and preparing an annual progress report
- For key greenhouse gas emission contributors, such as pharmaceuticals, medical devices and hospitals, a cross-sectoral working group is to be set up to support Strategy implementation in these areas
- Launching a process aimed at firmly establishing and strengthening the areas of health promotion, prevention, reduction of inappropriate treatment and oversupply
- Health impact assessment and HTA (Health Technology Assessment) are to be expanded to include aspects of climate action and environmental protection

5.2 Monitoring

Consistent monitoring is key to reviewing the level of action implementation and target achievement which requires development of suitable indicators. Monitoring can be aimed at the entire healthcare sector's footprint or focus on individual healthcare facilities.

5.2.1 Status quo

5.2.1.1 Availability of data on individual healthcare facilities/service providers

Another important source of data is individual healthcare facilities'/service providers' emission and consumption data, which can be used to calculate greenhouse gas emissions as they

1. enable identification of emission-reducing actions and targeted climate protection activities at individual facilities' level and
2. can be used for extrapolations to assess the (combined) impact of all healthcare facilities across Austria.

The fact, however, is that due to a lack of legal requirement, data availability varies greatly between healthcare facilities. While some healthcare providers have their own environmental or climate strategy, including carbon footprint information, or boast an

EMAS certification[10] including a publicly available environmental statement complete with consumption data, there is no information available for other hospitals or, in particular, for doctors' surgeries and pharmacies.

Hospitals and nursing and care facilities

Within the Austrian hospital sector, the Styrian Hospital Association (Steiermärkische Krankenanstaltengesellschaft, KAGes) plays a pioneering role in climate protection and emission data reporting. Under the "KAGes Climate and Energy Strategy PROKlima+" (KAGes, 2020) and the "KAGes Environmental and Climate Protection Report" (KAGes, 2019), total emissions for all KAGes activities (incl. Scope 3 emissions) totalling 200 kt CO_2 and 23.5 kt direct greenhouse gas emissions (Scope 1 and 2) were reported for 2020. Furthermore, the reported figures also include numerous consumption data and climate protection targets the Association has set itself.

Healthcare facilities certified under the Eco-Management and Audit Scheme (EMAS), such as those operated by the Carinthian Hospital Operating Association (Kärntner Landeskrankenanstalten-Betriebsgesellschaft, KABEG) or the Barmherzige Brüder Group, must prepare an annual environmental protection declaration in which they report their emissions from energy consumption (Scope 1 and 2) alongside various other consumption data. In this respect, relational indicators such as CO_2 emission by bed occupancy day, per gross floor area and/or performance-based hospital financing points[11] are of particular interest, as these enable direct comparison with other healthcare facilities. In this context it should be noted that EMAS-certified hospitals have already implemented many energy consumption-reducing and efficiency-increasing measures, and consequently their emission footprint is significantly smaller than that of other facilities that have not yet launched climate protection efforts. Furthermore, the EMAS environmental statement

[10] EMAS stands for "Eco-Management and Audit Scheme" and is a voluntary environmental management system that is open for participation to companies and organisations located in EU Member States. (https://www.umweltbundesamt.at/umweltthemen/umweltmanagement/emas)

[11] Performance-based financing" (PBF) in hospitals is a system for billing inpatient hospital costs on the basis of standardised points for inpatient hospital stays (https://www.sozialministerium.at/Themen/Gesundheit/Gesundheitssystem/Krankenanstalten/LKF-Modell-2022.html)

also includes consumption of refrigerants, some of which have a high greenhouse gas impact[12] , and (specifically for the inpatient medical sector) of anaesthetic gases[13].

Emergency medical services and patient transport

There is only very little data available on emergency medical services and transport of patients. Most service providers in this sector do not report any primary data on greenhouse gas emissions and energy consumption. However, many of the large emergency medical service and patient transport organisations publish the number of kilometres travelled by their respective vehicle fleets in annual reports or similar publications. Using vehicle-specific average consumption data and corresponding emission factors, it is possible to make a rough estimate of the greenhouse gas emissions caused in the course of emergency and patient transport services provided by the four largest Austrian emergency organisations (Red Cross, Workers' Samaritan Federation, the St. John Accident Assistance/Johanniter and the Emergency Medical Services of the City of Vienna/Wiener Berufsrettung), which ranges at around 43 kt CO_2e[14]. It is, however, not possible to record all other types of emissions from ambulance and patient transport services on the basis of this data. Detailed calculations concerning emissions data are only available for the Red Cross; dating from 2019, they were prepared for an unpublished feasibility analysis on CO_2 offsetting. Based on this analysis, the Austrian Red Cross had a total footprint (Scope 1-3) of 48.5 kt CO_2 in 2019. Broken down by scope level, 69 per cent of emissions are attributable to direct energy consumption (Scope 1), four per cent to purchased energy (Scope 2) and 27 per cent were generated in the upstream and downstream value chains (Scope 3).

[12] 1 kg of the refrigerant R507, for instance, generates almost 4000 kg of CO_2e (Environment Agency Austria/Umweltbundesamt 2022b).

[13] 1 litre of the anaesthetic gas desflurane, for instance, causes around 2500 kg of CO_2e (Andersen et al. 2012).

[14] The estimate is based on the figures published in the respective emergency medical services organisations' annual reports on the kilometres travelled in performing emergency and patient transport services. These were then multiplied by the emission factors per kilometre for light commercial vehicles published by the Environment Agency Austria.

Doctors' surgeries, primary care units and pharmacies

Currently, no primary data on greenhouse gas emissions is available for doctors' surgeries, primary care units and pharmacies. According to Weisz et al. 2020, it is, however, possible to make a gross estimate of the energy consumption and the resulting emissions (Scope 1 and 2) based on the average consumption of private households, although such an estimate is subject to great uncertainty.

5.2.1.2 Data availability for pharmaceuticals and medical devices/processes

Pharmaceuticals, medical devices and medical treatment processes account for 37.6 per cent of the Austrian healthcare sector's total CO_2 footprint (Weisz et al. 2020) and therefore represent a central starting point for improving the Austrian healthcare system's carbon footprint. Knowledge concerning the individual products' and processes' emission is essential to enable identification of climate-friendly alternatives and reduction of the respective area's footprint.

Emissions from individual pharmaceuticals, medical devices and processes are calculated based on life cycle assessments (LCA) and/or simplified climate assessments (which only determine the environmental impact of global warming and do not consider other environmental impact factors) (see Chapter 5).

Preparing life cycle analyses is, however, very complex, expensive and time-consuming. Owing to this fact – and due to the high number and heterogeneity of pharmaceuticals and medical devices/processes – greenhouse gas emissions estimates are only available for a few of the pharmaceuticals, medical devices and treatment processes used. The platform HealthcareLCA that went online at the end of 2022[15], provides a database that contains the emissions information for 1,400 pharmaceuticals, medical products and processes.

Table 14 lists the greenhouse gas emissions of a selection of pharmaceuticals, medical devices and treatment procedures.

[15] https://healthcarelca.com

Table 14: Emissions from selected pharmaceuticals, medical devices and processes

Product/Process	Reference unit	kg CO_2e	Source
Pharmaceuticals			
Paracetamol	gAPI1	0.0078	Weisz et al. (2020)
Acetylsalicylic acid ("Aspirin")	gAPI1	0.0049	Weisz et al. (2020)
Ibuprofen	gAPI1	0.0031	Weisz et al. (2020)
Naproxen	gAPI1	0.0023	Weisz et al. (2020)
Amoxicillin (antibiotic)	gAPI1	0.0143	Weisz et al. (2020)
Morphine	gAPI1	0.0020	McAlister et al. (2016)
Disposable gloves			
Disposable latex glove	g of material	0.0033	Weisz et al. (2020)
Nitrile disposable glove	g of material	0.0117	Weisz et al. (2020)
Anaesthetic gases			
Nitrous oxide N2O	Kg	300	Andersen et al. (2012)
Isoflurane	Kg	510	Andersen et al. (2012)
Sevoflurane	Kg	130	Andersen et al. (2012)
Desflurane	Kg	2540	Andersen et al. (2012)
Imaging diagnostics			
X-ray (breast)	examination	0.5–0.8	McAlister et al. (2022)
Ultrasound	examination	1	Picano (2021)
Computed tomography (CT)	examination	6 9.2	Picano (2021) McAlister et al. (2022)
Magnetic resonance tomography (MRI)	Untersuchung	20 17.5	Picano (2021) McAlister et al. (2022)
Miscellaneous			
COVID-19 mRNA vaccination	Vaccination dose	0.01-0.2	Kurzweil et al. (2021)
GHG-containing metered dose inhalers	Application	0.02-0.47	Jeswani/Azapagic (2019)

1 gAPI stands for "gram of active pharmaceutical ingredient" and thus refers to 1 g of the active ingredient.

Illustration: GÖG/Austrian National Public Health Institute

5.2.1.3 Concepts and methods used for determining the GHG footprint

Preparing greenhouse gas emissions protocols is a complex endeavour. A range of concepts and methods may be employed depending on the level of analysis required and the type of data available. The following sections provide an overview of the most important concepts and calculation methods for quantifying greenhouse gas emissions generated by the Austrian healthcare system.

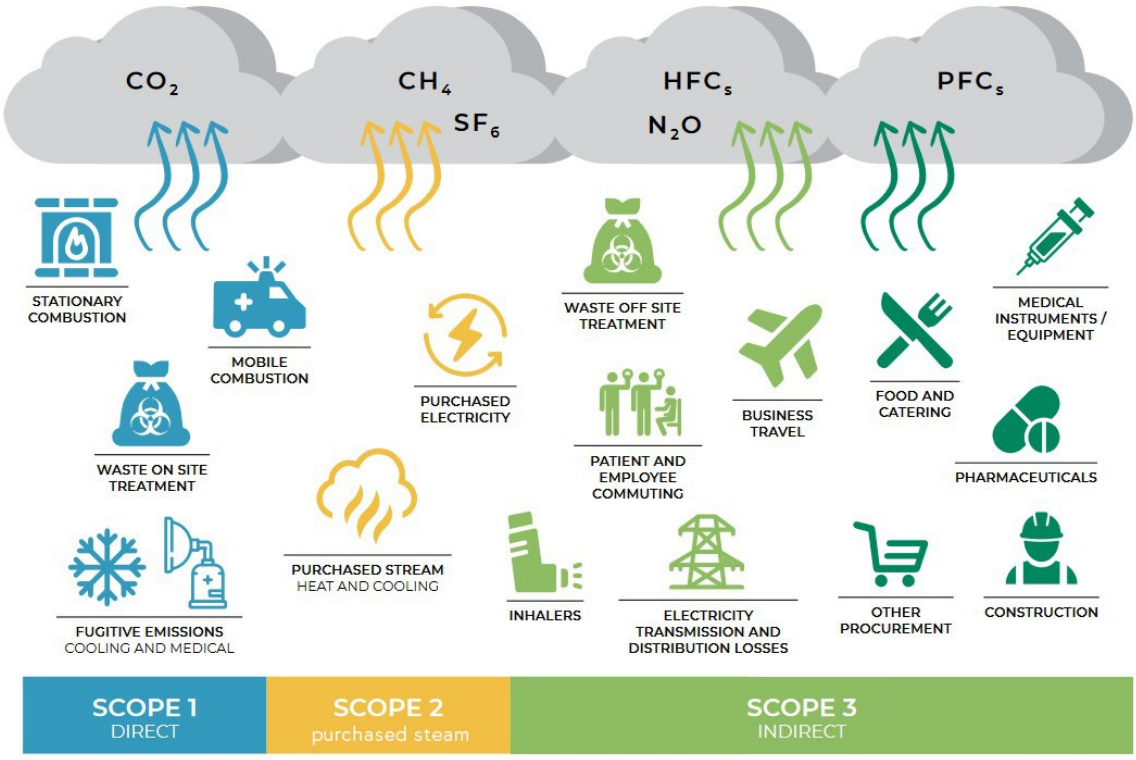
Greenhouse Gas Protocols based on Scope levels

The GHG Protocol Corporate Standard (WBCSD/WRI 2004), the standardised protocol developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), has become the established system for preparing greenhouse gas protocols at company level. Under this approach, emissions are categorised into three Scopes (see Figure 24):

- Scope 1 summarises those emissions that arise directly at the healthcare facility. This includes, for instance, burning fossil fuels to generate heat (e.g. gas or oil heating systems), emissions generated by the company's own vehicle fleet (e.g. travel by ambulance vehicles, transport of patients) and fugitive emissions (e.g. anaesthetic gases escaping into the atmosphere). These direct emissions are owned by or under the healthcare facility’s direct control.
- Scope 2 includes emissions caused by energy purchased (such as electricity, district heating, district cooling). Although these are physically generated outside the healthcare facility, they are included in the greenhouse gas protocol as they are attributable to energy required by the healthcare facility.
- Scope 3 includes all indirect emissions that occur along the value chain of a healthcare facility. Upstream indirect emissions are, for example, all emissions resulting from the production and transport of purchased products (such as pharmaceuticals, medical devices, food), the construction of buildings and travel by patients and employees. Downstream indirect emissions within Scope 3 result, for instance, from the proper disposal of medical waste or from the propellants emitted when using metered dose inhalers. Scope 3 emissions are therefore not directly owned or under the control of the healthcare facility and can only be influenced by it.

When calculating the emissions of all Scope levels, one needs to rely on various different data sources and data collection methods. While the energy-related emissions of Scope 1 and 2 can usually be calculated based on consumption data (provided such data is available) and the respective emission factors, estimating Scope 3 emissions is comparatively more complex and resource-intensive. In order to accurately calculate these emissions, one needs to draw on data on the emissions intensity of all products (including, for instance, pharmaceuticals) and services along the entire value chain. For this reason, the values given for Scope 3 emissions are often only rough estimates based on monetary data and average emission intensities using input-output analyses (top-down).

Figure 24: Scope levels in Greenhouse Gas Protocols

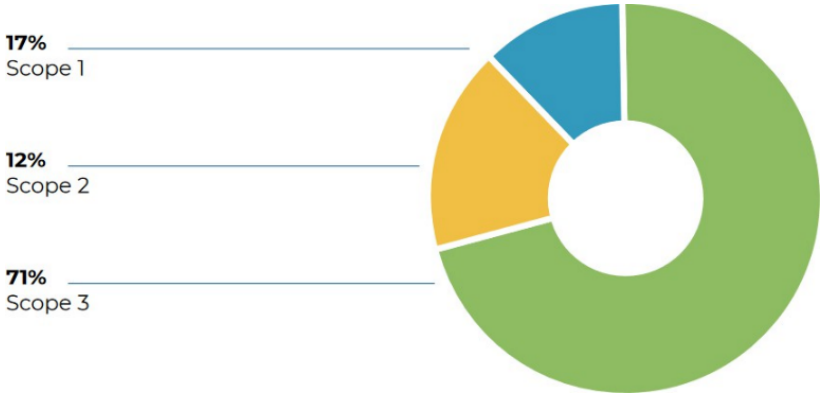


Source: HCWH (2022), this representation: GÖG/Austrian National Public Health Institute

A study carried out by Health Care Without Harm (Karliner 2019) shows that globally 17 per cent of total healthcare sector emissions are attributable to Scope 1, while purchased energy (Scope 2) accounts for twelve per cent and 71 per cent are made up of indirect Scope 3 emissions along the supply chain. Within Scope 3 emissions, pharmaceuticals,

other services procured, food and catering as well as accommodation are percentage wise the most important sources of emissions, thus representing the most important starting points for greenhouse gas reductions.

Figure 25: Global healthcare footprint broken down by scopes



Source and illustration: HCWH (2022)

Methods for calculating greenhouse gas emissions

There are a range of different methods for calculating greenhouse gas emissions, whose use depends on source of data and the level of analysis. Bottom-up methods are methods that use consumption data provided at organisational or product level, which are multiplied by emission factors – as in the standardised life cycle assessment method. Bottom-up methods are used to calculate emissions at product level (pharmaceuticals, medical devices etc.). In contrast to these, top-down methods are based on linking aggregated expenditure data with the emissions intensity of individual economic sectors to estimate the healthcare sector's total emissions based on input-output analyses. These methods were used by all the studies undertaken to calculate the healthcare sector's total footprint (see Chapter 2.3.2).

Top-down: Environmentally extended input-output analysis

All analyses prepared to assess Austria's total greenhouse gas footprint use a form of extended input-output analysis that includes environmental impacts, namely the "environmentally extended multi-regional input-output analysis" (EE-MRIO analysis).

All transactions between the individual economic sectors (the output of one sector is often the input for another economic sector) and end consumers are recorded in input-output tables. Although these are material flows, the transactions are usually presented in monetary values for purposes of easier recording and better comparability. By adding environmental information such as greenhouse gas emissions, it is possible to assign to each sector an environmental impact (a "footprint") for these transactions. Similar to tracking the flow of money or costs from production to consumption, an input-output model extended to include environmental effects allows the tracking of environmental footprints along the supply and production chains. As each production step includes further environmental impacts, the result is a life cycle inventory of the environmental impacts attributable to production and consumption, for instance greenhouse gas emissions generated by companies, organisations, sectors, cities/regions or countries (Kitzes 2013; Schaffartzik et al. 2014).

Country-specific input-output tables are usually provided by national statistical institutions. Footprint calculations, however, require extended data that covers not only environmental effects but also the global economy.
These multiregional input-output tables can be found in databases such as Eora[16], Exiobase[17] or WIOD[18] which differ in terms of break-down of sectors, country coverage and environmental impacts included.

To calculate the footprint of the healthcare system, national healthcare expenditure is allocated to the sectors in the MRIO tables. In all the studies mentioned, these calculations were performed using the standardised System of Health Accounts (SHA)[19] established by the OECD, which enables international comparability. Based on established input-output analysis calculation methods that also include environmental effects (Leontief 1986), such data enables a robust estimate of the healthcare sector's overall footprint.

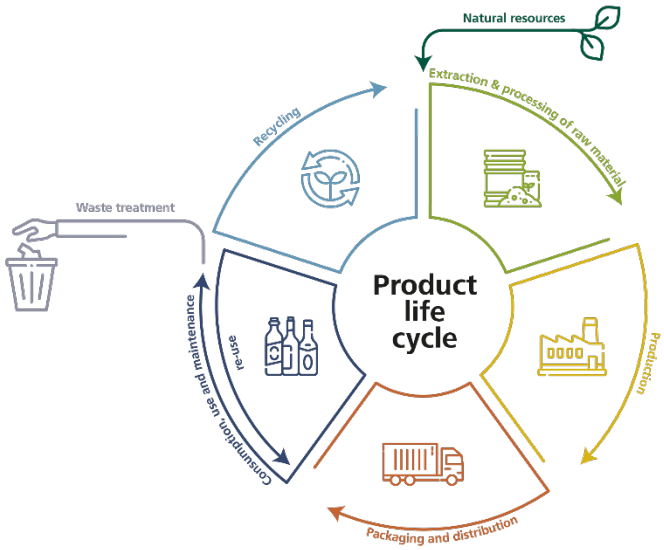
As a modelling approach, EE-MRIO is therefore an efficient tool for assessing the healthcare system including its associated direct and indirect emission sources.

[16] https://www.worldmrio.com
[17] https://www.exiobase.eu
[18] https://www.rug.nl/ggdc/valuechain/wiod
[19] https://www.oecd.org/publications/a-system-of-health-accounts-2011-9789264270985-en.htm

Bottom-up: Life-Cycle-Assessment

Emission intensities (and other environmental impacts) of medicinal products, pharmaceuticals, medical devices and processes are generally calculated based on life cycle assessments (LCAs) as a standardised method in accordance with ISO 14040 and ISO 14044. LCAs usually consider the entire life cycle of a product, from the extraction of raw materials through production and use to waste utilisation ("cradle to grave"; see Figure 26).

Figure 26: Product life cycle



Source: FOEN (2022), illustration: GÖG/Austrian National Public Health Institute

Life cycle analyses provide information on the environmental impacts – such as the level of greenhouse gas emissions – of a product or process. Alongside the purely descriptive component, they also enable a comparison of different product alternatives and identification of particularly environmentally harmful "hotspots" in the product life cycle (Eberle et al. 2017; Klöpffer/Grahl 2009).

Life cycle assessments are carried out in four steps. First, the objective and scope of the study is defined (step 1), then a comprehensive life cycle inventory of all input and output flows along the product life cycle is drawn up (step 2). This is followed by an impact assessment considering the various environmental impacts (step 3) and finally – as the

final step – the interpretation of the results (step 4) (Eberle et al. 2017; Klöpffer/Grahl 2009).

When conducting life cycle assessments, it is necessary to prepare a life cycle inventory, i.e. collect and analyse data on all materials and manufacturing processes along their entire life cycle, namely data on raw material extraction and transport, manufacturing and processing processes, auxiliary and operating materials, the utilisation phase and the product's disposal routes as well as all waste generated during production. Even if it is in many cases possible to use existing databases, this process is extremely labour-intensive and time-consuming.

Advantages and limitations of the calculation methods

The benefit of top-down approaches using EE-MRIO is that they capture the entirety of the economic system's direct and indirect emission sources and thus avoid system truncation errors (e.g. the omission of emissions due to data gaps) when determining the footprint of the healthcare system (Kitzes 2013). Furthermore, the workload for data collection and calculation is relatively low compared to bottom-up approaches and, once a model is established and validated, it is relatively easy and inexpensive to perform a calculation based on updated MRIO data (Weisz et al. 2020). At the same time, however, there are some important limitations to top-down EE-MRIO analyses. First and foremost, they present a strong simplification of the environmental and climate impacts of the economic sectors, as homogeneous emission intensities are assumed for each sector. This problem is further exacerbated by the fact that input-output tables are often only available at a less detailed level of sectoral breakdown. And while these models provide valid estimates for the healthcare sector's overall footprint, their results often present the healthcare sector as a "black box" and only enable limited statements about where exactly the emissions occur.

Thus, bottom-up approaches based on life cycle assessment using consumption data and emission intensities of individual products and processes are an important supplement highlighting emission "hotspots" and identifying climate-friendly product alternatives. Thorough life cycle assessments provide detailed insights into the products' environmental impact along their entire life cycle. As life cycles are, however, highly complex, it is often necessary to make assumptions and use average values. The results generated by life cycle analyses therefore never represent the "ecological truth" but must

always be interpreted in the context of the scope of the study, the system boundaries drawn, the assumptions made, and the data used (Eberle et al. 2017). Furthermore, life cycle analyses are very time-consuming and cost intensive.

