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Communities creating climate solutions for a healthy planet and healthy people

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While on a global level, the implementation of climate solutions is slow, numerous local initiatives such as ecovillages are actively working towards establishing a harmonious and sustainable relationship with