In order to obtain the best possible estimates of healthcare sector emissions, it is therefore recommended that the two approaches mentioned be combined to construct a hybrid calculation model that leverages the benefits of both approaches (HCWH 2022; Weisz et al. 2020).

5.2.1.4 Assessment of the data situation

The data situation on healthcare system greenhouse gas emissions in Austria is very complex and varies greatly depending on the respective area. While relatively precise and reliable calculations are available for some areas, for others there are only estimates subject to high levels of uncertainty or no data at all (see Table 15). In this connection, mention should again be made of the project “Carbon Footprint of the Austrian Health Sector” (Weisz et al. 2020), which is currently the most reliable data source.

Table 15: Overview of the data situation assessment

	Assessmen	Remarks
Total CO_2 footprint	+	Comprehensive survey, but already outdated (2014)
Healthcare facilities	~	Some primary data available
Hospitals	~	Consumption and emissions data for individual facilities available
Emergency medical services	~	Emissions data available for one service provider, otherwise only information on kilometres driven/year, which enable emission estimates
Primary care units	-	initial primary data available
Doctors' surgeries	-	initial primary data available
Pharmacies	-	initial primary data available
Pharmaceuticals/ medical devices	~	Emissions data calculated via lifecycle analysis for individual pharmaceuticals and/or medical devices, but no comprehensive data available

Source and illustration: GÖG/Austrian National Public Health Institute

Thanks to three analyses based on input-output models, there are relatively good estimates of the Austrian healthcare sector's overall footprint available, which also include the emissions generated in the upstream and downstream value chains (Scope 3). They furthermore enable both a categorisation of the healthcare sector's greenhouse gas relevance within the Austrian economic sectors and an international comparison of the healthcare sector's emissions intensity. It should, however, be noted that all available calculations of the total footprint date back more than eight years and it can be assumed that emissions (or their distribution within the healthcare sector) have changed in the meantime, especially due to the effects associated with the COVID-19 pandemic. Summarising, it can be said that there are good estimates and validated calculation models available on the Austrian healthcare system's overall footprint, which do, however, require an urgent update based on the latest economic data.

While the total footprint discussed above is relatively easy to calculate, it is much more difficult to identify the exact source of emissions occurring within the healthcare sector, and the healthcare system may – as pointed out above – often be considered a "black box" in this respect.

This is particularly true for Scope 3 emissions, which are generated in the upstream and downstream value chains and, for instance, include the entire life cycle of pharmaceuticals and medical devices used in Austria – from raw material extraction to disposal. Due to the large number of different pharmaceuticals, medicinal products and medical devices used as well as the complexity and cost-intensity of life cycle analyses, greenhouse gas protocols are only available for a very limited number of pharmaceuticals and medical devices.

The range of available primary consumption data (and the emissions data derived therefrom) varies greatly, depending on the individual healthcare facilities and service providers. While some hospitals communicate this data transparently and make it publicly available in the context of their climate strategy or environmental management system, no data is available for other healthcare facilities. This holds particularly true for "small" healthcare facilities such as doctors' surgeries and pharmacies, which often lack both the know-how and, above all, the necessary time to systematically document this data. In the efforts aimed at closing this data gap, the project "Beratung klimafreundliche Gesundheitseinrichtungen" (consultancy services for climate-friendly healthcare facilities) and follow-up projects building on it, implemented by the Climate and Health Competence Centre Climate at the Austrian National Public Health Institute is playing an important role. Under this project, healthcare facilities are not only supported in identifying and implementing climate protection measures, but their primary consumption data (Scope 1 and 2 in a first step) are also collected using a standardised survey, which may subsequently serve as a basis for further conclusions to be drawn with respect to the emissions generated by the healthcare facilities.

In conclusion, it should be noted that the data situation regarding the Austrian healthcare system's greenhouse gas emissions is inadequate. Taking (further) targeted climate protection measures in the healthcare sector and monitoring the evolution towards a climate-neutral healthcare system require detailed data collection at very short intervals with regard to the healthcare system's overall emissions as well as greater transparency regarding individual healthcare facilities' consumption data.

5.2.2 Options for action

Updated and regular survey of the Austrian healthcare sector' greenhouse gas footprint

The last survey of the Austrian healthcare sector' greenhouse gas footprint is based on data from 2014 and 2015. In order to create a sound database that serves as a basis for further measures, a new calculation based on more up-to-date data is required – especially as it can be assumed that the COVID-19 pandemic has led to a change in healthcare sector emissions. The direction of this change is, however, unclear as the number of intensive care inpatient treatments has increased and there has been a massive increase in the consumption of disposable products (masks, test kits, protective clothing etc.), while the use of healthcare services in other areas has declined.

To be able to evaluate the measures taken to reduce the GHG footprint in the healthcare sector, it is generally advisable to conduct a survey of total healthcare sector emissions using a standardised method and at regular intervals (1-3 years). As soon as the necessary EE-MRIO model has been established and validated, a calculation based on updated MRIO data can be performed comparatively easily and cost-effectively (Weisz et al. 2020).

Development of a database on the emissions intensity of pharmaceuticals and medical devices and processes

With a view to taking account of the high share of emissions attributable to pharmaceuticals and medical devices and to laying the groundwork for more sustainable procurement, it is necessary to develop a database on the emissions intensity of medicinal products, pharmaceuticals, medical devices and medical processes. This database should contain a systematic collection of the results of available life cycle assessments of pharmaceuticals and medical devices/processes that is updated on an ongoing basis. Furthermore, it is necessary to identify pharmaceuticals and products that are used in large quantities but for which life cycle assessments are not yet available, to subsequently encourage or commission their life cycle assessment. This database should be developed building on international cooperation (for instance in collaboration with the existing

HealthcareLCA platform[20]) or at EU level to avoid unnecessary duplication of effort and to ensure international comparability.

Enshrining a consumption data reporting obligation for large healthcare facilities in law

There is a fundamental need for validated, standardised and generally accepted indicators for calculating greenhouse gas emissions for the entire healthcare sector. Subsequently, these indicators can be used by healthcare facilities to track their emissions and regularly document their results. The related indicators, which are used to monitor the implementation of measures and the achievement of targets, should be standardised nationwide to enable comparison between healthcare facilities. The indicators should be determined in close consultation with the federal provinces to facilitate establishment of a standardised reporting system.

With a view to addressing the gaps in the availability of primary data on energy consumption, the consumption of anaesthetic gases as well as pharmaceuticals and medical devices, the introduction and legal establishment of mandatory reporting requirements (CSRD/ESRS) for larger (public) healthcare facilities would be a welcomed step. This measure is associated with little to no additional effort for healthcare facilities as consumption data of this kind is collected and documented anyway in the context of forward-looking, future-oriented corporate management.

In this respect, the Estates Returns Information Collection (ERIC)[21] introduced by the of the National Health Service (NHS) in the UK can serve as a model. This database contains cost and consumption data for buildings (e.g. energy and water consumption), services (such as food, catering and laundry) and medical care services of all NHS healthcare facilities collected in mandatory surveys. Collected centrally, this information subsequently contributes to identifying emission hotspots in the healthcare sector.

Possible starting points for a reporting obligation for healthcare facilities are the Corporate Sustainability Reporting Directive (CSRD) at European level and the Energy

[20] https://healthcarelca.com

[21] https://digital.nhs.uk/data-and-information/publications/statistical/estates-returns-information-collection/england-2021-22

Efficiency Act (EEffG) at national level (Federal Energy Efficiency Act; EU Corporate Sustainability Reporting Directive 2022). The CSRD, which came into force at the beginning of 2024, requires all large companies to provide comprehensive ESG (Environmental, Social and Governance) reporting containing information on the social and environmental risks of their business activities starting in 2024/2025. The directive is based on a double materiality perspective, meaning that companies must record the impact of sustainability aspects on their corporate economic situation as well as the impact of their corporate operations on sustainability aspects. This does, however, not include specific consumption data. According to the definition of large companies (if two of the following criteria are met, the company is subject to reporting: > 250 employees, > 50 million euros turnover, > 25 million euros balance sheet total), numerous healthcare facilities in Austria will also be affected by this reporting obligation. In line with the national Energy Efficiency Act it is mandatory for large companies to conduct regular external energy audits or to introduce an environmental/energy management system, and to also report key findings and efficiency measures to the energy efficiency monitoring centre.

5.3 Indicators

5.3.1 Status quo

Indicators show the status of and/or changes to the relevant system resulting from economic and/or environmental policy measures in the context of climate and health. Indicators are used for the planning, implementation and evaluation of objectives and measures and fulfil the following key functions (Federal Ministry for Climate Action, 2011):

- Motivational function
- Coordination function
- Control function
- Decision-making function
- Communication function

If indicators fulfil the essential criteria and functions, they are a suitable instrument to be used by decision-makers and executing bodies when implementing the respective strategies, actions and measures (Lichtenecker 1994).

Indicators need to fulfil the following specific criteria:

- Relevance
- Consistency of content
- Comprehensibility/Intelligibility
- Transparency
- Comparability
- Verifiability

The report on "Outcome-Messung im Gesundheitswesen" (outcome measurement in the healthcare system) published by the Federal Ministry of Social Affairs lists numerous indicators to be applied to the following areas: health promotion and prevention, curative care, palliative care and palliative care units, long-term care and support, and the overall system (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2021b).

In the Federal Finance Bill, the following indicators are used in the healthcare context: density of hospitals, days of hospitalisation, consumption of fruit, vegetables, and sugar. In the climate context, the following criteria are used: reduction of greenhouse gas emissions, vehicles with alternative drive systems, increase in the share of renewable energy in gross energy consumption, resource productivity, organisations that have set up environmental management systems (Federal Ministry of Finance 2021).

5.3.2 Options for action

Developing climate-relevant indicators for the healthcare sector

Developing a set of indicators for the various areas that fulfils the functions listed in Chapter 5.3.1 is key to climate-neutral healthcare. This set of indicators is to relate to monitoring, the basis for decision-making and communication. Specific accompanying indicators may be carbon footprint, investments in renewable energies, the number of

climate-neutral healthcare facilities, the number of trained climate managers, reduced CO_2 emissions and the share of renewable energies in the healthcare sector.

5.4 Strategic and legal framework conditions

5.4.1 Status quo

At international, EU, national or regional level, the following legally binding documents and strategies are particularly relevant with respect to health and climate across all sectors and/or specifically for the fields of action of energy supply, pharmaceuticals and medical devices, buildings (including green spaces), waste, transport and mobility as well as the food/catering system. Due to the large number of documents, the following list only covers the most important ones.

For the sake of clarity and categorisation, the documents listed are presented in chronological order according to the fields of action.

5.4.1.1 International and European Union

Laws, regulations and directives

- Cross-cutting
  - Emissions Trading Directive 2003/87/EC as amended
  - Paris Agreement UN Framework Convention on Climate Change (UNFCCC, 2015), ratification in Austria in Federal Law Gazette III 197/2016
  - National Emission Ceilings Directive: NEC Directive (EU) 2016/2284 as amended
  - Effort-sharing Regulation (EU) 2018/842 as amended
  - Supply Chain Directive (EU) 2022/71 as amended
  - LIFE Regulation (EU) 2021/783 as amended
  - European Climate Law (EU) 2021/1119 as amended
  - Corporate Sustainability Reporting Directive [CSRD]) (EU) 2022/2464
- Health
  - Regulation on serious cross-border threats to health (EU) 2022/2371 as amended
  - EU4Health Programme 2021-2027 (EU) 2021/522 as amended

  - Regulation establishing a European Centre for Disease Prevention and Control (EC) No 851/2004 as amended
- Energy supply
  - Renewable Energy Directive (EU) 2018/2001 as amended
  - Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999 as amended
  - Energy Efficiency Directive 2012/27/EU as amended
  - Energy Efficiency Directive (EU) 2023/1791 as amended
  - Energy Performance of Buildings Directive 2010/31/EU as amended
- Pharmaceuticals and medical devices
  - Directive on public procurement (EU) 2014/24 as amended
  - Ecodesign Directive (EU) 2009/125 as amended
  - Medical Devices Regulation (EU) 2017/745 as amended
- Buildings (including green space)
  - Directive on the Energy Performance of Buildings (EU) 2010/31 as amended
  - Waste
  - Commission Delegated Decision as regards a common methodology and minimum quality requirements for the uniform measurement of levels of food waste (EU) 2019/1597 as amended
  - Regulation on shipments of waste (EU) 2006/1013 as amended
  - Directive on packaging and packaging waste (EU) 1994/62 as amended
  - Waste Framework Directive (EU) 2008/98 as amended
  - Directive on Industrial Emissions (EU) 2010/75 as amended
  - Directive on Waste Electrical and Electronic Equipment (EU) 2012/19 as amended
  - Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EU) 2011/65 as amended
  - Directive on batteries and accumulators and waste batteries and accumulators (EU) 2006/66 as amended
  - EU Regulation on shipments of waste (EU) 2006/1013 as amended
  - Directive on the protection of workers from risks related to exposure to biological agents at work (EU) 2000/54 as amended
- Transport and mobility
  - Regulation setting CO_2 emission performance standards for new passenger cars and for new light commercial vehicles (EU) 2019/631 as amended
  - Directive on the promotion of clean road transport vehicles in support of low-emission mobility (EU) 2009/33 as amended

- Directive as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions (EC) 2009/30 as amended

- Food system
  - Directive on the quality of water intended for human consumption (recast) (EU) 2020/2184 as amended
  - Regulation (EC) No 1333/2008 as regards the use of beeswax (E 901), carnauba wax (E 903), shellac (E 904) and microcrystalline wax (E 905) on certain fruits
  - Regulation on maximum levels for certain contaminants in food (EU) 2023/915 as amended
  - Regulation laying down health rules as regards animal by-products and derived products not intended for human consumption (EC) 1069/2009 as amended
  - Directive as regards the environmental risk assessment of genetically modified organisms 2001/18/EC as amended

Strategic documents

- Cross-cutting
  - EU Sustainability Strategy 2006
  - Parma Declaration on Environment and Health (Fifth Ministerial Conference on Environment and Health), WHO 2010
  - Agenda 2030 for sustainable development including the UN Sustainable Development Goals, UN 2015
  - Ostrava Declaration: Commitment to shaping a health-promoting environment (Sixth Ministerial Conference on Environment and Health), WHO 2017
  - A clean planet for all - A European strategic, long-term vision for a prosperous, modern, competitive and climate-neutral economy (Long-term Strategy 2050), COM/2018/733
  - European Green Deal, COM/2019/640
  - Pathway to a Healthy Planet for All: EU Action Plan: Towards Zero Pollution for Air, Water and Soil, COM/2021/400
  - Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change COM/2021/82
  - “Fit for 55”: delivering the EU's 2030 Climate Target on the way to climate neutrality 2030, COM/2021/550
- Health
  - Health21 Health for all in the 21st century - Framework, WHO 1998
  - Health 2020 (Health 2020): A European framework and strategy for the 21st century, 2013
  - Physical Activity Strategy for the WHO European Region (2016- 2025), WHO 2015

  - Global Action Plan on Physical Activity 2018-2030, WHO 2018
  - COP28 UAE Declaration on climate and health, 2023
  - Declaration of the Seventh Ministerial Conference on Environment and Health: Budapest, Hungary 5-7 July 2023
  - EU4Health, 2021
  - Geneva Charter for Well-being, 2024
  - Global Charter for Public Health
- Energy supply
  - Strategy for Energy System Integration, COM/2020/299
- Pharmaceuticals and medical devices
  - European Union Strategic Approach to Pharmaceuticals in the Environment, COM/2019/128
  - A Pharmaceutical Strategy for Europe, COM/2020/761
- Buildings (including green space)
  - New European Bauhaus: Beautiful - Sustainable - Together, COM/2021/573
- Waste
  - A new Circular Economy Action Plan - For a cleaner and more competitive Europe, COM/2020/98
- Transport and mobility
  - Pan-European masterplan for cycling promotion 2021
- Food system
  - A Farm to Fork Strategy (for a fair, healthy and environmentally-friendly food system in Europe), COM/2020/381

5.4.1.2 Federal level Austria

Laws and regulations in Austria[22]

- Cross-cutting
  - Klimaschutzgesetz (Climate Protection Act), Federal Law Gazette I 106/2011 as amended
  - Emissionsgesetz-Luft (Emissions Act-Air) 2018, Federal Law Gazette I No. 75/2018 as amended

[22] Further information please see [documents mostly in German]: https://www.ris.bka.gv.at

- Health
  - Allgemeines Sozialversicherungsgesetz (ASVG, General Social Insurance Act), Federal Law Gazette No. 189/1955 as amended
  - Krankenanstalten- und Kuranstaltengesetz (KAKuG, Hospitals and Health Resorts Act), Federal Law Gazette No. 1/1957 as amended
  - Bundesgesetz über die Regelung der gehobenen medizinisch-technischen Dienste (MTD-Gesetz, Federal Act on the Regulation of Higher Medical-Technical Services), Federal Law Gazette No. 460/1992 as amended
  - Hebammengesetz (HebG, Midwifery Law), Federal Law Gazette No. 310/1994 as amended
  - Gesundheits- und Krankenpflegegesetz (GuKG, Healthcare and Nursing Act), Federal Law Gazette I No. 108/1997 as amended
  - Ärztegesetz (ÄrzteG, Austrian Medical Act), Federal Law Gazette I No. 169/1998 as amended
  - Sanitätergesetz (SanG, Paramedics Act), Federal Law Gazette I No. 30/2002 as amended
  - Medizinischer Masseur- und Heilmasseurgesetz (MMHmG, Clinical Masseur and Curative Masseur Act (MMHmG), Federal Law Gazette I No. 169/2002 as amended
  - Gesundheitsqualitätsgesetz (GQG, Austrian Health Quality Act, Federal Law Gazette I No. 179/2004 as amended
  - Zahnärztegesetz (ZÄG, Austrian Dentists Act), Federal Law Gazette I No. 126/2005 as amended
  - Patientencharta (Patients' Charter), Federal Law Gazette I No. 42/2006 as amended
  - Medizinische Assistenzberufe-Gesetz (MABG, Medical Assistant Professions Act), Federal Law Gazette I No. 89/2012 as amended
  - Psychologengesetz (Psychologists Act), Federal Law Gazette I No. 182/2013 as amended
  - Gesundheits-Zielsteuerungsgesetz (G-ZG, Target-based Health Governance Act), Federal Law Gazette I No. 26/2017 as amended
  - Vereinbarungsumsetzungsgesetz 2017 (VUG 2017, Health Reform Act 2017), Federal Law Gazette I No. 26/2017 as amended
  - Vereinbarung gem. Art. 15a B-VG Zielsteuerung-Gesundheit (Agreement pursuant to Art. 15a of the Federal Constitutional Act on Target-based Health Governance), Federal Law Gazette I No. 97/2017 as amended
  - Vereinbarung gemäß Art. 15a B-VG über die Organisation und Finanzierung des Gesundheitswesens, (Agreement pursuant to Art. 15a of the Federal

Constitutional Act on the organisation and financing of the healthcare system, Federal Law Gazette I No. 98/2017 as amended
  - Primärversorgungsgesetz (PrimVG, Primary Care Act), Federal Law Gazette I No. 131/2017 as amended
- Energy supply
  - Heiz- und Kältekostenabrechnungsgesetz (Heating and Cooling Cost Billing Act), Federal Law Gazette No. 827/1992 as amended
  - Elektrizitätswirtschafts- und -organisationsgesetz ElWOG 2010 (Electricity Management and Organisation Act), Federal Law Gazette I No. 110/2010 as amended
  - Gaswirtschaftsgesetz GWG 2011 (Gas Management Act), Federal Law Gazette I Nr. 107/2011 as amended
  - Bundes-Energieeffizienzgesetz (Federal Energy Efficiency Act), Federal Law Gazette I Nr. 72/2014 as amended
  - Erneuerbaren-Ausbau-Gesetz (EAG, Renewable Energy Expansion Act) Federal Law Gazette I No. 150/2021 as amended
  - Erneuerbare-Wärme-Gesetz (EWG, Federal Act on Renewable Heat Supply/Renewable Heat Act) Federal Law Gazette I No. 8/2024 as amended
- Pharmaceuticals and medical devices
  - Arzneimittelgesetz (Medicines Act) Federal Law Gazette No. 185/1983 as amended
  - Bundesvergabegesetz 2018 (BVergG 2018, Federal Procurement Act) Federal Law Gazette I No. 65/2018 as amended
  - Medizinproduktegesetz 2021 (Austrian Act on Medical Devices) Federal Law Gazette I No. 122/2021 as amended
- Buildings (including green spaces)
  - Arbeitsstättenverordnung (Workplace Ordinance) Federal Law Gazette II No. 368/1998 as amended
- Waste
  - Abfallwirtschaftsgesetz (AWG 2002, Waste Management Act), Federal Law Gazette I No. 102/2002 as amended
  - Abfallbilanz-Verordnung (Waste Balance Ordinance), Federal Law Gazette II 497/2008 as amended
  - Abfallnachweisverordnung (ANV 2012, Ordinance on Waste Recovery and Disposal Records), Federal Law Gazette II 341/2012 as amended
  - Verpackungsverordnung 2014 (Packaging Ordinance), Federal Law Gazette II 184/2014 as amended

- Abfallbehandlungspflichtenverordnung (Abfall BPV, Waste Treatment Obligations Ordinance), Federal Law Gazette II 102/2017 as amended
- Abfallverzeichnisverordnung 2020 (Waste Catalogue Ordinance), Federal Law Gazette II 409/2020 as amended

Strategies and concepts in Austria

- Cross-cutting
  - Nachhaltigkeitsstrategie des Bundes 2002 (NSTRAT, the Austrian Federal Government's Strategy for Sustainable Development)
  - Nachhaltigkeitsstrategie des Bundes und der Länder 2010 (ÖSTRAT, the Austrian Federal Government's and Provinces' Strategy for Sustainable Development)
  - Österreichische Sicherheitsstrategie, 2013 (Austrian Security Strategy)
  - SDG-Aktionsplan 2019+ (SDG Action Plan 2019+)
  - Langfriststrategie 2050 gemäß Verordnung (EU) 2018/1999 – Vision klimaneutrales Österreich 2050, 2019 (Long-term strategy 2050 in accordance with Regulation (EU) 2018/1999 - Vision for a climate-neutral Austria 2050)
  - Nationales Luftreinhalteprogramm gem. § 6 Emissionsgesetz-Luft, 2019
  - (National Clean Air Programme pursuant to Section 6 of the Air Emissions Act)
  - Integrierter Nationaler Energie- und Klimaplan für die Periode 2021–2030 (NEKP 2019, Integrated National Energy and Climate Plan for the period 2021-2030, NECP)
  - FTI-Strategie 2030 – Strategie der Bundesregierung für Forschung, Technologie und Innovation, 2020 (RTI Strategy 2030 – The Austrian Federal Government's Strategy for Research, Technology and Innovation)
  - Österreichisches Raumentwicklungskonzept „Raum für Wandel" (ÖREK 2030), 2021 (Austrian Spatial Development Concept "Space for Change")
  - Österreichische Strategie zur Anpassung an den Klimawandel, 2024 (Austrian Strategy for Adaptation to Climate Change)
  - Nationaler Hitzeschutzplan, 2024 (Austrian National Heat Protection Plan)
- Health
  - Gesundheitsziele Österreich, 2012 (Austrian Health Targets)
  - Qualitätsstrategie für das österreichische Gesundheitswesen, 2017 (Quality strategy for the Austrian healthcare system)
  - Nationale Strategie „Gesundheit im Betrieb", 2019 (National strategy "Health in the workplace")
  - Agenda Gesundheitsförderung, 2022 (Health promotion agenda)

  - Gesundheitsförderungsstrategie im Rahmen des Bundes-Zielsteuerungsvertrags, 2023 (Health promotion strategy in the context of the Federal Target-based Health Governance Agreement)
  - Österreichischer Strukturplan Gesundheit, 2023 (Austrian Structural Plan for Healthcare)
  - Roadmap Zukunft Gesundheitsförderung, 2023 (Roadmap “Future of Health Promotion”)
- Energy supply
  - Wasserstoffstrategie für Österreich, 2022 (Austrian Hydrogen Strategy)
  - Bauplan für die Energiezukunft Österreichs, 2023 (Blueprint for Austria's energy future)
- Pharmaceuticals and medical devices
  - Aktionsplan nachhaltige öffentliche Beschaffung, 2021 (Austrian Action Plan for Sustainable Public Procurement)
- Waste
  - Strategie zur Vermeidung von Lebensmittelabfällen, 2021 (Strategy for the prevention of food waste)
  - Branchenkonzept für Abfälle aus dem medizinischen Bereich – 3. Auflage 2021 (Sector-based concept for medical sector waste - 3rd edition 2021
  - Die österreichische Kreislaufwirtschaftsstrategie, 2022 (The Austrian circular economy strategy)
  - Bundes-Abfallwirtschaftsplan mit Abfallvermeidungsprogramm, 2023 (Federal waste management plan including waste prevention programme)
- Transport and mobility
  - Nationaler Aktionsplan Bewegung (NAP.b), 2013 (National Action Plan on Physical Activity)
  - Masterplan Radfahren, 2015 (Masterplan Cycling)
  - Mobilitätsmasterplan 2030 für Österreich, 2021 (Austria’s 2030 Mobility Masterplan)
  - Masterplan Gehen 2030, 2022 (Masterplan Walking)
  - Sharing Strategie im Personen-Mobilitätsbereich, 2023 (Sharing strategy for the personal mobility sector)
- Food system
  - Qualitätsstandard für die Verpflegung in Betrieben, 2021 (Quality standard for food and catering in companies)

- Qualitätsstandard für die Ernährung in Wohn- und Pflegeeinrichtungen für Seniorinnen und Senioren, 2021 (Quality standard for food and nutrition in residential and care facilities for senior citizens, 2021)

5.4.1.3 Federal Provinces' level

Laws, ordinances and regulations

Due to Austria's federal structure, many of the relevant fields of action fall – at least to some extent – within the scope of the nine federal provinces' responsibility. In the areas of hospitals or electricity, for instance, the federal government adopts basic laws, whose implementation is a matter for the federal provinces. In other areas, such as building law, the federal provinces hold exclusive responsibility for legislation, implementation and enforcement.

This leads to a complex legal structure characterised by partly interrelated federal and nine different provincial laws. For this reason, it is not possible to present a summarised overview, as it would be necessary to prepare a detailed case-by-case analysis for each specific legal situation.

The Federal Provinces' Strategic Documents

- Climate and energy
  - Burgenland 2050 – Klima- & Energiestrategie, 2020 (Burgenland 2050 - Climate & Energy Strategy, 2020)
  - Energiemasterplan Kärnten 2025, 2014 (2025 Energy Masterplan Carinthia)
  - NÖ Klima- und Energieprogramm 2030, Maßnahmenperiode 1: 2021 bis 2025, 2021 (Lower Austrian Climate and Energy Programme 2030, Action Period 1: 2021 to 2025)
  - Energie-Leitregion Oberösterreich 2050, 2017 (Leading Energy Region Upper Austria 2050)
  - Die Oberösterreichische Klima- und Energiestrategie, 2022 (The Upper Austrian Climate and Energy Strategy)
  - Klima- und Energiestrategie Salzburg 2050, 2012 (Climate and Energy Strategy Salzburg 2050)

- Masterplan Klima+Energie 2030 zur Klima- und Energiestrategie Salzburg, 2021
- (Climate+Energy 2030 Masterplan for the Salzburg Climate and Energy Strategy)
- Klima- und Energiestrategie Steiermark 2030 (KESS 2030), 2017 (Climate and Energy Strategy Styria 2030)
- Klimawandelanpassung - Strategie Steiermark 2050, 2017 (Climate Change Adaptation - Strategy Styria 2050)
- Aktionsplan 2022–2024 zur Klima- und Energiestrategie Steiermark 2030, 2022
- (2022-2024 Action Plan for the Climate and Energy Strategy Styria 2030)
- Tiroler Nachhaltigkeits- und Klimastrategie 2050, 2021 (Tyrolean Sustainability and Climate Strategy 2050)
- Maßnahmenprogramm 2022-2024 zur Tiroler Nachhaltigkeits- und Klimastrategie 2050, 2022 (Programme of Measures 2022-2024 for the Tyrolean Sustainability and Climate Strategy 2050)
- Tiroler Energiestrategie 2050, 2022 (Tyrolean Energy Strategy 2050)
- Strategie Energieautonomie+ 2030 Vorarlberg, 2021 (Strategy Energy Autonomy+ 2030 Vorarlberg)
- Aktionsplan 2022/2023 zur Strategie zur Anpassung an den Klimawandel in Vorarlberg, 2022 (2022/2023 Action Plan on the climate change adaptation strategy in Vorarlberg)
- Fachkonzept Energieraumplanung des Stadtentwicklungsplans 2025 für Wien (STEP 2025), 2014 (Energy-based planning concept for the Urban Development Plan 2025 for Vienna)
- Urban Heat Islands (UHI) – Strategieplan Wien, 2015 (Urban Heat Islands, UHI - Vienna Strategy Plan)
- Smart Klima City Strategie Wien, 2022 (Smart Climate City Strategy Vienna)
- Wiener Hitzeaktionsplan, 2022 (Vienna Heat Action Plan)
- Wiener Klimafahrplan – Unser Weg zur klimagerechten Stadt, 2022 (Vienna Climate Roadmap - Our pathway to a climate-neutral city)
- Wiener Wärmeplan, 2024 (Vienna Heating Plan)

- Health
  - Regionaler Strukturplan Gesundheit – Burgenland 2025, 2021 (Regional Health Care Structure Plan – Burgenland)
  - Regionaler Strukturplan Gesundheit – Kärnten 2025, 2020 (Regional Health Care Structure Plan - Carinthia 2025, 2020
  - Gesundheitsland Kärnten, 2022 (Health Province Carinthia)
  - Regionaler Strukturplan Gesundheit für Niederösterreich 2025 – Teil 1, 2018 (Regional Health Care Structure Plan for Lower Austria 2025 - Part 1)

- 2. Regionaler Strukturplan Gesundheit – Oberösterreich 2025, 2022 (2nd Regional Health Care Structure Plan - Upper Austria)
- Gesundheitsziele Oberösterreich 2021 – 2032, 2021 (Health Targets for Upper Austria 2021-2032)
- Regionaler Strukturplan Gesundheit – Salzburg 2025 – akutstationärer Teil, 2019 (Regional Health Care Structure Plan - Salzburg 2025 - acute inpatient part)
- Regionaler Strukturplan Gesundheit – Salzburg 2025 – ambulanter Teil, 2019 (Regional Health Care Structure Plan - Salzburg 2025 - outpatient part)
- Salzburger Gesundheitsziele 2021–2025, 2021 (Salzburg Health Targets 2021-2025)
- Digitales Gesundheitssystem Steiermark – eHealth Strategie, 2018 (Digital Health System Styria - eHealth strategy)
- Regionaler Strukturplan Gesundheit Steiermark 2025, 2019 (Regional Structural Plan Health Styria 2025)
- Steirischer Gesundheitsplan 2035, 2020 (Styrian Healthcare Plan 2035)
- Gesundheitsziele Steiermark, 2022 (Health Targets Styria)
- Tiroler Gesundheitsziele, 2016 (Tyrolean Health Targets)
- Regionaler Strukturplan Gesundheit Tirol 2025 (RSG 2025) – Planungsmatrix, 2019
- (Regional Structural Plan Health Tyrol 2025, RSH 2025 - Planning matrix)
- Regionaler Strukturplan Gesundheit Tirol 2025 (RSG 2025) – Erläuterungen, 2019
- (Regional Structural Plan Health Tyrol 2025, RSH 2025 – Explanations)
- Regionaler Strukturplan Gesundheit Vorarlberg, 2020 (Regional Structural Plan Health Vorarlberg)
- eHealth Strategie Vorarlberg 2024 – 2028 (eHealth Strategy Vorarlberg 2024 - 2028)
- Vorarlberger Gesundheitsförderungs- und Präventionsstrategie 2024 – 2030, 2024
- (Vorarlberg Health Promotion and Prevention Strategy 2024 – 2030)
- Wiener Gesundheitsziele 2025, 2015 (Vienna Health Targets 2025)
- Regionaler Strukturplan Gesundheit Wien (RSG), (Regional Structural Plan Health Vienna, RSH)
- Wiener eHealth-Strategie 2023/2024 (Vienna eHealth Strategy 2023/2024)

- Waste
  - Landes-Abfallwirtschaftsplan Salzburg, 2006 (Provincial Waste Management Plan Salzburg)
  - Oö. Abfallwirtschaftsplan 2017, 2017 (Upper Austrian Waste Management Plan 2017)

  - Vorarlberger Landes-Abfallwirtschaftsplan 2017, 2017 (Vorarlberg Provincial Waste Management Plan 2017)
  - Wiener Abfallwirtschaftsplan und Wiener Abfallvermeidungsprogramm, 2018 (Vienna Waste Management Plan and Vienna Waste Prevention Programme)
  - NÖ Abfallwirtschaftsplan, 2018 (Lower Austrian Waste Management Plan)
  - Landes-Abfallwirtschaftsplan Steiermark, Planungsperiode 2019 bis 2024, 2019
  - (Provincial waste management plan Styria, planning period 2019 to 2024)
- Buildings (including green spaces)
  - Fachkonzept Grün- und Freiraum des Stadtentwicklungsplans 2025 für Wien (STEP 2025), 2014 (Specialist concept for green and open spaces in the Urban Development Plan 2025 for Vienna (STEP 2025))
- Transport and mobility
  - E-Mobilitätsstrategie Burgenland – Zukunftsthemen der Mobilität, 2022 (E-mobility Strategy Burgenland – mobility of the future)
  - Mobilitätsmasterplan Kärnten 2035 (MoMaK 2035), 2016 (Mobility Masterplan Carinthia 2035)
  - Mobilitätskonzept Niederösterreich 2030+, 2015 (Mobility concept Lower Austria 2030+)
  - Mobilitätsinitiative des Landes Oberösterreich – mobil ans Ziel, 2022 (Mobility initiative of the province of Upper Austria – active mobility to reach your destination)
  - Mobilität gestalten – Mobilitätsleitbild Oberösterreich 2035, 2023 (Shaping mobility - Mobility leitbild Upper Austria 2035)
  - salzburg.mobil 2025 – das Landesmobilitätskonzept 2016-2025, 2016 (salzburg.mobile 2025 - the province’s mobility concept 2016-2025)
  - Steirisches Gesamtverkehrskonzept 2008+, 2008 (Styrian overall transport strategy 2008+)
  - Landesstrategie Elektromobilität Steiermark 2030 – Strategie zur flächendeckenden Einführung von Elektromobilität, 2016 (Styrian Electric Mobility Strategy 2030 - Strategy for the province-wide introduction of electric mobility)
  - Radstrategie Tirol 2030, 2022 (Cycling Strategy Tyrol 2030)
  - Mobilitätskonzept Vorarlberg – Umfassendes Konzept für die nächsten zehn bis 15 Jahre, 2019 (Vorarlberg mobility concept - Comprehensive concept for the next ten to 15 years)
  - Fachkonzept Mobilität des Stadtentwicklungsplans 2025 für Wien (STEP 2025), 2014 (Specialised mobility concept under the 2025 Urban Development Plan for Vienna, STEP 2025)

- Elektromobilitätsstrategie Wien, 2016 (Electric Mobility Strategy Vienna)

5.4.2 Options for action

5.4.2.1 Supply chain legislation: EU Directive

The following comments and options for action are essentially based on the study "Climate protection and health" by expert consultant university professor Dr Erika M. Wagner (Wagner 2024).

Adopted by the European Council on 24 May 2024, the EU Supply Chain Directive deviates in many respects from the Commission's original 2022 proposal for a directive (EU Supply Chain Directive (Proposal) 2022). At the 26th Austrian Environmental Law Days, Erika Wagner and Daniela Ecker presented the proposed directive in September 2022 and published it in the "Jahrbuch des Österreichischen und Europäische Umweltrechts 2023" (2023 yearbook of Austrian and European environmental law) (Ecker 2024). In the following, an extract from this article is presented, updated to reflect the changes in the final directive adopted in May 2024, including subsumption with respect to medical law issues.

Intention

The EU Supply Chain Directive (Directive on corporate sustainability due diligence) aims to promote sustainable and responsible corporate behaviour in all global value chains and thus to make a decisive contribution towards advancing ecological change and the protection of human rights – not only in Europe, but also beyond. The EU accords a key role to companies in building a sustainable economy and society – to which the medical sector also has to contribute.

At the same time, it creates legal certainty (recitals 31, 45 and 53) and a level playing field (Art. 36(2)(b) and (g) as well as recitals 31 and 98), as some of the Member States have

already introduced due diligence[23] provisions. In the medical sector, this second area of competitive conditions will be of secondary importance behind achieving sustainability objectives.

The EU Supply Chain Directive will bring about far-reaching improvements in sustainability that are difficult to achieve by relying only on the voluntary measures that many companies have already implemented on their own initiative.

These improvements also mean more transparency for consumers and investors alike (recital 4). Citizens who use health sector services may rely on the fact that respective practices will not contradict global agendas that affect people's health: while great efforts are currently being undertaken in industrialised countries to alleviate the illnesses of individuals and provide relief in the event of accidents (keyword “medical care”), the medical system – like all other economic sectors too – does not currently focus on ensuring that the supply chains required for hospital care are compliant with fundamental and human rights. It is therefore quite possible that mercury in medical devices is produced under precarious circumstances. Hence, it is only logical that a much greater focus needs to be placed on supply chains in both sustainability strategies and sustainability legislation.

Subject matter

The EU Supply Chain Directive introduces provisions on exercising due diligence (Art. 1 para. 1 lit. a in conjunction with Art. 5 of the Directive) to take action against

- actual and potential adverse impact (keyword: precautionary principle)
- on human rights (Article 1(1)(a) in conjunction with Article 3(1)(c) of the Directive) and the environment (Article 1(1)(a) in conjunction with Article 3(1)(b) of the Directive)
- connected with
  - companies’ own operations (Art. 1 para. 1 lit. a in conjunction with Art. 3 para. 1 lit. d of the Directive),

[23] So far, France (Loi relative au devoir de vigilance of 2017) and Germany (Sorgfaltspflichtengesetz of 2021) have introduced horizontal legislation on due diligence, while other Member States (Belgium, the Netherlands, Luxembourg and Sweden) plan to do so in the near future. The Netherlands has, furthermore, also introduced a more specific law targeting child labour (Wet zorgplicht kinderarbeid of 2019).

- operations of their subsidiaries (Art. 1 para. 1 lit. a in conjunction with Art.
- 3 para. 1 lit. e of the Directive; keyword “controlled undertaking”) and
- operations of their business partners in the chains of activities of the companies (Art. 1 para. 1 lit. a in conjunction with Art. 3 lit. f and g of the Directive).

According to Art. 3 Para. 1 lit. g of the EU Supply Chain Directive, the chain of activities covers large parts of the life cycle, namely activities of a company’s upstream business partners related to the production of goods or the provision of services by that company, (including the design, extraction, sourcing, manufacture, transport, storage and supply of raw materials, products [or parts of products] and the development of the product or the service) as well as activities of a company’s downstream business partners related to the distribution, transport and storage of a product of that company, where the business partners carry out those activities for the company or on behalf of the company. This also applies to hospitals, primary care centres, health institutions and nursing homes. All these companies must be of a certain size and operated in the form of a public limited company or limited liability company (reference to Annex I of Directive 2013/34/EU). The code of conduct referred to in the Directive relates to “business partners’ chains of activities”. According to Art. 3 (1) (f) of the Directive, the term “business partner” includes, on the one hand “direct business partners”, i.e. any entity with which the company has a commercial agreement related to the operations, products or services of the company or to which the company provides services pursuant to Art. 3 para. 1 lit. g, and “indirect business partners”, i.e. any entity which is not a direct business partner, but which performs business operations related to the operations, products or services of the company. Medical law also includes such “business partners’ chains of activities”.

However, the EU Supply Chain Directive also introduces provisions on liability for failure to comply with the above obligations, thus imposing penalties for infringements (Art. 27 of the Directive) or triggering civil liability (Art. 29 of the Directive)).

Human rights protection

The scope of human rights protection is structured as follows: It covers both actual and potential adverse impacts on human rights. The EU Supply Chain Directive thus refers to adverse impacts on protected persons resulting from the violation of one of the prohibitions and obligations listed in the Annex (Art. 1 para. 1 lit. a in conjunction with Art.

3 para. 1 lit. c and Part I Section 1 of the Annex to the Directive) from the international human rights conventions listed in the Annex (Part I, Section 2).

The rights include the right to

- life, liberty and security,
- freedom of association, of assembly, and the rights to organise and collective bargaining (including trade unions and/or strikes),
- just and favourable conditions of work (including a fair wage and an adequate living wage for employed workers and an adequate living income for self-employed workers and smallholders, a decent living, safe and healthy working conditions and reasonable limitation of working hours)

including various rights relating to children, such as the right to

- education and an adequate standard of living,
- be protected from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development,
- highest attainable standard of health,
- be protected from all forms of sexual exploitation and sexual abuse and to be protected from being abducted, sold or moved illegally to a different place in or outside their country for the purpose of exploitation.

Mention is also being made of the prohibition

- of torture, cruel, inhuman or degrading treatment,
- of arbitrary or unlawful interference with a person's privacy, family, home or correspondence,
- of unlawful attacks on a person's honour or reputation,
- of interference with the freedom of thought, conscience and religion,
- of human trafficking,
- of forced or compulsory labour,
- of all forms of slavery and slave-trade, including practices akin to slavery, serfdom or other forms of domination or oppression in the workplace (such as extreme economic or sexual exploitation and humiliation, or human trafficking),

- to restrict workers' access to adequate housing, if the workforce is housed in accommodation provided by the company, and to restrict workers' access to adequate food, clothing, water and sanitation in the workplace and
- of unequal treatment in employment

as well as two prohibitions concerning children, namely the prohibition of the worst forms of child labour and prohibition of the employment of a child under the age at which compulsory schooling is completed.

Some of the rights and prohibitions also include environmental rights (see Part I, Section 1 of the Annex to the Directive), namely

- the right of individuals, groupings and communities to lands and resources and the right not to be deprived of means of subsistence,
- the prohibition of causing any measurable environmental degradation, such as harmful soil change, water or air pollution, harmful emissions, excessive water consumption, degradation of land, or any other impact on natural resources, such as deforestation,
  - that substantially impairs the natural bases for the preservation and production of food,
  - or that denies a person access to safe and clean drinking water,
  - or that makes it difficult for a person to access sanitary facilities or destroys them,
  - or that harms a person's health, safety, normal use of land or lawfully acquired possessions,
  - or that substantially adversely affects ecosystem services through which an ecosystem contributes directly or indirectly to human wellbeing,
- the prohibition to unlawfully evict or take land, forests and waters when acquiring, developing or otherwise using land, forests and waters, including by deforestation, the use of which secures the livelihood of a person.

The international human rights conventions listed in the Annex are

- the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights,
- the Convention on the Rights of the Child and
- the International Labour Organization's eight core/fundamental conventions.

Environmental protection

The scope of environmental protection is structured as follows: It covers both actual and potential adverse impacts on the environment. The EU Supply Chain Directive thus refers to adverse environmental impacts resulting from the violation of one of the prohibitions and obligations listed in the Annex to the Directive, as well as adverse impacts resulting from the breach of one of the obligations and prohibitions under the international environmental instruments listed in the Annex (see Art. 1 para. 1 lit. a in conjunction with Art. 3 para. 1 lit. b and Part II of the Annex to the Directive).

The prohibitions specified include

- the import, export, re-export or introduction from the sea of any specimen included in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) without a permit,
- the manufacture, import and export of mercury-added products listed in the Minamata Convention on Mercury (Minamata Convention),
- the use of mercury or mercury compounds in the manufacturing processes listed in the Minamata Convention,
- unlawful treatment of mercury waste contrary to the Minamata Convention,
- the production and use of chemicals listed in the Stockholm Convention on Persistent Organic Pollutants (POPs Convention),
- the unlawful handling, collection, storage and disposal of waste, in an environmentally unsound manner contrary to the POPs Convention,
- import or export of a chemical listed in the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade,
- the unlawful production, consumption, import and export of controlled substances in Annexes to the Montreal Protocol on substances that deplete the Ozone Layer to the Vienna Convention for the protection of the Ozone Layer, interpreted in line with the Montreal Protocol and licensing provisions under applicable law in relevant jurisdiction,
- the export of hazardous or other waste, interpreted in line with the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention),
- the export of hazardous wastes from countries listed in the Annex to the Basel Convention to countries not listed in the Annex to the Basel Convention, and

- the import of hazardous wastes and other wastes from a non-party that has not ratified the Basel Convention.

The obligations specified in the Directive consist of the following,

- to avoid or minimise adverse impacts on biological diversity, interpreted in line with the Convention on Biological Diversity and applicable law in the relevant jurisdiction, including the obligations of the Cartagena Protocol on the development, handling, transport, use, transfer and release of living modified organisms and of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity,
- to avoid or minimise adverse impacts on the properties delineated as natural heritage as defined in the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) and applicable law in the relevant jurisdiction,
- to avoid or minimise adverse impacts on wetlands as defined in the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) and applicable law in the relevant jurisdiction,
- to prevent the pollution from ships interpreted in line with the International Convention for the Prevention of Pollution from Ships as amended by the Protocol of 1978 (MARPOL 73/78) (the prohibition on the discharge into the sea of certain substances, of unlawful marine pollution by harmful substances carried by sea in packaged form and of unlawful pollution by garbage from ships), and
- to prevent, reduce and control pollution of the marine environment by dumping, interpreted in line with the United Nations Convention on the Law of the Sea (UNCLOS) and the applicable law in the relevant jurisdiction.

Climate protection

To a certain extent, climate also falls explicitly within the scope of protection of the EU Supply Chain Directive, namely due to the obligation to adopt and put into effect a transition plan for climate change mitigation (Art. 1 para. 1 lit. c in conjunction with Art. 22 of the Directive) for all companies within the scope of the EU Supply Chain Directive (Art. 22 in conjunction with Art. 2 para. 1 lit. a, b and c and para. 2 lit. a, b and c of the Directive).

Under this plan companies must

- ensure, through their best efforts, that the business model and strategy of the company are compatible with the transition to a sustainable economy and with the limiting of global warming to 1.5°C (in line with the Paris Agreement) and the objective of achieving climate neutrality (as established in the 2021 European Climate Law) and
- specify intermediate and 2050 climate neutrality targets and address, where relevant, the exposure of the company to coal-, oil- and gas- related activities.

The design of the transition plan for climate change mitigation referred to in the first subparagraph shall contain (Art. 22 (1) of the Directive):

- time-bound targets related to climate change for 2030 and in five-year steps up to 2050 based on conclusive scientific evidence and, where appropriate, absolute emission reduction targets for greenhouse gas for Scope 1, Scope 2 and Scope 3 greenhouse gas emissions for each significant category;
- a description of decarbonisation levers identified and key actions planned to reach the these (time-bound and, where appropriate, absolute) targets, including, where appropriate, changes in the product and service portfolio of the company and the adoption of new technologies;
- an explanation and quantification of the investments and funding supporting the implementation of the transition plan for climate change mitigation; and
- description of the role of the administrative, management and supervisory bodies with regard to the transition plan for climate change mitigation.

Member States must ensure that the transition plan for climate change mitigation is updated every 12 months and contains a description of the progress that the company has made towards achieving the (time-bound and, where appropriate, absolute – please see above) targets (Art. 22 (3) of the Directive).

Scope of application

The scope of the EU Supply Chain Directive includes certain “large” companies (Art. 3 para. 1 lit. a of the Directive) in the EU (Art. 2 para. 1 of the Directive) or from third countries (Art. 2 para. 2 of the Directive), whereby different dates of application (Art. 37

of the Directive) are provided for, depending on the entry into force of the Directive. The companies can be categorised into EU companies with limited liability (groups 1, 2 and 3) and companies from third countries operating in the EU (groups 4, 5 and 6). In accordance with Art. 2 Para. 5, the EU Supply Chain Directive shall only apply to companies that have met the aforementioned conditions for each of the last two consecutive financial years and should no longer apply where they cease to be met for each of the last two relevant financial years.

For Group 1 of limited liability companies established in the Union two thresholds relating to significant size and significant economic power are decisive, namely more than 1000 employees on average and a net worldwide turnover exceeding 450 000 000 euros (Art. 2 para. 1 lit. a of the Directive). The decisive factor is the last financial year for which annual financial statements have been or should have been adopted. The calculation is based on full-time equivalents; temporary agency workers are to be included (Art. 2 para. 4 of the Directive). The due diligence obligation under the EU Supply Chain Directive (see below) must be applied five years after the Directive has come into force.

Group 2 are EU limited liability companies that do not meet the thresholds of Group 1 (see above) but are the ultimate parent company of groups of companies that – taken together – fulfil those thresholds in the last financial year for which consolidated financial statements were adopted or should have been adopted (Art. 2 para. 1 lit. b of the Directive). Due diligence under the EU Supply Chain Directive (see below) must be applied five years after the Directive has come into force. Group 3 covers certain “significant” EU limited liability companies that entered or are the ultimate parent company of a group that entered into franchising or licensing agreements in the Union in return for royalties with independent third-party companies, where those agreements ensure a common identity, a common business concept and the application of uniform business methods (Art. 2 para. 1 lit. c of the Directive). These royalties must have amounted to more than EUR 22,500,000 in the Union in the financial year preceding the last financial year for which annual financial statements were adopted or should have been adopted. Furthermore, such companies or ultimate parent companies of groups of companies must have generated a net turnover of more than EUR 80,000,000 in the Union in the financial year preceding the last financial year for which (consolidated) annual financial statements were adopted or should have been adopted. The due diligence obligation under the EU Supply Chain Directive must be applied five years after the Directive has come into force. However, it is very unlikely that medical facilities are among Group 3 companies.

Group 1, 2 and 3 companies (see above) that had more than 3000 employees on average and generated a net worldwide turnover of more than 900 million euros are required to apply the due diligence obligation under the EU Supply Chain Directive (see below) as early as four years after the Directive has come into force (with the exception of the measures necessary to comply with the communication obligation under Art. 16 of the Directive [to be applied for financial years beginning on or after 1 January 2029]).

Companies in Groups 1, 2 and 3 (see above) that had more than 5000 employees and generated a net worldwide turnover of more than 1.5 billion euros must apply the due diligence obligation under the EU Supply Chain Directive (see below) three years after the Directive has come into force (with the exception of the measures required to remedy actual adverse impacts and minimise their extent under Art. 11 of the Directive [to be applied for financial years beginning on or after 1 January 2028]).

For Group 4, i.e. companies from third countries operating in the EU, net sales generated in the EU by Group 1 (i.e. more than 450 million euros see above) are recognised. The decisive factor here is the financial year preceding the last financial year. The due diligence obligation under the EU Supply Chain Directive must be applied five years after the Directive has come into force.

Group 5 comprises third country companies operating in the EU that do not reach the threshold of Group 4 (i.e. more than 450 million euros, see above), but are the ultimate parent company of a group that reached this threshold on a consolidated basis in the financial year preceding the last full financial year. The due diligence under the EU Supply Chain Directive (see below) must be applied five years after the Directive has come into force.

Group 6 covers certain “large” third country companies operating in the EU that have concluded franchise or licence agreements in the EU with independent third companies in return for licence fees (common identity, common business concept and application of uniform business methods) or are the ultimate parent company of a group that has entered into such agreements (Art. 2 para. 1 lit. c of the Directive). The same requirements apply here as for Group 3 (see above). The due diligence obligation under the EU Supply Chain Directive (see below) must be applied five years after the Directive has come into force.

Small and medium enterprises (SMEs) therefore do not fall directly within the scope of the EU Supply Chain Directive but may be affected by the due diligence obligation under the Directive in the activity chain (keyword “business partners’ chains of activity”).

Although SMEs are not included in the scope of this Directive, they could be impacted by its provisions as contractors or subcontractors to the companies which are in the scope (recital 69).

Where the ultimate parent company (Group 2 and 3 or Group 5 and 6, see above) has as its main activity the holding of shares in operational subsidiaries and does not engage in taking management, operational or financial decisions affecting the group or one or more of its subsidiaries, it may under certain conditions be exempted from carrying out the obligations under this Directive (Art. 2 para. 4 subpara. 1 of the Directive) but remains jointly liable with the designated subsidiary in the event of non-compliance with these conditions (Art. 2 para. 4 subpara. 2 of the Directive).

Medical organisations, established as a public limited company or limited liability company, will often not reach the thresholds of Groups 1 and 2. Nevertheless, the Directive is also relevant for them if they are active as suppliers of medical devices and therefore obliged to obtain the information required by the proposed Directive with regard to the environment, climate protection and human rights.

Due Diligence

The due diligence obligation pursuant to Art. 5 para. 1 of the EU Supply Chain Directive shall be fulfilled by carrying out the following actions

- integrating due diligence into policies and risk management systems (Art. 5 para. 1 lit. a in conjunction with Art. 7 of the Directive),
- identifying and assessing actual or potential adverse impact (Art. 5(1)(b) in conjunction with Art. 8 of the Directive) and, where necessary, prioritising actual and potential adverse impacts (Art. 5(1)(b) in conjunction with Art. 9 of the Directive),
- preventing and mitigating potential adverse impacts (Art. 5 para. 1 lit. c in conjunction with Art. 10 of the Directive),
- bringing actual adverse impacts to an end and minimising their extent (Art. 5 para. 1 lit. c in conjunction with Art. 11 of the Directive),

- providing remediation for actual adverse impacts (Art. 5 para. 1 lit. d in conjunction with Art. 12 of the Directive),
- carrying out meaningful engagement with stakeholders (Art. 5 para. 1 lit. e in conjunction with Art. 13 of the Directive),
- establishing and maintaining a notification mechanism and a complaints procedure (Art. 5 para. 1 lit. f in conjunction with Art. 14 of the Directive),
- monitoring the effectiveness of their due diligence policy and measures (Art. 5 para. 1 lit. g in conjunction with Art. 15 of the Directive),
- publicly communicating on due diligence (Art. 5 para. 1 lit. h in conjunction with Art. 16 of the Directive).

For this reason alone, it will be essential for obligated companies in the medical sector, but also for suppliers in the context of the "business partners' chain of activities" in the medical sector to compile information on compliance with due diligence obligations and to actively prepare this information.

Austrian companies in Groups 1 and 2 are subject to special obligations and must also submit a climate change mitigation plan (see above).

Infringements in the areas penalised by the directive (human rights and environmental violations) must be cancelled. It should be noted, however, that particularly in environmental protection legislation, the Directive is not very "robust". Particularly in the environmental sector, however, there is an urgent need for improvements in supply chain legislation.

It is thus necessary to critically monitor the transposition and implementation processes and to take adaptation measures as necessary.

Sanctions under public law

In implementing the EU Supply Chain Directive and in order to ensure effective enforcement, Member States are to provide for dissuasive, proportionate and effective penalties for infringements (including pecuniary penalties and a public statement indicating the company responsible and the nature of the infringement if the company fails to comply with a decision imposing a pecuniary penalty within the applicable timeframe) and impose penalties applicable to infringements of the provisions of national

law adopted pursuant to this Directive, and shall take all measures necessary to ensure they are implemented (Art. 27 (1) and (3) of the Directive).

In deciding whether to impose penalties and, if such penalties are imposed, in determining their nature and appropriate level, due account shall be taken of the aspects referred to under of Art. 27 (2) of the Directive (the nature, gravity and duration of the infringement, and the severity of the impacts resulting from that infringement); any investments made and any targeted support provided pursuant to Articles 10 and 11 of the Directive; any collaboration with other entities to address the impacts concerned; where relevant, the extent to which prioritisation decisions were made in accordance with Article 9; any relevant previous infringements by the company of the provisions of national law adopted pursuant to this Directive found by a final decision; the extent to which the company carried out any remedial action with regard to the subject matter concerned; the financial benefits gained or losses avoided by the company due to the infringement; any other aggravating or mitigating factors applicable to the circumstances of the case concerned).

Pursuant to Art. 22 (4) of the Directive, pecuniary penalties imposed shall be based on the company's net worldwide turnover (not less than 5% of the net worldwide turnover of the company in the financial year preceding that of the decision to impose the fine). Any periodic penalty payments imposed must be based on the company's worldwide net turnover (at least 5% of the company's worldwide net turnover in the financial year prior to the decision to impose the periodic penalty payment) or calculated taking into account the consolidated turnover reported by the ultimate parent company.

Any decision concerning penalties related to the infringements of the provisions of national law adopted pursuant to the EU Supply Chain Directive shall be published and remain publicly available for at least five years – without providing personal data as defined by the General Data Protection Regulation (2016).

Civil liability

According to Art. 29 of the EU Supply Chain Directive, companies shall be held liable for damage caused to a natural or legal person if they fail to fulfil the obligations arising from the

- prevention and mitigation of potential adverse impacts (Art. 10)
- or the elimination of actual adverse impacts and the minimisation of their extent (Art. 11)
- intentional or negligent failure to comply with the obligations laid down in Articles 10 and 11, when the right, prohibition or obligation listed in the Annex to this Directive is aimed at protecting the natural or legal person, where
- as a result of this failure damage to the natural or legal person's legal interests that are protected under national law was caused and if
- the damage was not exclusively caused by their business partners in their chain of activities (see above).

Companies that have participated in industry or multi-stakeholder initiatives, or used independent third-party verification or contractual clauses to support the implementation of due diligence obligations may nevertheless be held liable in accordance with Art. 29 para. 4 of the EU Supply Chain Directive.

According to Art. 29 (5) of the Directive, the civil liability of a company for damages arising under the above provision shall be without prejudice to

- that of its subsidiaries or
- any direct or indirect business partners in the chain of activities.

If the damage was caused jointly by the company and its subsidiary, direct or indirect business partner, they shall be liable jointly and severally (without prejudice to the provisions of national law concerning the conditions of joint and several liability and the rights of recourse).

The Member States are obliged to transpose and implement the Directive. It should be noted that the Directive itself stipulates that all national provisions adopted in implementation of the Directive are of direct applicability, i.e. Member States shall ensure that the provisions of national law transposing this Article are of overriding mandatory application pursuant to Art. 29 (7) of the Directive

- in cases where the law applicable to such claims
- is not the national law of a Member State (keyword PIL/Private International Law – overriding mandatory provision).

5.4.2.2 Relevant constitutional standards

The following comments and options for action are essentially based on the study "Klimaschutz und Gesundheit" (Climate Protection and Health) by expert consultant university professor Dr Erika M. Wagner (Wagner 2024).

Fundamental rights

a) European Convention on Human Rights (ECHR)
b) Charter of Fundamental Rights of the European Union
c) Convention on the Rights of the Child of 20 November 1989
d) Federal Constitutional Law on the Rights of Children
e) International Covenant on Economic, Social and Cultural Rights
f) European Social Charter

Constitutional legislation in Austria

g) Federal Constitutional Act on Sustainability, Animal Welfare, Comprehensive Environmental Protection, Safeguarding the Water and Food Supply and Research

At national level, the Federal Constitutional Act includes a commitment to sustainability:

"§ 1 The Republic of Austria (federal government, federal provinces and municipalities) is committed to the principle of sustainability in using natural resources to ensure that future generations will also benefit from optimal quality of life.

Climate protection (SDG 13) and the need to engage in climate protection in the context of the healthcare sector are integral to the principle of sustainability and can thus also be derived – via the duty to take relevant action – from the provisions under the Federal Constitutional Act on Sustainability. Conversely, health protection (SDG 3) and the need to take relevant action through climate protection measures can also be derived as a call for action from the Federal Constitutional Act on Sustainability.

h) Allocation and sharing of responsibilities

At national level, the healthcare sector is a cross-cutting issue. This means that federal and provincial legislators may thus regulate the area of health protection from various

perspectives. In connection with climate change, this is a matter covered by Art. 10 para. 1 no. 12 (healthcare) and therefore falls within the federal government's legislative and enforcement scope of powers.

With regard to medical care and nursing institutions that fall within the scope of health resorts and natural curative resources, the federal government's remit in terms of legislation and implementation relates only to sanitary supervision. Pursuant to Art. 12 para. 1 subpara. 1 of the Federal Constitutional Act these fall under the legislative framework competence of the federal government. All provisions under §§ 1 to 42e of the Hospitals and Health Resorts Act (Krankenanstalten- und Kuranstaltengesetz) are therefore provisions relating to principles and fall within the federal government's scope of responsibility, while the federal provinces are responsible for implementing and enforcing laws.

These responsibilities can, however, not be applied to general measures and activities. Powers relating, for instance, to including hospitals in spatial planning concepts, or even establishing standards with respect to special regulations relating to the construction of hospitals can, however, not be derived from these provisions.

5.4.2.3 Quality targets in the healthcare sector in the context of climate protection goals

The following comments and options for action are essentially based on the study "Klimaschutz und Gesundheit" (Climate Protection and Health) by expert consultant university professor Dr Erika M. Wagner (Wagner 2024).

Hospitals and Health Resorts Act

As a fundamental provision within the federal government's scope of responsibilities, § Section 5a contains a catalogue of patients' rights, which is to be specified and put into concrete terms by implementing laws is the business of the federal provinces. The related rights are basic needs but are only most remotely related to aspects associated with climate protection and climate neutrality. Thus, there is, for instance, no such thing as a right to a certain type of diet for ideological or climate protection reasons.

A study conducted by the Federal Ministry of Social Affairs, Health, Care and Consumer Protection also found that Section 5a contains deficits in so far as relevant content that would take proper account of the constantly growing environmental awareness is lacking (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2021a).

Fundamental rights require the state to adopt corresponding legislation via laws. In this spirit, the standards governing the healthcare system are to be upgraded with a view to ensuring the best possible patient protection regarding the challenges of climate protection – as the state is responsible for protecting each individual person.

2004 Federal Act on the Quality of Healthcare 2004 (Gesundheitsqualitätsgesetz, GQG)

With respect to the sustainable promotion of high-quality healthcare services, Section 1 of the 2004 Federal Act on the Quality of Healthcare Act (Gesundheitsqualitätsgesetz – GQG) stipulates as follows:

§ 1.

(1) Systematic quality work is to be implemented and intensified in order to provide, secure and improve quality on a full-coverage basis within the Austrian healthcare system. The work to set up, further develop, ensure and evaluate a full-coverage Austrian quality system shall be implemented nationwide, across all federal provinces, sectors and professions, especially including the outpatient sector. It must be founded on the principles of patient orientation and transparency, and it must promote and ensure quality in a sustainable way throughout the provision of healthcare services, taking patient safety into account.

(2) Specifications concerning the quality system have to meet the requirements of the "Zielsteuerung-Gesundheit" (management by objectives in the healthcare sector, i.e. Target-based Health Governance) by all means, in accordance with the Federal Act on Management by Objectives in the Healthcare Sector (i.e. Target-based Health Governance), Federal Law Gaz. I No 81/2013, as amended, and particularly of the monitoring referred to therein. Quality work must provide a significant contribution to the medium- and long-term improvement of effectiveness and efficiency in healthcare and therefore contribute to the improvement of the population´s healthcare and its long-term

financial sustainability. Throughout this process structural, procedural and outcome quality parameters need to be taken into account.[24]

(3) For purposes of assuring that the principles established in § 1 (1) and (2) are upheld, the Federal Minister for Health must ensure corresponding coordination among all the stakeholders involved in the quality system throughout Austria. Furthermore, the Federal Minister for Health is responsible for ensuring nationwide coordination of quality actions for purposes of national and international comparability of healthcare services.

For the purposes of this Act, a quality system pursuant to Section 2(1) of the 2004 Healthcare Quality Act is considered to be a federal coordination, promotion, support and monitoring system aimed at continuously improving the quality of healthcare services.

The term quality is essential for the purposes of this paper. This term is legally defined in § 2 fig. 2 of the 2004 Healthcare Quality Act. It is understood as the degree to which patient-oriented, transparent, effective and efficient hallmarks in the provision of healthcare services are fulfilled. Key concerns in this context are the optimisation of structural quality, process quality and outcome quality.

This legal definition is therefore not merely a technical definition of quality in the sense of the absence of errors. The above definition of the term quality refers to the subjective view of quality from the patient's perspective. Quality is therefore the degree of fulfilment of the healthcare service provided, as assessed by the patients. As the term quality is defined very inconsistently in the healthcare sector (Lorenz 2022a) and there are many different approaches to defining it, it makes sense to take the definition of the term quality directly from the law and to consider the subjective aspect of quality in particular. Based on that, quality is defined by the evaluation or assessment of the healthcare services received/consumed by the patient (Lorenz 2022b). A large number of such patient assessments can be summarised as quality indicators.

[24] Highlighted by the authors

The term patient satisfaction in the context of climate protection and health

Patient assessments are therefore satisfaction ratings. The concept of (patient) satisfaction is a complex attitude construct[25] as they are summary assessments of social circumstances and condition. “An attitude is a psychological tendency that is expressed by evaluating a certain situation with a certain degree of approval or disapproval” (Spektrum 2022). In other words, satisfaction is a hypothetical construct that assesses the degree to which subjective expectations match the actual satisfaction experienced with a service or product (Gabler Wirtschaftslexikon 2022). Essentially one may say that a satisfaction rating is methodically defined by way of a target/actual comparison (Bruggemann 1974) between expected health service and health service received.

So, if patients who are to receive treatment expect that climate protection is considered in this context, climate protection should be taken into account in healthcare facilities as a quality dimension in accordance with Section 1 (1), last sentence of the Healthcare Quality Act *(“It must be founded on the principles of patient orientation and transparency and it must promote and ensure quality in a sustainable way throughout the provision of healthcare services, taking patient safety into account.”).*

In accordance with Section 1 (2), second sentence of the Healthcare Quality Act, this quality work must make a significant contribution to increasing the effectiveness and efficiency of the healthcare system in the medium to long term and thus contribute to improving healthcare for the population and its long-term financial viability. From the quality system point of view, it is thus necessary to consider the levels of structural, process and outcome quality in this context.

As regards the definition of the term effectiveness in the Healthcare Quality Act, § 2 fig. 6 stipulates that effectiveness refers to the degree of achievement between a targeted objective and the realisation thereof, whereby the goal set in the healthcare system is ideally the maintenance and/or restoration of the health of both citizens and patients alike. Effectiveness therefore means doing the right things, i.e. selecting the right strategic goals in the healthcare system.

[25] The term "attitude" refers to an individual's willingness, based on experience, to react in a certain way to a person, a social group, an object, a situation or an idea, which may be expressed in cognitive (assumptions and beliefs), affective (feelings and emotions) and behavioural (behaviours) terms.

In this context, this also includes protecting citizens from the impacts of climate change and the related strategic goal can therefore be summarised as follows: “Climate protection is health protection”. The starting point for the strategic direction of all activities launched in the healthcare sector may thus be defined as “climate-friendly healthcare system”.

De lege ferenda, this means that one of the healthcare system’s quality characteristics defined in future legislation must be the extent to which the requirements of climate protection are taken into account or to which extent the carbon footprint has been reduced. De lege lata – as reflected in the present study – an understanding of the matter in hand may already lead to this result.

§ 1 (5) and (6) read:

“(5) With a view to strategic reorganisation and further development of cross-sectoral quality assurance and quality monitoring in the healthcare sector, the Federal Minister responsible for healthcare shall ensure appropriate coordination between the stakeholders involved in the overall Austrian quality system, in particular the provinces and the social insurance institutions.

(6) To this end, a Quality Council comprising members from the federal provinces, social insurance institutions and the federal government is to be set up in the context of the target-based governance bodies. The Quality Council shall take strategic decisions on the structure, possible steps towards expansion and the implementation of quality assurance.”

Strategic target: “Climate protection is health protection”

This goal, although the wording used is not identical, is included in several healthcare facilities’ strategic concepts, including the Upper Austrian Health Holding Company (Oberösterreichische Gesundheitsholding), Carinthian Hospital Operating Association (KABEG), the Vienna Health Association (Wiener Gesundheitsverbund). At national level, however, there is currently no single strategy in which the goal of climate protection as health protection has been firmly established. Although individual strategy papers, discuss inter alia core process strategies, networking strategies, employee strategies, financial strategies and IT strategies, they have not yet established a link between climate protection and health.

This goes to show that also from a strategic point of view it is necessary to raise awareness of the fact that climate protection is key to health protection.

Avoiding the health impacts of climate change as a statutory quality objective

As outlined at the beginning of this study, effective climate-protecting measures in the healthcare sector play an important role in achieving the goals and implementing the strategy positioning “Climate protection is health protection”. Although these measures cannot be implemented by the healthcare sector alone, they have a direct impact on people's health and therefore have a direct effect on the demand for healthcare services.

According to § 2 fig. 11 of the 2004 Health Quality Act, a healthcare service is “any act performed by a member of a legally recognised healthcare profession or a legally recognised health care organisation on or for a person for the purpose of promoting, maintaining, restoring or improving his/her physical or mental state of health”.

The goal pursued by climate-protecting measures is to mitigate health impairments caused by climate change and thus reduce the demand for related healthcare services in the long term. As a result, this also leads to reduced hospital capacity utilisation. The fewer people that fall ill, the lower the capacity utilisation of hospitals, which means that fewer healthcare services and resources are required (fewer rooms, less medication, less energy etc.), leading altogether to a reduction in pollutant emissions.

Once the effective, conceptual formulation of the strategic direction to be pursued has been defined, i.e. “Climate protection is health protection”, it is necessary to adopt measures aimed at implementing this strategy. Effectiveness in the healthcare sector is thus complemented by efficiency, and this refers to doing the effective (selected, correct) things right, i.e. acting quickly and in a resource-efficient manner. Under § 2 fig. 7 of the 2004 Health Quality Act, the term efficiency is defined as follows: “the relationship between the input and the outcome of a service in accordance with the principle of economy, always with a view to keeping costs down”.

According to Section § 1 (2) of the 2004 Health Quality Act, the main cornerstones of efficiency are measures that are characterised by structural, procedural and outcome quality parameters:

In accordance with § 2 fig. 8 of the 2004 Health Quality Act, “structural quality” refers to “the total of material equipment and staff availability expressed in terms of quantity and quality”.

According to § 2 lit 9 of the 2004 Health Quality Act, “process quality” refers to “work sequences and procedures carried out systematically according to comprehensible and verifiable rules and according to the state of professional knowledge, regularly evaluated and continuously improved”.

Both elements, structural quality and process quality, have a direct impact on the outcome quality, which is defined under § 2 fig. 10 of the 2004 Health Quality Act, as measurable changes in the professionally assessed state of health, quality of life and satisfaction of a patient or population group as a result of specific framework conditions and measures.

Pursuant to Section 4 (1) of the 2004 Health Quality Act, the Federal Minister of Health can support the development of quality standards for performing specific healthcare services, by including the respective parties involved, in particular the relevant healthcare professions and the patients.

(2) In connection with performing healthcare services, the Federal Minister of Health and Women’s Affairs can recommend quality standards as Federal quality guidelines or decree ordinances on Federal quality directives, with particular attention paid to

1. nationwide uniformity,
2. consideration of an approach across all sectors and professions,
3. patient orientation,
4. basic principles of health promotion,
5. transparency,
6. state of the art in science and experience in terms of effectiveness and efficiency

This means that – derived from the strategic thrust of “climate protection is health protection” – it would be possible to develop more detailed quality standards aimed at climate protection that contain specifications and recommendations for action with respect to healthcare services and are defined in accordance with the three dimensions of structural quality, process quality and outcome quality defined in Section 1 (2) of the Health Quality Act. This is within the Federal Minister’s scope of responsibilities.

With a view to mandatory target achievement, it is recommended that quality indicators be defined. As set out in § 2 fig. 15 of the 2004 Health Quality Act, a quality indicator is a measurable value that enables monitoring, comparison and evaluation of the quality of healthcare services. As already mentioned, the satisfaction ratings and assessments shared by patients could be grouped into quality indicators.

There is currently no meaningful list of health indicators grouped into climate-relevant, i.e. harmful and beneficial, categories. The development of such indicators would make the strategic goal "Climate Protection is Health Protection" at operational level comparable and contribute to improving health performance. At European level, 88 European health indicators have been developed (EC 2022). Position no. 17 takes account of extreme temperatures.

According to § 5 (1) of the 2004 Health Quality Act, the Federal Minister of Health must "ensure that the quality provisions regarding the provision of healthcare services in the sense of systematic quality work consider structural, procedural and outcome quality, whereby the development of corresponding methodical work and the reporting and documentation requirements must be considered. Structural, procedural and outcome quality shall be in direct and balanced proportion to one other, bearing in mind that the development and improvement of quality outcome indicators and their measurement in all sectors of the healthcare system shall be a priority" [26] These specifications shall also be undertaken in accordance with the targets defined in "Management by objectives in the healthcare sector" (i.e. target-based health management), taking account of current reporting and documentation requirements as well as international developments.

§ 5 (2), (3), (4) and (5) read as follows:

(2) With respect to structural quality, the Federal Minister of Health and Women's Affairs shall develop binding structural quality criteria for the provision of healthcare services. These structural criteria shall be complied with when providing healthcare services irrespective of the organisational entity in which they are performed. Corresponding reporting obligations must be defined by the Federal Minister of Health.

[26] Highlighted by the authors

(3) With respect to process quality, the Federal Minister of Health shall develop binding requirements and ensure support by providing appropriate instruments. The Federal Minister of Health must ensure that process quality indicators and reporting obligations regarding these process quality indicators be defined inter alia within the framework of Austrian quality reporting.

(4) With respect to outcome quality, the Federal Minister of Health shall ensure that indicators and reference scopes regarding outcome quality and corresponding reporting duties are stipulated, inter alia within the framework of Austrian quality reporting."[27]

(5) With a view to drawing up recommendations aimed at developing and regularly adapting the ordinance in accordance with § 9b, the Federal Minister responsible for healthcare may make use of the National Institute for Quality in Healthcare (Bundesinstitut für Qualität im Gesundheitswesen, BIQG) in line with § 9.[28]

All these quality dimensions could be put into more concrete terms based on climate-protecting quality indicators or could already be interpreted in this way. When developing quality indicators, care must be taken to ensure international comparability. *"A related challenge is to ensure the effectiveness, efficiency and coherence of action across the various levels of governance. EU adaptation policy should consider national strategies and plans, as well as actions at transnational levels" (EEA 2017).*

As illustrated by the international developments outlined above, such quality indicators are in line with international developments, as these are also increasingly reacting to climate-related threats.

5.4.2.4 Climate-related improvements in the organisational structure

The following comments and options for action are essentially based on the study "Klimaschutz und Gesundheit" (Climate Protection and Health) by expert consultant university professor Dr Erika M. Wagner (Wagner 2024).

[27] Highlighted by the authors
[28] Highlighted by the authors

Energy management system according to ISO 50001

Provided it is not already mandatory to have an energy management system – see below on large companies' obligation relating to environmental management systems or energy audits – consideration should also be given to the extent to which such a system should be required by law.

ISO 50001 is the most important international standard for improving energy efficiency. ISO 50001 for energy management systems has been transposed into the Austrian standard regulations and supports organisations in setting up systematic energy management. The standard defines requirements relating to the introduction, realisation, maintenance and improvement of energy management systems. Furthermore, a systematic approach and the establishment of corresponding processes and systems are to facilitate ongoing improvements in energy-related performance.

In light of the fact that the quality system was established by law pursuant to § 2 lit 1 of the 2004 Health Quality Act, which is understood as a federal coordination, promotion, support and monitoring system aimed at improving the quality of healthcare services, it is suggested to also establish an energy management system by law either directly for the healthcare facilities or, like the quality system, as a federal coordination, support and monitoring system whose stipulated aim is to increase the quality of climate-friendly healthcare services. In this case, it would be necessary to either amend the Health Quality Act or enact the corresponding new legislation.

A statutory obligation to introduce such an energy management system directly in all healthcare facilities or doctors' surgeries would strongly support the climate strategy in the healthcare sector (see below for the companies already obliged to do so).

An alternative approach could, for instance, consist of granting financial incentives to promote the introduction of energy management systems.

According to Section 41 (1) of the Federal Energy Efficiency Act (Bundes-Energieeffizienzgesetz), companies based in Austria are obliged ("obligated companies") to conduct an energy audit or to set up a recognised management system (such as an energy management system or an energy efficiency management system). if they are large companies (within the meaning of § 37 fig. 25 of the Federal Energy Efficiency Act) (fig. 1), which have exceeded the thresholds within the meaning of § 37 fig. 31 of the

Energy Efficiency Act in the calendar year preceding the last calendar year (fig. 2), *"or are in a consolidated corporate view more than 50% owned by another company or hold more than 50 % ownership of other companies and have exceeded the thresholds pursuant to § 37 fig. 31 of the Energy Efficiency Act in the calendar year preceding the last calendar year in all companies that are more than 50 % affiliated." (fig. 3).*

"Large companies" are (cf. § 37 fig. 25 of the Federal Energy Efficiency Act) those companies that are not small (fig. 29) or medium-sized enterprises (fig. 31). "Small companies" are companies that have a maximum of 49 employees and whose turnover or balance sheet total does not exceed ten million euros (cf. § 37 fig. 29 of the Federal Energy Efficiency Act). "Medium-sized companies" are those companies that have a maximum of 249 employees and whose turnover does not exceed 50 million euros or a whose balance sheet total does not exceed 43 million euros, unless they are small companies (fig. 29) (cf. § 37 Z 31 of the Federal Energy Efficiency Act).

Accordingly, companies based in Austria with more than 249 employees or a turnover of more than 50 million euros or a balance sheet total of more than 43 million euros are obliged to conduct an energy audit or set up a recognised management system.

The following regulations in § 41 (2) and (3) of the Energy Efficiency Act must be observed with respect to the calculation:

"(2) Companies which are more than 50% owned by another company or which hold more than 50% of the shares in other companies shall be aggregated on a group basis.

(3) A controlling influence pursuant to section § 244 (2) fig. 3 of the Austrian Commercial Code means that in the context of the group aggregation pursuant to para. 2, these companies are to be treated in the same way as companies that are more than 50% owned by another company."

Small and medium-sized enterprises may make voluntary use of energy efficiency services and report the findings or have the findings generated, particularly on energy consumption and savings potential, reported to E-Control (comp. § 41(4) of the Energy Efficiency Act).

Energy audits and management systems at companies

According to § 42 (1) of the Energy Efficiency Act , the “obligated companies” have two equivalent options for complying with the obligation as defined in § 41 Energy Efficiency Act.[29] They either have to conduct an energy audit at regular intervals (at least every four years) performed by an energy auditor (fig. 1) or set up one of the recognised management systems listed below (fig. 2). Companies may also combine energy audit and recognised management system to meet the obligation under (1) (comp. § 42 (5) Energy Efficiency Act).

Management systems:

The recognised management systems (fig. 2) may be an energy management system (lit. a) or an environmental management system (lit. b).

An energy management system (within the meaning of lit. a) must be certified by an accredited body and be based “on recognised relevant European, international or adopted standards”. It must comply with the Austrian Standard ÖNORM EN ISO 50001.

Subsequent standards of this ÖNORM EN ISO 50001 are considered recognised management systems in accordance with this provision .[30]

An environmental management system must be certified by an accredited body and be “based on recognised relevant European, international or adopted standards” or a validated environmental management system in accordance with EMAS Regulation (EC) No. 1221/2009, OJ No. L 342 of 22. 12. 2009 p. 1" (lit. b). It must therefore comply with either ÖNORM EN ISO 14001 or the EMAS Regulation .[31] Here too, management systems that comply with the successor standards to ÖNORM EN ISO 50001 or ÖNORM EN ISO 14001 are recognised management systems in accordance with this provision .[32]

In Annex 1 (to § 42), the Energy Efficiency Act also sets out minimum requirements in terms of content to be fulfilled by energy audits and management systems, whereby the

[29] cf. IA 3426/A 26. GP 46
[30] cf. IA 3426/A 26. GP 46
[31] cf. IA 3426/A 26. GP 46
[32] cf. IA 3426/A 26th GP 46

main consumers of energy (buildings, production processes and transport) are subject to energy analyses and evaluations.

Introduction of an environmental management system

Participation in an environmental management system (EMAS, ISO 14001) also has lasting positive effects on the climate. Hence, participation in such a system could be made a legal obligation for those who do not yet have to take part in such a system anyway (i.e. meeting the requirements under § 42 (1) fig. 2 of the Energy Efficiency Act, see above). The scope of an environmental management system is broader than that of an energy management system and inter alia includes information on waste and water.

Holistic orientation towards environmental management supports climate-protecting measures and encourages healthcare facilities to permanently adopt a green management approach, which is also evaluated (Flintrop 2001).

Using this instrument could also enable improvements in the healthcare sector that contribute to achieving the CO_2 reduction target.

Firmly establishing climate protection at organisational level in the healthcare sector by installing a climate manager

Although not yet enshrined in law, it would nevertheless be advisable to establish the position of a climate protection officer or climate manager. A climate manager could oversee all these measures, being responsible at organisational level for all aspects related to climate protection and health in healthcare facilities and could furthermore design, roll out and be responsible for an energy management system in accordance with ISO 50001.

The position of climate manager would be newly created. The person who holds this position must have undergone specific training in the fields of climate protection and health. Enshrining this position in the law also requires clear definition of the precise framework conditions (for instance one climate manager per provider/operating organisation/location etc.). The recommended set-up is one climate manager per location. It would also be necessary to lay down further necessary framework conditions, such as relevant minimum qualifications, minimum time resources, not subject to instructions

when making active use of expert knowledge, definition of responsibilities and tasks, to name but a few.

According to § 5b of the Federal Act on Hospitals and Sanatoria (KAKuG), provincial legislation requires hospital operators to fulfil the following obligations:

§ 5b.

(1) Provincial legislation shall oblige hospital operators to provide for quality assurance measures and measures to ensure patient safety within the framework of the organisation, while also taking sufficient account of supra-regional concerns. The measures shall be designed in a way that facilitates comparative audits with other hospitals.

(2) Hospital operators shall create the conditions for internal quality assurance measures. These measures shall cover structural, process and outcome quality.

(3) The collegial management team shall ensure the implementation of comprehensive quality assurance activities. In hospitals that are not managed by a team sharing collegial responsibility, the hospital operator shall take care that for each individual area the responsible person ensures implementation of quality assurance measures.

(4) A quality assurance committee shall be set up in every hospital with beds and shall be headed by a professionally qualified person. This committee shall include at least one representative of the medical service, the nursing service, the medical-technical service and the administrative service. In hospitals that are wholly or partly used for research and teaching at a medical university, the committee shall also include the rectorate or a university professor at the medical university proposed by this university. In hospitals that are wholly or partly used by a medical school at a university for the purpose of research and teaching, the commission shall include the vice-rector responsible for medical matters, or a university professor proposed by the medical vice-rector.

(5) The commission shall be tasked with initiating, coordinating and supporting quality assurance measures as well as with promoting the implementation of quality assurance and to advise the hospital’s management team or, in hospitals without collegial management team, the respective person responsible, on all necessary measures.

(6) Provincial legislation shall oblige hospital operators to participate in regular Austria-wide quality reporting.

Under § 5b of the Hospitals and Health Resorts Act, climate protection-relevant dimensions could be added to the quality criteria. Furthermore, enshrining the position of climate manager in the law would fulfil the content-related obligations defined in § 5b. With regard to climate protection and health, it is therefore necessary to define the respective goals and specify the respective climate-protecting quality indicators based on the climate strategy defined. This task would fall under the climate manager's scope of responsibility, as would the ongoing process-orientated improvement of the selected climate-friendly measures.

Alongside developing the necessary soft skills, ongoing further development also includes expertise in the field of pharmaceuticals, medicinal products and medical devices.

The position of climate manager is not enshrined in the substantive laws, but could be enshrined in the Health Quality Act, for instance, and could drive achievement of climate neutrality and climate change adaptation targets forward. The climate manager would therefore be responsible for climate protection and health at both the operational and the strategic level.

In light of the above, it would thus be advisable to enshrine the position of climate manager in the law.

5.4.2.5 Target-based Health Governance

The topics of climate protection, climate change adaptation and climate resilience have – as yet – not been included in the Target-based Governance Agreement. The extent to which ecological parameters affected by the changes set in motion by the reforms of Target-based Health Governance has not yet been taken into account. When assessing Target-based Health Governance based on ecological aspects, it is possible to identify starting points that may potentially also contribute to CO_2 emissions reductions (Brugger 2023):

- Reduction of patient journeys through decentralised care
- Integrated healthcare and telemedicine

- Reduction in medical care as a result of the increase in health promotion and prevention activities

In the context of future negotiations on a new federal Target-based Governance Agreement, it is important to address and consider potential synergies or conflicts regarding health-related and environmental targets.

With a view to firmly establishing the topics of climate protection, climate change adaptation and climate resilience in Target-based Health Governance, it is recommended that a separate category be included that focuses on climate-related targets in the healthcare sector.

5.5 Financing

5.5.1 Status quo

Due to the structure of both the Austrian healthcare system and the federal system (please see Chapter 2.5.3), financing flows are very complex. Such flows are, however, a key control variable in the context of climate protection, climate change adaptation and resilience. Transformation towards a climate-neutral healthcare system may be accelerated using various tools and instruments, in which context, financial equalisation and federal budgets play a key role.

5.5.2 Options for action

Integrating climate protection into fiscal equalisation

Fiscal equalisation and the associated legal matters form a central building block in financing the healthcare sector (as well as other climate-relevant areas such as transport or education). Fiscal equalisation regulates the financial relations between the federal government, the federal provinces and the municipalities as well as the associated tasks and is enshrined in the Agreement between the Federal Government and the Provincial Governments pursuant to Art. 15a of the Federal Constitutional Law on the organisation

and financing of the healthcare system. Climate change and the associated consequences impact the public sector and fiscal equalisation in multiple ways. This is associated with the fact that specific requirements for a resilient organisation of financial equalisation have to be met. A resilient public sector – which also includes fiscal equalisation – is characterised by the following dimensions (Getzner 2021):

1. Robustness, endurance and sustainability
2. Adaptability and flexibility
3. Versatility and innovative power
4. Preparedness and learning ability

When dealing with crisis situations and the special requirements of financial equalisation, a distinction must be made between acute crises and chronic crises. Acute crises, such as the COVID-19 pandemic, come quickly and unexpectedly. Chronic crises, such as climate change and its impacts, are foreseeable and in terms of substance often associated with developments clearly expected by experts and may thus also be countered (Thöne 2021). With respect to problem-solving, the goal pursued in acute crises is usually to overcome the crisis and reach a point that is more or less similar to the starting point. Thöne emphasises that in chronic crisis the nature of problem-solving differs in two key respects: it is no longer possible to overcome the challenges, and the overall system is changing towards a new state, thereby changing the tasks to be fulfilled by the state as well as the financing requirements, which holds particularly true for adapting to climate change and also for combating its aggravation.

When it comes to managing chronic crises, Thöne has identified “political inertia” and often “frozen political compromises” in fiscal equalisation as challenges (Thöne 2021, 43).

Against the background of the climate crisis, fiscal equalisation systems are quite generally faced with the major challenge of integrating new and changed tasks into the federal provinces’ and municipalities’ service portfolio. Thöne describes integrating the new and additional financial requirements as the “ultimate test” for the resilience of fiscal equalisation (Thöne 2021, 44).

Approaches to and instruments for integrating climate protection into fiscal equalisation in the health sector

The following measures are to be promoted in future agreements on fiscal equalisation (using the specific example of the agreements concluded in the context of the 2023 healthcare reform):

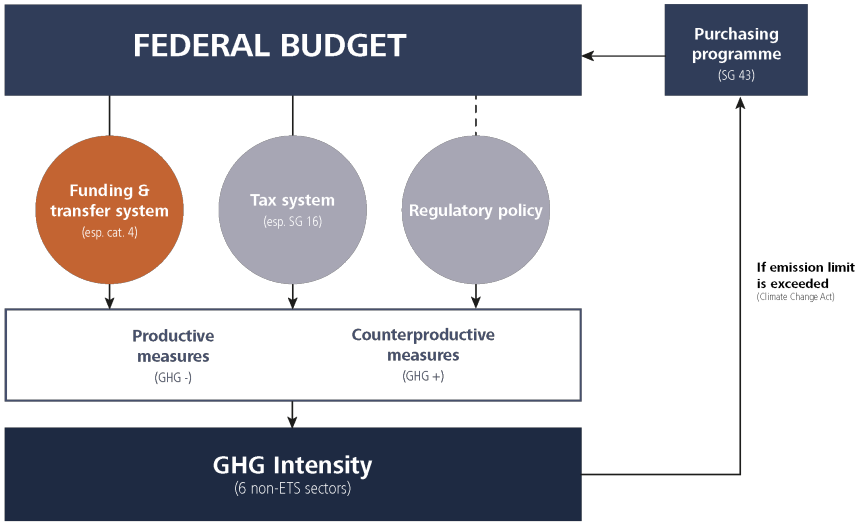
- In both the inpatient and outpatient sectors, financial flows can be linked to climate protection and climate change adaptation requirements that inter alia meet criteria such as energy efficiency, energy saving, resource efficiency, increasing the proportion of reusable items, waste reduction etc. It is possible to link financial flows to criteria or to grant a bonus if the criteria are met or – otherwise – a reduction in funding if they are not met.
- Provision of financial resources and setting up an 'innovation fund' for the special project "Climate-Neutral Healthcare Facilities"
- Firmly establishing the topics of climate protection, climate resilience and climate change adaptation in the Agreement under Art. 15a of the Federal Constitutional Law on the organisation and financing of the healthcare system under Section 8, Reallocation of financial resources to optimise care, Art. 31 and Art. 32
- Firmly establishing the topics of climate protection, climate resilience and climate change adaptation in the Agreement under to Art. 15a of the Federal Constitutional Law on the organisation and financing of the healthcare system under Section 9, Further financing measures, Art. 35

Furthermore, it is necessary to reconsider existing systems in the context of hospital financing and to establish corresponding innovative incentive structures to facilitate savings in energy and resources.

Climate and environmental protection in the federal budget and green budgeting

The categorisation of climate- and environment-related financial flows (incoming and outgoing payments or revenues and expenses) is a complex challenge and requires a systemic approach, which is illustrated in Figure 27 below.

Figure 27: Systematic approach to climate and environmental protection in the federal budget



Source: Federal Ministry of Finance (2022a)

This systematic approach is to be expanded in the coming years. Transparency will subsequently enable the necessary conclusions to be drawn regarding the measures to be launched and their effectiveness.

The European Commission and the OECD use the term green budgeting to describe the innovative approach of linking budgetary considerations with climate policy and environmental protection. The Federal Ministry of Finance defines green budgeting as follows:

“Green budgeting records and analyses the positive, neutral and negative climate- and environmental-specific impacts of all budgetary, regulatory and tax policy measures and processes in the public sector, taking all available data into account. This analysis includes both financial aspects (input analysis) and impact dimension assessments (impact analysis) and provides a basis for decision-making on the contribution to compliance with climate and environmental targets that are binding under national, international and international law.” (Federal Ministry of Finance 2022a, p. 14 [German version]).

Application of the green budgeting principles to the main health budgets would constitute a central pillar of transparency and impact-orientation in delivering on climate neutrality.

Module 1 of the Spending Review cycle under the Austrian Recovery and Resilience Plan relates to the 'analysis of the subsidy and incentive landscape with regard to climate and energy policies' and includes 'climate responsibility mechanisms' for relevant stakeholders and the definition of specific greenhouse gas reduction targets specifying fixed budget ceilings. In the context of the 2024 stocktaking process, the contents of Module 1 are also considered important input.

The Federal Ministry of Finance defines the focus and target structure as follows: (Federal Ministry of Finance 2022b, p. 7 [German version]): "With the continuous increase in the global greenhouse gas concentration in the atmosphere and the associated negative impacts attributable to climate change, the topic of 'climate, environmental and energy policy' is also expected to become increasingly relevant in political discourse and thus also in the national budget itself. With a view to delivering on the goal of a cost-effective and socially acceptable transformation of Austria as a business location from a budgetary perspective, without leaving the path of a sustainably organised national budget, it is necessary to adopt integrated approaches with respect to inter alia (i) budget and tax policy as well as (ii) climate, environmental and energy policy."

The probability of having a national budget that is sustainable, effective and well-ordered – also in the long term – increases if the following targets are met:

- Target status 1: Ensuring cost-effective compliance with the climate and energy targets agreed under international and EU law (i) while avoiding carbon leakage, (ii) considering possible flexibilities (including under the Effort Sharing Regulation) and (iii) tapping into potential for natural and technical sequestration and/or capturing, separating and selling greenhouse gases for industrial use.
- Target status 2: Cost-effective increase in Austria's resilience to the adverse impacts of climate change, inter alia by (i) avoiding erroneous and/or inadequate adaptation, (ii) gradual reduction of the stranded asset risk for the state budget and (iii) avoidance of loss and damage scenarios.
- Target status 3: Budget-friendly compliance with EU and international law pledges and commitments to international climate financing while maximising the given crediting potential in the relevant Austrian funding and incentive landscape.

In order to achieve the goal of 'cost-effective transformation', it is necessary to shift the focus away from input orientation and towards impact, focusing on the relationship between the resources used and the results achieved.

The green budgeting approach defines the methodological framework for the change of perspective at the interface between budget and climate policy and is used to analyse the climate and energy policy subsidy and incentive landscape. This includes financial aspects (input analysis) and the assessment of the impact dimension (impact analysis) and thus provides a central decision-making basis for the contribution of measures to achieving and complying with climate, energy and environmental targets that are binding under national, EU and international law.

The central instruments of green budgeting include (Federal Ministry of Finance 2022b, p. 123 [German version])

- Identifying and recognising relevant financial flows and/or revenues and expenses with a climate, energy and/or environmental policy effect ("base tagging"),
- the identification and recording of the climate, energy and/or environmental impact-related trend and/or effects (counterproductive, productive or neutral) of the relevant finance flows and/or revenues and expenses,
- the climate, energy and/or environmental policy categorisation of the relevant cash flows or income and expenses, and
- preparation and processing of data thus collected, mapping relevant measures and public interventions ("reporting").

Subsequently, and with a view to illustrating the impact-related aspects, a six-stage green budgeting scorecard was developed, which enables the first-ever categorisation of finance flows in the budget. The various levels are defined as follows: (Federal Ministry of Finance 2022b, p. 124 [German version]):

- Intentional counterproductivity (score: "-2")
- Counterproductivity as a side effect (score: "-1")
- No effect (score: "0")
- Productivity as a side effect (Score: "+1")
- Intended productivity (score: "+2")
- Unclear effect (score: "99")

The Federal Ministry of Finance plans to roll out the green budgeting method across all departments and subdivisions.

A central starting point is that the regional authorities' and social insurance institutions' budgets are analysed and transparently presented based on their climate-related knock-on effects.

Integration of sustainability criteria into statutory health insurance contracts

Currently, collective agreements with healthcare facilities in Germany do not include any factors that take sufficient account of sustainability criteria. Representatives of health insurance funds and the supervisory authority are, however, discussing the integration of sustainability into the contracts they conclude in the collective and selective sectors. If the health insurance funds were to start including sustainability criteria in collective bargaining contracts – for instance by integrating them into fee-based contracts with doctors surgeries or into the state base rates – services provided in the context of statutory health insurance would not only be "sufficient, appropriate and economical" in future, but also "sustainable" (Ärzteblatt 2024).

5.5.3 Recommendations for action – stakeholder process

In the context of the stakeholder process aimed at developing a Strategy for a Climate-Neutral Healthcare System, initiated by the Health and Climate Competence Centre, recommendations for action related to "financing" were developed in the "Hospitals, climate and resilience" and in the "Emergency services and climate protection" workshops and are summarised in Table 16 and Table 17.

Table 16: Overview of the recommendations for action developed in the "Hospitals, climate and resilience" workshop on the topic of "financing"

Field	Action	Brief description
Financing	**Enshrined as earmarked investment in fiscal equalisation**	Fiscal equalisation to include earmarked investments in the climate sector
	Expansion of funding opportunities in the healthcare sector	Focus on climate in current funding programmes and establishment of new funding programmes in the healthcare sector
	Implementation of the CSR Directive in the healthcare sector	Implementation of the Corporate Sustainability Reporting Directive (CSRD) as adopted by the European Commission

Source: GÖG/Austrian National Public Health Institute

Table 17: Overview of the recommendations for action developed in the "Emergency medical services and climate protection" workshop on the topic of "financing"

Field	Action	Brief description
Awareness-raising, training and firm holistic establishment	**Funding for measures aimed at promoting sustainability and climate protection**	Raising awareness of the need to finance climate protection measures in the emergency medical services

Source: GÖG/Austrian National Public Health Institute

5.6 Subsidies

5.6.1 Status quo

Subsidies are key instruments in the context of transformation processes. There are comprehensive funding opportunities for climate-relevant measures that can be tapped into in order to drive climate protection and reduce greenhouse gas emissions at various levels. In this respect, the state – as a provider of substantial public support and subsidies

along the entire investment chain and building on research, technology and economic policies that promote innovation –, has a particularly important role to play as a significant source of investment. The importance attributed to climate protection has recently been reflected in the sharp rise in funding made available to climate-relevant areas.

The following section provides an initial rough overview of the funding landscape at EU, national and province level. Note should, however, be taken of the fact that this funding landscape is highly complex and difficult to generalise.

At European Union level, there are a number of funding programmes directed at climate protection. The LIFE programme is a central European Union funding instrument aimed at promoting environmental, nature and climate protection projects throughout the EU. The Climate Change Mitigation and Adaptation sub-programme seeks to contribute to promoting the transition to a sustainable, energy-efficient, renewable energy-based and climate-neutral economy. The LIFE programme has a total budget of 5.4 billion euros for the 2021 to 2027 programme period. With a view to achieving the goals defined by the European Green Deal, at least 30 per cent of funding made available under the European Regional Development Fund (ERDF) must be invested in environmental and climate protection from 2021 to 2027. For the programme period referred to above, some 60.1 billion euros in funding may therefore be tapped into across the EU. Of this total funding amount, 3.5 billion euros are earmarked for environmental activities and 1.9 billion euros for climate action.

Together with the Ministries of Health of Slovenia and Belgium, the Federal Ministry for Social Affairs, Health, Care and Consumer Protection has initiated the “Resources Hub for Sustainable Investing in Health” project in cooperation with the European Commission. The project seeks to support Member States in making proper use of EU funding mechanisms to improve their public healthcare systems. The pilot project “Greening Healthcare Facilities” is being implemented in Austria in the context of this joint project. Placing the focus on hospitals, the aim is to identify funding opportunities for climate projects (e.g. the implementation of energy efficiency measures) at EU level and to support selected hospitals in making use of these instruments, especially when submitting applications (European Commission, 2022).

In Austria, there is a range of programmes available that seek to support climate-relevant measures at national level, some of the most relevant are briefly outlined below:

- The most important funding instrument at federal level is national environmental subsidies made available to companies for investment in environmental and climate protection measures.
- The Climate and Energy Fund offers funding opportunities for corporate environmental measures, such as model refurbishments.
- Alongside quality standards, the “klimaaktiv” action programme shares information and advice.
- The “klimaaktiv mobil” action programme supports companies in implementing transport-related measures aimed at reducing CO_2 emissions from corporate mobility.
- SMEs that introduce energy management systems (EnMS) may obtain subsidised funding for establishing an energy management system and/or having it certified.

Based on the green budgeting method, the Federal Ministry for Climate Action has earmarked a total of some 3,137.8 million euros in budgeted funds as “intended productive” for climate and environmental protection in 2023. The most significant items here are the funds allocated for disbursement under sub-group (SG) 43, Climate, Environment and Energy, in the detailed budgets for domestic environmental funding (1,251.0 million euros), the Climate and Energy Fund (a total of 355.4 million euros in SG 43 and 226.0 million euros in SG 41, Mobility), Climate and Energy (142.3 million euros) as well as Environment and Circular Economy (totalling 99.9 million euros) (Federal Ministry of Finance 2022a).

These national subsidies are not only relevant from an environmental perspective but are also of economic importance. Total investment in environmental subsidies at national level amounted to some 1.7 billion euros in 2021. Subsidies triggered were made available under the building renovation campaign offering a “Get out of oil and gas” bonus, the e-mobility campaign, for the remediation of contaminated sites, and for international climate protection measures. In total, the 24,000 projects thus funded have contributed to annual savings of more than 507,000 tonnes of greenhouse gas emissions (Federal Ministry for Climate Action 2021c). Making available substantial public funding along the entire investment chain, providing infrastructure and fostering research, technology and economic policies that promote innovation, the state – as an important source of investment – has a significant role to play.

The focus of public funding is on supporting plans and projects that contribute towards the achievement of politically defined goals. The boundaries of the departments’ responsibilities as well as the respective funding programmes are therefore geared

towards direct competences. This means that subsidies in the healthcare sector primarily focus on specific health topics. Based on the initial results of the project "Beratung klimafreundliche Gesundheitseinrichtungen" (consultancy services for climate-friendly healthcare facilities) (Lichtenecker et al. 2022), the Federal Ministry for Climate Action in cooperation with the Federal Ministry of Social Affairs, and the Competence Centre Climate and Health at the Austrian National Public Health Institute, has developed two funding lines for inpatient healthcare facilities. The Federal Ministry for Climate Action provides funding totalling 350 million euros for realising energy efficiency promoting measures in hospitals, rehabilitation clinics, senior citizens homes as well as nursing and care facilities.

The implementation of comprehensive energy saving measures will, for instance, lead to a reduction in hospitals' energy bills, thus a higher share of operating costs can be used for health promoting measures. A key topic in this respect is the creation of special funding programmes focusing on environmental promotion in Austria's healthcare facilities directed at boosting energy efficiency in the healthcare sector, based inter alia on the following approaches:

- **Energy efficiency in healthcare facilities:** Energy savings through efficient equipment and/or medical devices equipped with intelligent metering and control technology, investment in climate-friendly buildings, renovation, refurbishment and meeting the "klimaaktiv Gold" standard for new buildings; very concrete steps such as replacing less energy efficient windows, insulation, transition to LED lighting, retrofitting elevators, using smart building technology that enables efficiency increases
- **Installing systems that enable increasing the share of renewable energies** in the heating/cooling and electricity supplied by using roofs and car parks for photovoltaic and solar thermal systems, using large heat pumps and district heating and cooling networks
- **Promoting climate-friendly mobility**, for instance by switching to e-mobility in the healthcare sector and building the necessary charging infrastructure, promoting the establishment of public transport connections and promoting increased use of bicycles by developing the necessary infrastructure.

The province level also plays a very relevant role with regard to climate-relevant subsidies, since the federal provinces are responsible for construction and nature conservation matters. In some cases, a measure that is subsidised by the federal level is co-funded by the provinces (for instance waste heat recovery for industrial and commercial

enterprises). In this connection, subsidies for consultancy services and investment cost subsidies for renovations, refurbishments or the installation of solar and PV systems is of particular interest to companies (Federal Ministry for Climate Action, 2023c).

5.6.2 Options for action

Promotion of consultancy services for healthcare facilities

In the context of the study “Klimaschutz in Praxen” (climate protection in doctors’ surgeries), a research team from Martin Luther University Halle-Wittenberg conducted a Germany-wide survey on climate protection in outpatient healthcare in 2021 (Mezger et al. 2021). Of the 1,683 participants, 83 per cent considered climate change to be an urgent problem that required immediate and comprehensive action. In this respect, respondents considered lack of information and support from professional organisations as well as additional costs as obstacles.

Such study results and experience illustrate that those responsible at healthcare facilities are generally interested and willing to implement climate protection measures, but at the same time these results highlight that implementation of energy and resource-efficient as well as climate-protecting measures is hampered inter alia by lack of know-how, information, practical assistance and support.

This is precisely where the pilot project “Beratung klimafreundliche Gesundheitseinrichtungen” (consultancy services for climate-friendly healthcare facilities) (Lichtenecker et al. 2022) comes in. In the context of the project, which was presented to the public in August 2022, a counselling service, developed specifically for healthcare facilities (hospitals, senior citizens/residential and nursing homes, outpatient departments, primary care units, doctors’ surgeries and pharmacies), was launched. It provides a fundamental, central and innovative impetus to counteract existing obstacles, and promote the implementation and integration of climate protection measures in the best possible manner while at the same time contributing to health promotion in the healthcare facility.

It would be conducive and indeed very sensible to expand and strengthen consultancy services and expert advice offered to healthcare facilities on their path towards climate

neutrality, and to also include the development of innovative approaches (digital platforms).

5.7 Research and innovation

5.7.1 Status quo

Research and innovation are key pillars and drivers for transformation towards climate neutrality and resilience in all areas of society. Research into the healthcare sector's transformation towards climate neutrality is necessary in order to actually achieve transformation in the respective organisational, political-economic and social environment. The interrelations between climate and health can best be effectively analysed through inter/transdisciplinary, practice-relevant and international research projects. In this respect it is also important to include different stakeholder perspectives right from the outset.
Specific funding for dedicated research by such organisations as the Climate and Energy Fund, the federal ministries involved, and the federal provinces can contribute to analysing the topic in all its complexity.

5.7.2 Options for action

Interdisciplinary analysis and research activities

It is pivotal to define priorities with respect to the current core funding themes and to focus on in-depth interdisciplinary analysis and research activities in the following areas:

- Climate-neutral products and supply chains relating to pharmaceuticals and medical devices – comprehensive life cycle analysis
- Energy efficiency and renewable energies in the healthcare sector
- Evaluation of measures: health and economic benefits, emission reduction potential and costs
- Research on socio-economic conditions related to health and climate protection
- Analysing impact chains

- Communication of complex interrelationships and options for action as well as adaptation of framework conditions to achieve behavioural changes
- Data collection and greenhouse gas calculator
- Development of indicator sets for monitoring and evaluation
- Development of practical/realistic and implementation-orientated transformation paths towards CO_2 reduction in the healthcare sector
- Quantification of the direct and indirect effects the climate and climate change have on the population's health
- Pillars of successful implementation of health promotion and prevention in everyday life
- Strategies for climate change mitigation, adaptation and resilience in the health sector as well as strategies for climate change adaptation and resilience at the individual level – especially for vulnerable groups
- Using digitalisation in the healthcare sector
- Labelling and certification systems

Further important areas are

- Increasing resources for research and innovation in the context of climate and health
- Strengthening and further development of innovative systems in the health sector
- Strengthening interdisciplinary and international cooperation
- Analysing the determinants for successful implementation of innovations in the healthcare sector

5.8 Awards and certificates

5.8.1 Status quo

An important contribution to creating a sound basis for ongoing and continually improved climate protection activities in healthcare facilities is an initiative that supports the implementation of measures both in the individual healthcare facilities and in the healthcare system building on science-based climate protection criteria and, if the criteria are met, awards special distinctions in recognition of these healthcare facilities' efforts.

Such an award or certificate should provide transparent and credible information about the healthcare facilities' commitment to climate protection, inter alia to all interested stakeholders and the public, and thus enable an assessment of their climate and environmental protection performance.

An award or certification programme, in which as many healthcare facilities as possible participate in the long term, commit to binding climate protection targets as well as to achieving these targets and regularly reporting on their progress, is another important contribution made by a nationwide Strategy for a Climate-Neutral Healthcare System and towards reducing greenhouse gas emissions of Austrian healthcare facilities. Likewise, it is essential that the synergies between climate protection and health promotion be considered (see Chapter 2.3.5).

Existing national and international programmes and initiatives were analysed and evaluated in the outcome report on "Optionen für die Auszeichnung bzw. Zertfizierung von klimafreundlichen Gesundheitseinrichtungen" (options for granting awards and/or certificates to climate-friendly healthcare facilities). Building on this report, the key elements and aspects of an award or certification programme to recognise climate-friendly healthcare facilities have been developed (Truppe/Lichtenecker 2023).

5.8.2 Options for action

Introduction of an award and/or certification system

The following options for an award and/or certification programme have been identified:

Establishing an independent award, labelling programme

Setting up an independent programme on the one hand offers sponsoring organisation(s) and programme operator(s) the greatest possible freedom of design and flexibility. On the other hand, however, it clearly requires more resources as it will be necessary to develop, establish and set up the entire programme administration.

Using an existing system

If an existing system is to be used, the most appropriate national programmes are "Österreichisches Umweltzeichen" (Austrian Ecolabel), EMAS and ISO 14001 / ISO 50001. The "Ecolabel", "klimaaktiv" and "Betriebe im Klimabündnis" (companies belonging to the Climate Alliance) are as such well-established climate protection brands. It would, however, be necessary to (further) develop separate award programmes for healthcare facilities. The benefits of using such established systems are brand awareness and, in the case of "klimaaktiv", presumably the availability of resources.

Development of an independent awards programme based on an existing system

This solution combines the advantages of an independent awards programme with the benefits of existing systems (such as level of awareness, well-established, networks).

Best Practice Award

The goal is to identify and recognise specific, particularly successful climate protection projects implemented in the healthcare sector and to present them to a broad audience. Attracting public attention, this example of high-profile corporate social responsibility in turn incentivises other healthcare facilities to implement their own projects. Recognising, and thus giving visibility to innovative pioneering projects also contributes to developing a knowledge base on the topic of climate protection in the healthcare sector and stimulates the transfer of climate action-related knowledge between healthcare facilities. In this spirit, the Climate and Health Competence Centre at the Austrian National Public Health Institute developed the Best Practice Award for Healthcare Facilities, which has been presented since 2023.

5.9 Awareness-raising and communication

Although the climate crisis is one of the most pressing challenges of our time, there is still an urgent need for action on climate change communication. By combining and linking the topics of climate protection, the impacts of the climate crisis, climate change adaptation and health promotion, it is possible to prepare the ground for successfully raising

awareness of the importance of both climate and health protection among the general public, the informed public, experts, decision-makers and healthcare staff.

The following comments and recommendations are essentially excerpts from the study "Klima und Gesundheit – Empfehlungen zur Kommunikation von gesundheits- und klimarelevanten Inhalten" (Climate and Health – recommendations for communicating health- and climate-relevant content) by the two expert advisors on this Strategy, Christoph Hofinger and Werner Sturmberger (Hofinger/Sturmberger, 2023).

5.9.1 Status quo

A key driver for effective and target group-specific communication of climate and health issues is appropriate information sharing. It is necessary to explain the often-complex interconnections in a way that they are understood, generate positive energy and motivate the population to become active and get involved.

Successful communication means that the opportunities, advantages and benefits of climate-friendly action and climate-friendly measures take centre stage and are presented in a way that inspires implementation and integration into people's everyday life.

The co-benefits in particular provide an opportunity for presenting health and climate as a cross-cutting theme and thus to present both topics from an attractive target group-specific perspective. By tapping into the potential inherent in active mobility and the growing importance of plant-based nutrition, it is possible to improve people's state of health and consequently reduce the use of health services. Reduced use of healthcare services is associated with a reduction in CO_2 emissions and therefore makes a significant contribution to a climate-neutral healthcare system.

For this reason, the specific practical examples explained in the following place a focus on co-benefits, climate and health. Changes in behaviour that have positive effects on both personal health and the climate – for instance by increasing active mobility such as walking or cycling or switching to a plant-based, regional and organic diet – are referred to as co-benefits.

Why do we fail when we talk about the climate?

There is a wealth of scientific findings and enormous practical knowledge on how the population or specific stakeholder groups can be won over to the cause. In recent decades, this knowledge has only very slowly found its way into climate-related communication and is not yet available on a broad scale.

To put it bluntly, every mistake that can be made in climate communication has been made time and time again – and can be summarised in the following "short guide to failure in climate communication":

- Assume that your audience consists of rational beings who make decisions based on reasonable considerations.
- Fear motivates people to change their behaviour.
- When it comes to change, people weigh up the pros and cons equally.
- Foreign words, figures and data can impress and motivate people.
- Metaphors are for authors.
- People seek first and foremost to maximise their own benefit.
- The truth is best shared using neutral language.
- People have clear world views.
- Point out undesirable behaviour.
- You yourself are the best communicator.

5.9.2 Options for action

Reaching people on an emotional level through communication

What do behavioural sciences, experimental economics, psychology, cognitive sciences and linguistics tell us about the things that really move people? … both internally, in terms of attitude, and externally, in terms of behaviour?

1. People cannot make decisions without emotions (Damasio 2001), whether it is a doctor's appointment, voting for a party or changing a radiator (Wang et al. 2018).
2. Fear certainly attracts attention and is therefore used in political advertising. However, fear also narrows the perspective and paralyses. In order to motivate

people, one also needs to appeal to other emotions such as annoyance or even anger (to overcome obstacles and restrictions) and excitement or joy (Hofinger 2011). Fear in particular has an inhibiting effect when combined with an inability to act and a lacking sense of self-efficacy.

3. When weighing up and balancing options for action, most people – putting it simply – attach only half as much weight to gains as to possible losses (Kahneman et al. 1982).
4. Simple words (first learned as a child) trigger the most important reactions in the brain – they are interconnected in many ways; many technical terms trigger – in the best case – no reaction and – in the worst case – annoyance (because the audience feels "stupid"). The same applies to figures and charts if they are not intuitively understandable.
5. Our reasoning thinks in metaphors (Lakoff/Johnson 2008). We use linguistic images to understand a complex world and get a sense of what is right and what is wrong.
6. The Rational Choice Model – which is empirically based on a shaky ground –, portrays people as utility-maximising individuals, very much in the spirit of the 1980s' lifestyle: extremely mature and responsible, but also rather lonely consumers. However, an impressive list of cognitive distortions (Dobelli 2011) shows that we are not permanently focused on our own advantage. In systems of social relationships based on shared values, behaviour patterns that focus on the communal often predominate (Rustichini/Gneezy 2000).
7. Every concept only becomes understandable through frames of interpretation (Lakoff 2010). According to Paul Watzlawick, we cannot communicate in frames. This also means that we have to say goodbye to a naive desire for neutral language, because frames help us, largely unconsciously, to judge whether something is good or bad, or if it is right or wrong.
8. Many people harbour two world views and can look at the same facts from both perspectives. These "bi-conceptualists" (Lakoff 2010) have two souls in their chests and tend to agree with logically contradictory statements in surveys if they interlink with one of their world views.
9. Public institutions in particular have repeatedly complained about harmful behaviour on the part of citizens – from vaccination scepticism to environmentally damaging actions. Increased coverage of such harmful behaviour in turn, however, creates the undesirable social proof that such adverse behaviour is actually quite widespread (Bator/Cialdini 2000). If the desired behaviour is still that of a minority but is becoming more popular, social proof can be conveyed by the fact that a growing number of people have adopted this behaviour (Mortensen et al. 2019).

10. Political decision-makers who want to bring about change in society often erroneously assume that they are the ones who can make the biggest difference to the population. It is, however, much more effective to identify those opinion-leaders and influencers in the community who are trusted by the various segments of the population. If these ambassadors share the desired message with the target audience, they are usually much more successful (Bavel et al. 2020).

Linking climate and health as an opportunity in communication

What are the consequences of these widespread misconceptions, especially in climate communication? On the one hand, there is the trivial intention to avoid all these mistakes when it comes to climate and health, but on the other hand, there is also the desire to focus on the exciting question of whether linking climate and health can help to not only avoid these classic communication traps, but also to take advantage of opportunities that arise precisely from the joint consideration of climate and health, and especially due to their co-benefits.

1. Harnessing the power of emotions. Health topics are linked to all the emotions that people experience. We are afraid of illness and death, disgusted by certain symptoms of illness or illness-causing substances, mourn the loss of performance and are happy after exercising together. Communicating climate in the context of health makes it possible to link well-known emotions from the health sector with climate change and to tap into the potential of emotional energy to initiate change. At the same time, the induction of emotions should be well-considered and emotional appeals should be used with caution, as reactions to emotions vary, are inconsistent, difficult to predict and difficult to control.
2. Breaking the shackles of helplessness. Many climate narratives paint an apocalyptic end, the “Highway to Climate Hell” (CNBC LLC 2022). If this is the only image that gets firmly established in people's minds, they will react with denial and paralysis. Helplessness and powerlessness can have a paralysing effect and promote denial instead of commitment. In communication, care should therefore be taken to highlight options for action and positive developments based on such options/actions. Health communication can provide guidance as it offers people a way out, towards life, directed at the best possible preservation of health and therefore always focuses on what is feasible and on taking the next step into the right direction.

3. Two advantages for every disadvantage. Applying the theses put forward by Nobel Prize laureates Daniel Kahneman and Amos Tversky with respect to human behaviour means – in simple terms – guaranteeing a (certain) double win (win-win) for every (possible) loss. By linking health and climate one will achieve precisely this effect, i.e. if I walk to the third floor instead of taking the lift, I don't produce a single gram of CO_2 and at the same time it is good for my health. Trying out vegetarian food now and again means more variety, doing something for the climate and strengthening your own body. Without fast fashion, there is less CO_2 in the atmosphere and there are fewer toxic substances on my body.
4. Will a ten-year old understand what I'm saying? Communication must always be designed in such a way that it is understandable and appropriate for the respective target group. Words that we learned as children are well "wired" in our brains – connected with other terms, with emotions, with behaviours. Words like "decarbonisation" or sector coupling" only mean something to experts, and even they often understand such terms in different ways. At the same time, language that is overly simple harbours the risk that the addressees may assume that they are not being taken seriously. Those working in the healthcare system deal with people of all different ages and backgrounds, so they should also be able – at least in principle – to explain most body parts, illnesses, therapies etc. to young patients and their parents, and, if necessary, also in simple terms. This can be an inspiration for climate communication and may also serve as a basis for metaphors.
5. Use emotional metaphorical language. Climate communication is full of terms that have evolved historically – and do not serve the cause. Political consultant Frank Luntz, for instance, advocated the use of the term "climate change" rather than "global warming". Without relying on spin doctors, the ecological movement has succeeded in outsmarting itself linguistically when it came up with the word "climate protection". Because while "animal protection" and "environmental protection" trigger empathy towards living beings, the climate is something inanimate that is also beginning to change in a threatening way that currently affects each and every one of us (Hofinger 2011).

   All successful communication relies on verbal imagery, and in the case of the climate, there is an urgent need for new metaphors, both from the descriptive and the motivational perspective. There are analogies from the health sector that lend themselves excellently to this purpose: if one, for instance, has a temperature, it is quite clear that a rise by just a few degrees can become a major challenge.
6. Placing a focus on community and social relationships. By joining forces, we will find it easier to achieve our goals. In this respect, there is indeed room for improvement in

health communication, which often focuses on the individual. Messages that strengthen confidence in the fact that people can succeed by joining forces and tackling things together – whether as a society or as a household – have a better chance of success.

7. Communicating within the interpretative frame of life. Successful communication deliberately chooses frames. By definition, health is about life – just like climate communication, which does not always live up to this claim. If, however, both topics are interlinked, it is clear that the common frame is life.
8. Some people have already "immersed themselves" into certain topics, but can still be considered bi-conceptualists overall, i.e. people who are still open to different world views. Linking climate and health offers more points of contact for overcoming individual "frozen" points of view.
9. In both climate and health, there are numerous areas in which behaviour that is more favourable for both the planet and for individuals has not yet been adopted by a majority. Thus, health and climate offer a broad field for "trending social norms", i.e. desirable social norms and behaviours that more and more people consider sensible or live by. A communication focus on the increasing number of people who adopt such desirable behaviour can strengthen the corresponding norms and thus lead to an upward spiral that adds momentum to such behaviour, which becomes increasingly widespread and established.
10. Learning our lessons from the pandemic: The COVID-19 pandemic has been extremely instructive in terms of communication strategies (Ruggeri et al. 2022). These lessons learned go beyond pandemics and also apply to climate communication[33]. One such lesson is that it is indeed worth identifying those people who can communicate authentically and credibly with specific sections of society – which opens up new opportunities both in the healthcare sector (well-known health professionals may act as communicators) and on health-related topics (recognised figures raise awareness of health issues among target groups within their communities).

[33] This includes, for instance, the fact that political polarisation has a negative impact on any topic, or the realisation that it is necessary to support people "in the middle" in building resilience to fake news and conspiracy narratives.

Overcoming communication traps

The recommendations outlined in Table 18, understandable language (4), metaphors (5) and life frame (7) are to be observed in all communication activities.

Table 18: Overview: Ten communication traps, ten ways out

	Guide to failure	What really moves people	Opportunities in linking climate and health
1	Assume that your audience consists of rational beings.	People cannot make decisions without emotions.	The topic of health is full of emotions and therefore helps to break out of an "overly intellectual" discourse.
2	Fear motivates people to change behaviour.	Fear leads to paralysis – while excitement and sometimes even anger gets us into motion.	Focus not on fear, but on the feasible next step
3	When it comes to change, people balance pro and cons equally	Even a possible loss receives twice as many ratings as a safe win.	Co-benefits lead to more benefits for the individual, and it is also possible to reframe "loss" as "win".
4	Foreign words, figures and data can impress and motivate people	Simple expressions are well connected and interlinked in the brain – technical, however only to a very limited extent, which may lead to irritation and annoyance.	When explained properly, it should be possible for a 10-year-old to understand the concepts of "health" and of "the climate". If a 10-year-old understands, an adult should also be able to.
5	Metaphors are for authors.	People need emotional and motivating metaphors to be able to decide what is right and what is wrong.	The topic of health concerns all people and provides strong verbal images to be used for climate communication.
6	People seek to first and foremost maximise their own benefit.	People act in the spirit of the community, wherever a cooperative climate is established.	Focusing on community and the joint path we have embarked on together when talking about climate and health.
7	The truth is best shared using neutral language.	We are simply not able not to communicate in frames, not to constantly evaluate against a (mostly unconscious) interpretation framework what is right and what is wrong.	When linking climate and health ("Planetary Health" / "One Health") we have the life frame right in front of us.

	Guide to failure	What really moves people	Opportunities in linking climate and health
8	People have clear world views.	Many harbour contradictory world views, which results in more opportunities to connect.	Linking the topics of health and climate enables overcoming "entrenched" positions.
9	Point out undesirable behaviour.	When people hear that a majority does something undesirable, they see no reason for change.	Placing a focus on "trending social norms"
10	You yourself are the best communicator	Community leaders have more persuasive power in their respective groups.	Established community leaders/Influencers can talk about health topics to their groups; actors in the healthcare system can act as communicators.

Source: Hofinger/Sturmberger (2023)

Use opportunities for target group-specific communication of co-benefits

At the interface between climate and health policy, options for action can be identified that have a positive impact on both climate protection and population health. Table 19 provides an overview of options for firmly establishing co-benefits in people's living environment and integrating them into everyday life.

Table 20 lists options for communicating co-benefits to specific target groups. Various measures relating to how the medical sector can act as an ambassador for co-benefits are presented in Table 21.

Table 19: Firmly establishing co-benefits in the living environment

1	**fit2work** Use the workplace as a point of contact between health and climate-related information Ergonomic workplace counselling, winning large insurance institutions (SMD, AUVA) over for co-benefits Consider climate and health potential in the context of company audits conducted by the AUVA/Workers' Compensation Board (e.g. bicycle parking facilities, canteen menus, filling of vending machines etc.) Guidelines for consulting firms that advise companies in the healthcare field	Co-benefit (3)
2	**"Stair climbing challenge"** Notices in all buildings with elevators Info: The elevator/ride consumes so and so much electricity. Participants collect points: Residents/residential building with the largest number of points wins	Cooperation (6), Trending Norms (9)
3	**Ideas competition in schools** Include co-benefits in curricula Folder for parents at home on how to integrate co-benefits into everyday life	Trending Norms (9)
4	**Considering co-benefits in building refurbishment and integrating them into funding processes** How can structural measures promote a healthy lifestyle (e.g. bicycle storage rooms, space reserved in inner courtyard for workouts etc.)? Cooperation with counselling centres such as "Wiener Hauskunft"	Co-benefit (3)
5	**Carbon footprint labels on food** Mandatory disclosure of all CO_2 emissions generated in the context of the production and transport per gram or nutritional value, analogous to the nutrition table May be extended to also include other climate and health-related products – such as passenger vehicles	Emotion (1)
6	**Planetary and Personal Health Tracker** A fitness climate tracker shows CO_2 savings thanks to active mobility (exercising), making health and climate co-benefits tangible. The app also shows the total savings generated by the community. Reward for climate and health-promoting behaviour (similar to the "Vienna culture token" initiative) The app may also be used for content sharing.	Emotion (1), Co-benefit (3), Co-operation (6)
7	**Co-Benefits Dashboard**	Trending Norms (9)

	Show that more and more people generate co-benefits and how this benefits climate and health Tracker/dashboard on increase in positive behaviour (compared to previous year) Reflect increase in art installations thus adding visibility (similar to the "Project Pi" factoids displayed on Vienna's Karlsplatz)	
8	**Promoting co-benefits in public service media** Using popular testimonials, such as well-known athletes who attract public attention "Bundesland heute" (local TV news show): ideas competition on climate protection and health	Trending Norms (9), Community-leaders (10)

Source: Hofinger/Sturmberger (2023)

Table 20: Target group-specific communication and measures

9	**Turning influencers into ambassadors for co-benefits** Cooperation with influencers who show how to save resources or who have not yet placed a focus on the topic Examples: Instagram accounts like @kraeuterfeen, @erdretter, @togoodtogo.at ...	Trending Norms (9), Community-leaders (10)
10	**Social media account: Health, climate, money** Development of an independent online presence in social media Promote the benefits of a climate and health-conscious lifestyle, sharing practical advice: Doing good and saving money at the same time	Co-benefit (3), Trending Norms (9)
11	**Interdenominational guide "Climate and health"** Benefiting from the credibility and reach of religious communities to communicate co-benefits All religions share the concept of "preserving the Creation". Invite people of different religions and beliefs to engage in dialogue	Trending Norms (9), Community leaders (10)

Source: Hofinger/Sturmberger (2023)

Table 21: Medicine as an ambassador for co-benefits

12	**Healthcare professionals talk about the climate.** Inform HCPs and win them over as ambassadors for the topic HCPs enjoy an excellent reputation and high credibility.	Community leaders (10)

	As health experts they may also use their credibility and reputation to promote climate-related matters.	
13	**Healthcare sector employees as testimonials for co-benefits.** Healthcare sector employees enjoy a high level of trust. This makes them ideal multipliers in their private and professional surroundings. Get health-relevant organisations on board and raise awareness among employees in cooperation with management and staff representatives Convincing employees of co-benefits (voluntary work and incentives), Benefits and special offers for healthcare sector employees: e.g. vouchers (bicycle repair, car sharing), bonuses, contributions towards "climate ticket" / e-vehicles / e-bikes, etc.	Co-benefits as a sign of appreciation Co-benefit (3), Trending Norms (9), Community leaders (10)
14	**Consider co-benefits during preventive medical check-ups** Deductible reduction: bonus for climate-friendly and health-promoting measures (eating less meat, not using cars etc.) Extend the "100 health euros" initiative (100 euros that can be claimed annually towards certain health-promoting activities) to also include climate-friendly measures: redeemable in bike shops (repair, purchase), "climate ticket", cooking courses for healthy eating, subscription to special delivery of organic vegetables ("Biogemüsekisterl") etc.	Co-benefit (3), overcome resistance (7)
15	**Include co-benefits in the curricula of health-related training programmes** Education on co-benefits and the way they are communicated to be included in medical, nursing and physiotherapy training programmes	Community leaders (10)
16	**Saving CO_2 in hospitals** While waiting, visitors/patients are informed about hospitals' CO_2 emissions reduction efforts and what contribution they can make towards emissions reduction. Make it clear that healthcare uses resources: emphasise the importance of a conscious approach to health → Good for you, good for the climate.	Co-benefit (3), Co-operation (6)

Source: Hofinger/Sturmberger (2023)

5.10 Expertise

5.10.1 Status quo

On the one hand, going green and implementing measures aimed at reducing greenhouse gas emissions is a key challenge for all healthcare facilities, and especially hospitals and other inpatient healthcare providers, which also has to do with the fact that there is often

a lack of skills and know-how necessary for firmly establishing climate protection in healthcare facilities. On the other hand, the effects of climate change on health have already become increasingly noticeable and staff at healthcare facilities increasingly require the skills to deal with climate-related health issues.

5.10.2 Options for action

Strengthening health-related climate literacy

With a view to strengthening health-related climate literacy, the representatives of the various professional groups in the healthcare sector were identified as key actors with regard to implementing the necessary measures. Thus, is necessary for them to acquire and further develop health-related climate literacy, which must be integrated into education and training. Health-related climate literacy "comprises the knowledge and use of this knowledge (i) to understand the interactions between climate and health, (ii) to apply options for action in climate change mitigation and adaptation and (iii) to utilise the synergies between climate change mitigation, adaptation and health promotion" (Brugger/Horváth 2023, 4).

The development of content that contributes to the expansion and strengthening of health-related climate literacy and its implementation in the corresponding curricula are of key relevance in this respect. In order to support climate literacy, the "Handbuch zur Stärkung der Klimakompetenz" (handbook for strengthening climate literacy) was published (Brugger et al. 2024), which provides a systematic, modular overview of climate literacy and forms a basis for integrating climate literacy into education, training and further education of representatives of the health professions. The comprehensive presentation of the various aspects of climate literacy was prepared taking account of the legally regulated healthcare professions and their different paths in education, training and continuing education.

Further training for employees of healthcare facilities

As important institutions in society, healthcare facilities also have the responsibility to assume a central role in climate protection.

Further training on climate protection and climate change adaptation for employees of healthcare facilities is of major importance in order to support healthcare facilities in firmly integrating climate protection in the organisation and strengthening resilience.

In order to ensure successful implementation of climate protection in healthcare facilities, it is pivotal that healthcare employees are equipped with the necessary key knowledge and skills. For this reason, the Climate and Health Competence Centre at the Austrian National Public Health Institute (Gesundheit Österreich GmbH, GÖG) developed the "Climate Manager in Healthcare Facilities" course on behalf of the Federal Ministry of Social Affairs, Health, Care and Consumer Protection.

The aim of this course is to strengthen the employees' skills, to convey a comprehensive understanding of climate protection in connection with health promotion and to foster the decision-making skills necessary to implement climate protection in inpatient healthcare facilities.

Green Teams in healthcare facilities

Interdisciplinary Green Teams (consisting of employees active in the fields of environment/sustainability/climate, medicine, nursing, technology, purchasing etc.) play a decisive role in healthcare facilities when it comes to promoting awareness of environmental and climate protection, sustainability, implementing environmental and climate protection measures, reducing greenhouse gas emissions from healthcare facilities and thus contributing to health protection. Green Teams can also be tasked with informing employees about environmental and climate protection options and motivating them to make an active contribution. Green Teams have a wide range of expert knowledge relating inter alia to data collection and analysis, project and process management, and the development of concrete action plans, which are subsequently evaluated and adapted.

They also play an important role in the field of communication as they inform patients, visitors and the wider public about the healthcare facility's efforts in order to raise awareness regarding the importance of sustainability and motivate others to make an active contribution.

Comprehensive development of climate-related skills and expertise in ministries

In addition to the various professional groups active in the healthcare sector, it is important to ensure comprehensive development of climate-related skills and expertise in both the Federal Ministry of Social Affairs, Health, Care and Consumer Protection and all other federal ministries. With a view to firmly establishing this topic, it may prove expedient to establish a corresponding department or staff unit.

5.10.3 Recommendations for action – stakeholder process

In the context of the stakeholder process aimed at developing a Strategy for a Climate-Neutral Healthcare System, initiated by the Health and Climate Competence Centre, recommendations for action related to "expertise" were developed in the "Emergency medical services and climate protection" workshop and are summarised in Table 22.

Table 22: Overview of the recommendations for action developed in the "Emergency medical services and climate protection" workshop in the area of "expertise"

Area	Measure	Brief description
Awareness-raising, training and comprehensive integration	**Providing climate-related training in first aid courses directed at the general public**	Include climate protection in public training courses (for instance first aid courses); multiplier effect Include climate protection in the training of employees and volunteers
	Staff training	Include climate protection in training courses for staff and volunteers

Source: GÖG/Austrian National Public Health Institute

5.11 Digitalisation and telemedicine

The central role played by telemedicine/telehealth and digitalisation within healthcare facilities as a contribution to climate protection is discussed in the following and selected practical examples are presented.

5.11.1 Status quo

According to the World Health Organisation (WHO), telehealth uses information communication technology for the exchange of information for the diagnosis and treatment of diseases and injuries, research and evaluation, and for the continuing education of health professionals (WHO 2010). The central feature of telemedicine/telehealth is that patients and healthcare providers are not present at the same location. There is a whole range of telemedicine applications that are being increasingly used, particularly as a result of the COVID-19 pandemic. Examples include telemonitoring, in which the health of patients is medically monitored remotely, teletherapy, in which patients are treated remotely, for instance via videotelephony or teleconsultation where a second opinion can be obtained via remote diagnosis. Telemedicine/telehealth applications are frequently used for chronic illnesses, such as diabetes or cardiovascular diseases (Laschkolnig 2021). Surveys show that acceptance rates and satisfaction with telemedicine services in Austria are also comparatively high among both patients (Kletečka-Pulker et al. 2021) and doctors (Hainzl/Juen 2020).

The use of telemedicine/telehealth offers a wide range of opportunities and has a lot of potential. Telemedicine increases the quality of care (for instance by monitoring patients more closely and at shorter intervals enables rapid intervention in the event of problems), contributes to increasing security of care and healthcare system resilience, reduces healthcare costs and helps to avoid regional and specialised underuse. In addition, the use of telemedicine leads to shorter waiting times and shortened or saved patients' journeys (Laschkolnig 2021; Purohit et al. 2021).

Climate relevance

The latter is the central starting point for using telemedicine/telehealth to reduce the healthcare sector's greenhouse gas emission. At around 825 kt CO_2, the transport induced by the Austrian healthcare sector, i.e. staffs' and patients' personal mobility accounts for around twelve per cent of the Austrian healthcare sector's total carbon footprint (Weisz et al. 2020). The largest share of greenhouse gas emissions from induced transport, at just under 60 per cent, is caused by patient mobility in the primary care sector, i.e. when travelling to and from visits to the doctor. The expansion of telemedicine services therefore offers great potential for reducing emissions by cutting down on travel.

Two recent meta-studies (Purohit et al. 2021; Ravindrane/Patel 2022) show that all studies investigating the environmental effects of telemedicine conducted to dateconclude that significant emission savings can be achieved. The savings potential generated by using telemedicine services (instead of on-site consultations) is estimated at 0.7 and 372 kg CO_2e per consultation (Purohit et al. 2021). And even taking into account the emissions caused by telemedicine equipment (computer, video conferencing software, internet connection etc.), the greenhouse gas footprint of a telemedicine consultation is 40 to 70 times lower than that of a face-to-face consultation with a doctor (Holmner et al. 2014). While a savings effect can be demonstrated in almost all areas of application, the scale of the savings depends on numerous factors such as geographical location (greater savings effects can be achieved in rural areas), the medical speciality and degree of specialisation (the more specialised, the greater the savings) and the technical basis for telemedicine (video calls are more emission-intensive than telephone consultations).

Apart from the reduction in kilometres travelled and the resulting savings in emissions, telemedicine services can also contribute to reducing the consumption of energy and resources in healthcare facilities and thus to climate protection (Ravindrane/Patel 2022; Yellowlees et al. 2010). This relates, for instance, to the consumption of disposable medical products and the necessary disinfection after examinations as well as the reduced energy requirements of hospitals due to a lower number or shorter duration of inpatient stays. As yet, however, no studies have been conducted to quantify these effects.

Legal challenges

The following comments and options for action are essentially based on the study “Klimaschutz und Gesundheit” (Climate Protection and Health) by expert consultant university professor Dr Erika M. Wagner (Wagner 2024).

In connection with such digitalisation processes, extensive legal and technical requirements arise with regard to technical and legal security of communication, questions regarding the storage and transmission of diagnostic and treatment documents. It is necessary to analyse in detail whether and in which areas of doctor-patient communication such virtual technological support services could be used. This is, of

course, beyond the scope of the present Strategy. Therefore, only the related key points are outlined here.

Health data is particularly sensitive data within the meaning of Section 4(2) of the Data Protection Act 1999: data of natural persons concerning their racial or ethnic origin, political opinions, trade union membership, religious or philosophical beliefs, health or sex life. § Section 9 of the Data Protection Act (Datenschutzgesetz – DSG) standardises the conditions under which confidentiality interests worthy of protection are not violated when sensitive data is used, but this raises extensive further legal questions. The misuse of data must also be taken into consideration.

In particular, comprehensive legal questions arise as to whether and in what form online medical counselling can be reconciled with the code of medical conduct and medical professional law. For example, Section 45 (4) of the 1998 Austrian Medical Practitioners Act (Ärztegesetz, ÄrzteG 1998) stipulates that the independent practice of the medical profession without a specific professional domicile (itinerant surgery) is prohibited. Therefore, if only a virtual medical expert service is provided without a professional domicile, the online services cannot be invoiced.

In this respect, a hybrid strategy, i.e. a combination of on-site surgery and additional online counselling, is a good option. A hybrid strategy will be all the more successful if certain conditions are met. A relationship of trust that has already been established between doctor and patient, as well as an existing basis for dialogue and making use of technologies only in the later stages of medical treatment are factors that support the success of such online treatments. It is also up to doctors to make patients aware of such online services. Experience from pilot projects shows that online services are accepted by around 90 per cent of patients (Horn 2022).

With such high acceptance rates, safeguarding medical confidentiality and that of all auxiliary persons in accordance with Section 54 (1) of the Medical Practitioners Act 1998 is a technical challenge.

Legislators are required to define legal criteria for technical safety.

A major hurdle for virtual medical treatment used to be Section 49 (2) of the Austrian Medical Practitioners Act, which standardises the principle of personal immediacy. The doctor had to practise his or her profession personally and directly, at best in

collaboration with other doctors. In the course of the 2023 healthcare reform, this para. 2 has been expanded to include an explicit provision for online consultations and treatments (telemedicine).

In principle, questions also arise regarding liability for incorrect online treatment or counselling and the resulting insurance issues. As technically supported communication is always susceptible to connection interruptions, it is questionable whether and to what extent liability could be extended to providers etc. In terms of liability, legal demarcation issues and legal sanction options in the event of online medical malpractice or other online deceptive acts are also interesting. Furthermore, every doctor must provide proof of professional liability insurance when practising as a freelancer. The extent to which errors in online counselling and/or online treatment are covered or can be covered by such professional liability insurance must be legally clarified.

In any case, the use of technology could enable enormous potential time and cost savings and also be a great help for people with limited mobility.

The use of various virtual messengers is suitable for notifications and internal communication; findings and X-ray images can be visualised on tablet PCs.

Practical examples

There are already numerous telemedicine services in Austria, and even if these were not established with a view to reducing emissions, they contribute to climate protection in the healthcare sector – in addition to health benefits – by reducing travel time and distances. A comprehensive overview of all telemedicine services in Austria (as of 2021) can be found in Laschkolnig (2021). In the following one project each from teletherapy, teleconciliation and telemonitoring is briefly presented in an exemplary manner:

- The health hotline 1450[34], which can be reached around the clock throughout Austria, serves as the first point of contact for health problems of all kinds. Qualified healthcare professionals and nurses advise callers on how to deal with the complaints described. In particular, an assessment is given as to whether self-treatment at home, a visit to a (specialist) doctor or to the emergency ward is appropriate. This avoids

[34] see: www.1450.at

unnecessary visits to the doctor and refers patients to the right address for treatment of their complaints. This avoids unnecessary journeys and helps to reduce emissions.

- Teledermatology Styria[35]: Up to 30 per cent of all visits to general practitioners are related to skin problems, but the density of specialised dermatologists in the Liezen district (Province of Styria) is comparatively low. The teleconciliation project "Teledermatology" aims to solve this problem. The general practitioner (GP) makes an initial diagnosis. This suspected diagnosis, a detailed question and professional images are sent to the participating dermatologists via a secure portal. The dermatologist's response is passed on to the patient by the GP. This saves patients additional waiting times and long journeys to specialised dermatologists, which in turn helps to reduce traffic-related emissions and thus contributes to climate protection.
- HerzMobil Tirol[36]: The "HerzMobil Tirol" telemonitoring project is a comprehensive care programme for people with heart failure. Participants use the Herzmobil app to record health-related data (heart rate, high blood pressure, etc.) in their home environment, which is then made available to the doctor treating them and contributes to the early detection of problems. In addition to stabilising illnesses and improving quality of life, the project also aims to avoid hospital stays. The project contributes to the reduction of climate-damaging emissions by saving on travelling and by eliminating the need for emission-intensive examinations and treatment in hospital.

5.11.2 Options for action

In addition to telemedical services, digitalisation and the resulting optimisation of processes as well as the use of software solutions and new technologies can also reduce emissions in the healthcare sector (Krojer 2022; Ludewig 2022). A key digitalisation step taken in the Austrian healthcare system in recent years has been the introduction of the electronic health record (ELGA)[37] . This not only contributes to the conservation of resources and – subsequently – to climate protection by digitalising former paper files, but also avoids incorrect and over-medication/treatment as well as the unnecessary multiple use of emission-intensive diagnostic procedures such as magnetic resonance imaging (MRI) through the exchange of information between healthcare providers. Automated and

[35] see: www.aekstmk.or.at/507?articleId=9094
[36] see: www.herzmobil-tirol.at
[37] see www.elga.gv.at

“smart” building solutions such as intelligent lighting controls, automated air conditioning or disinfection robots with UV light help hospitals and care homes in particular to reduce their energy requirements and avoid waste (Ludewig 2022) and subsequently contribute to climate protection.
Other digitalisation measures relate to areas such as supply chain management, commodities management/resource planning and personnel resource planning, which can increase resource efficiency.

Expansion of digitalisation and telemedicine services

Digitalisation and, in particular, the use of telemedicine offers substantial greenhouse gas reduction potential in the Austrian healthcare system and also have proven positive effects on the quality of medical care as well as the general security of care and enables cost reductions.
Digitalisation in the healthcare sector should therefore be encouraged in the interests of climate protection and health promotion and the expansion of telemedicine services be accelerated.

Clarifying the legal framework for telemedicine

Further clarification of the legal framework for the use of telemedicine is recommended (in addition to the new Section 49 (2) of the Medical Practitioners Act following the 2023 healthcare reform). This is because telemedicine currently operates in a field of tension between a wide variety of legal regulations in the areas of data protection, professional law, telecommunications law and medical device law (Laschkolnig 2021).

Scientific evaluation of the impact of healthcare system digitalisation on greenhouse gas emissions, costs and health

The expansion of digitalisation solutions and the expansion of telemedicine services must be scientifically monitored in order to quantify the emission savings, cost reductions and health effects achieved in the Austrian context and to derive further recommendations for

action. In particular, possible rebound effects[38] may undermine the efficiency increases and emission reductions achieved (Purohit et al. 2021).

[38] In this context, the rebound effect means that the time and cost savings achieved by patients and healthcare providers through digitalisation solutions and the use of telemedicine services may be used for other emission-intensive activities, thereby counteracting the climate protection effect.

6 Overview

Table 23 below summarises the options for action that can contribute to climate protection in the healthcare sector. For more detailed information on the individual options for action and further details, please refer to the respective chapters.

Table 23: Overview of options for implementing climate protection in the healthcare sector

Fields of action	Options for action
Energy, buildings and green spaces	• Zero emission building • Thermal building renovation/refurbishment • Circular economy, sustainable construction methods and use of climate-friendly building and other materials • Energy management • Optimised utilisation of the usable floor space • Optimisation of ventilation and air conditioning systems • Coolant with the lowest possible greenhouse gas potential • Optimisation of existing heating systems • Heat recovery and innovative grids • Lighting optimisation • Using electricity from renewable energy sources • Switching to district heating/cooling • In-house power generation from renewable energy sources • Greening of outdoor areas and indoor spaces
Pharmaceuticals and medical devices	• Reduction in medicines consumption • Introduction and mandatory consideration of sustainable procurement criteria • Environmental compatibility as an approval criterion • Climate friendliness in discount agreements • Reshoring and nearshoring • Labelling and information system • Environmentally friendly manufacturing processes for pharmaceuticals and medical devices

Fields of action	Options for action
	• Climate-friendly anaesthetic gases and recycling of anaesthetic gases • Product life cycle design of medical devices
Waste and resources	• Switch to reusable products • Reuse and reprocessing of medical devices • Recycling of medical devices • Reduction in single-use laundry • Reduction in paper consumption, and digitalisation • Reduction in pharmaceutical waste • Installation of a waste management officer • Waste separation and reduction of waste volume • Awareness-raising among employees
Transport and mobility	• Expansion of telemedicine/telehealth services • Bundling of medical services at one location • Improving public transport connections at existing locations • Public transport connections as a criterion for the choice of location • Making active mobility more attractive • Making the use of public transport more attractive for employees • Using (e-)cargo bikes for transport of (small) loads (on the healthcare facility's premises) • Conversion of the vehicle fleet to climate-friendly drive technologies • Selection of logistics partners based on sustainability criteria
Food system	• Climate-friendly menu planning and food procurement • Mandatory implementation of the criteria for sustainable procurement • Increasing the share of organic products • Health-promoting and climate-friendly menu option management • Introduction to plant-based recipe design • Optimising energy efficiency in kitchens • Reduction in food waste
Framework conditions	Options for action

Fields of action	Options for action
Governance	• Define the organisational structures, processes and procedures for managing the strategy • Establishment of the "Climate and Health" steering group – members: departments at the Federal Ministry of Social Affairs, Health, Care and Consumer Protection, at the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology as well as other affected departments, the Austrian National Public Health Institute, representatives of the Federation of Social Insurances at the level of the umbrella organisation and at province level • Establishment of a Climate, Environment and Health Department or a corresponding staff unit in the BMSGPK to fulfil the corresponding coordination and control functions • Design, definition of tasks and implementation of the "Platform for Climate and Health" • Commitment of all relevant organisations, disciplines and stakeholders to the "Pact for the Future of Climate and Health" • Development of "Climate-Neutral Healthcare Sector" roadmap • Involvement of representatives and employees of the healthcare system, patients (including adolescents, young adults, vulnerable groups) in the process of specifying the measures and their implementation as well as in the further development of the strategy • Involvement of the relevant economic players and stakeholders in the development of a roadmap • Establishment of a digital platform to inform and involve the population • Building on the Health Footprint study, the recording of the healthcare sector's climate footprint is to be updated and expanded, both top-down for the entire sector and bottom-up by analysing individual products and services and the associated supply chains • Monitoring of the measures is developed and implemented for the areas of action, and an annual progress report is prepared • For key areas with high greenhouse gas emissions such as pharmaceuticals and medical devices, as well as hospitals, establish an intersectoral working group, which accompanies the implementation in these areas. • Initiation of a process to anchor and strengthen the areas of health promotion, prevention, reduction of inappropriate treatment and overuse of treatment

Fields of action	Options for action
	• Health impact assessment and HTA (Health Technology Assessment) to be expanded to include aspects of climate and environmental protection.
Monitoring	• Updated and regular survey of the greenhouse gas footprint of the Austrian healthcare sector • Development of a database on the emissions intensity of pharmaceuticals and medical devices, products and processes • Legal establishment of a consumption data reporting obligation for large healthcare facilities
Indicators	• Development of climate-relevant indicators for the healthcare sector
Strategic and legal framework conditions	• Implementation of the Supply Chain Act • Adaptation of constitutional standards • Adaptation of quality targets in the healthcare sector in the context of climate protection targets • Hospitals Act • Health Quality Act • Climate-related improvements in the organisational structure • Energy management system in accordance with DIN ISO 50001 • Introduction of an environmental management system • Firmly establishing climate protection at organisational level in the healthcare sector by establishing the position of a climate manager • Firmly enshrining the topic of climate in Target-based Health Government
Financing	• Integration of climate protection in future agreements on financial equalisation • Establishment of innovative incentive structures for savings in the area of energy and resources • Climate and environmental protection in the federal budget and green budgeting • Integration of sustainability criteria into statutory health insurance contracts
Subsidies	• Creation of special funding programmes for healthcare facilities • Promotion of consultancy services for healthcare facilities
Research and innovation	• Interdisciplinary analysis and research activities at the interface between climate and health

Fields of action	Options for action
	• Increasing resources for research and innovation in the context of climate and health • Strengthening and further development of innovation systems • Strengthening interdisciplinary and international cooperation • Analysing the determinants for the successful implementation of innovations in the healthcare sector
Award and certification	• Introduction of an awards and certification system • Best Practice Award
Awareness-raising and communication	• Reaching people on an emotional level through communication • Linking climate and health as an opportunity for communication • Overcoming communication traps • Tapping into the opportunities for target group-specific communication of co-benefits
Expertise	• Strengthening health-related climate literacy among the various professional groups in the healthcare sector • Comprehensive development of climate-related skills and expertise in ministries and establishment of a relevant department or staff unit
Digitalisation and Telemedicine	• Expansion of digitalisation and telemedicine services • Clarification of the legal framework for telemedicine • Scientific evaluation of the effects of healthcare sector digitalisation on greenhouse gas emissions, costs and health

Source: GÖG/Austrian National Public Health Institute

7 Summary and Conclusions

With a view to achieving the binding climate targets, protect health and strengthen the resilience of the healthcare system, it is necessary for the healthcare sector to implement comprehensive measures aimed at reducing its greenhouse gas emissions. This requires transformation in the various climate-relevant fields of action and across all healthcare facilities.

The Strategy for a Climate-Neutral Healthcare System provides an overview of the status quo, the necessary framework conditions, the climate-relevant fields of action and the measures required to firmly establish climate protection in the healthcare sector and to accelerate comprehensive transformation.

The goal is to achieve climate neutrality, as set out in the Paris Agreement and the 2020-2024 government programme “Out of responsibility for Austria”.

While there is clarity with respect to the measures necessary to reach this goal (please see general overview in Chapter 6), the main challenge is to shape the framework conditions in a way that facilitates and supports this transformation towards climate neutrality in the healthcare sector. In a first step, the relevant decision-makers need to decide on the Strategy’s implementation. Key to successful realisation are the establishment of a steering group that accompanies the Strategy’s implementation (see Chapter 5.1), and further in-depth work by the relevant stakeholders, including from the business community, and interdisciplinary cooperation in setting up a concrete roadmap. Further pivotal steps are binding definition of and agreement on the target structure, commitment by the relevant stakeholders, cooperation between and across the various disciplines as well as citizens’ involvement and participation.

Another essential prerequisite for integrating and firmly establishing the topic of climate in the health sector is the focused and comprehensive development of skills and expertise in the departments concerned with this key topic for the future, including, for instance, by establishing a climate, environment and health department at the Federal Ministry of Social Affairs, Health, Care and Consumer Protection or a corresponding staff unit.

In view of the challenges associated with the climate crisis and the related solutions – ranging from the implementation of climate neutrality in their own organisation to green budgeting – all federal ministries and administrative bodies at all levels are confronted with the need to develop the necessary skills and expertise as well as to firmly integrate and establish climate protection at organisational level.

With a view to successful implementation of measures and meeting climate protection goals, the Austrian Court of Audit calls for strengthening and fostering cooperation between the responsible and relevant bodies and organisations at federal and provincial level and for promoting and stepping-up target achievement monitoring and reporting. It is essential that climate protection is understood as comprehensive health protection and that the “Pact for the Future of Climate and Health” is supported across organisations, disciplines and stakeholders.

Table of Tables

Table of Figures

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List of abbreviations

ACA	Austrian Court of Audit
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	Agreement concerning the International Carriage of Dangerous Good by Road
AIT	Austrian Institute of Technology
APCC	Austrian Panel on Climate Change
API	Active pharmaceutical ingredients
ASVG	General Social Insurance Act
ATC	Anatomical Therapeutic Chemical
BGA	Federal Health Agency
BIQG	National Institute for Quality in Healthcare
BMK	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology
BMSGPK	Federal Ministry for Social Affairs, Health, Care and Consumer Protection
BVergG	Federal Procurement Act
B-ZK	Federal Target-based Governance Commission
CHP	combined heat and power plants
CITES	Convantion on International Trade in Endangered Species of Wild Fauna and Flora
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COVID-19	corona virus disease 2019
COM	center of mass
COP	Conference of the Parties
CSRD	Corporate Sustainability Reporting Directive
CT	computer tomography
DALY	disability-adjusted life years

DGE	German Nutrition Society
e-bike	electric bike
EAA	Energy Alliance Austria
EAG	Renewable Energy Expansion Act
EC	European Commission
ECHR	European Convention on Human Rights
EEffG	Federal Energy Efficiency Act
EE-MRIO	Environmentally extended multi-regional input-output
ELGA	electronic health record
EMAS	Eco-Management and Audit Scheme
EnMS	energy management systems
ERIC	Estates Returns Information Collection
ESR	Effort Sharing Regulation
EU	European Union
FAG	Financial Equalisation Act
FFG	Austrian Research Promotion Agency
g	gram
GDP	gross domestic product
GHG	greenhouse gas
GÖG	Austrian National Public Health Institute
GP	general practitioner
GQG	Austrian Health Quality Act
h	hour
H_2	hydrogen
HCWH	Healthcare Without Harm
HTA	Health Technology Assessment
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardazation
IT	information technology
IVD	in vitro diagnostic medical devices
KABEG	Carinthian Hospital Operating Association

KAGes	Styrian Hospital Association
KAKuG	Hospitals and Health Resorts
kg	kilogram
km/h	kilometers per hour
KSG	Climate Protection Act
kT	kilo tonnes
kW	kilo watts
kWp	kilo watt peak
LCA	life cycle assessment
LED	light-emitting diode
LGF	Provincial Health Funds
LIFE	The Financial Instrument for the Environment
l/s	liters per second
L-ZK	Provincial Target-based Governance Commissions
m^2	square meter
m^3	cubic meter
MEAT	most economically advantageous tender
Mio.	millions
MRI	magnetic resonance imaging
MRIO	multi-region input-output tables
mRNA	messenger ribonucleic acid
Mt	mega tonnes
MW	mega watts
naBe	Austrian Action Plan for Sustainable Procurement
NEC	National Emission Ceilings
NECP	National Energy and Climate Plan
NHS	National Health Service
NPO	Non-profit organization
OECD	Organization for Economic Co-operation and Development
ÖGK	Austrian Health Insurance Fund
ÖGNI	Austrian Sustainable Building Council

ONGKG	Austrian Network of Health-Promoting Hospitals and Healthcare Institutions
ÖNORM	Austrian Standard
ÖVKT	Austrian Federation of Hospital Engineers
PHARMIG	Association of the Austrian Pharmaceutical Industry
PIL	Pricate International Law
POP	Stockholm Concention on Persistent Organic Pollutants
PV	photovoltaics
RID	Regulations concerning the International Carriage of Dangeroud Goods by Rail
SDG	Sustainable Development Goals
SME	small and medium enterprises
t	tonnes
UniNEtZ	Austrian cross-university project to achieve the SDGs
WAM	with additional measures
WBCSD	World Business Council for Sustainable Development
WEM	with existing measures
WHO	World Health Organization
WiGeV	Vienna Health Association
WRI	World Resources Institute
UK	United Kingdom
UN	United Nations
UniNetZ	Universities and Sustainable Development Goals
USA	United States of America
UZ 46	Austrian Eco-label UZ46 (Green electricity)
VAT	Value Added Tax
ZS-G	Target-based Health Governance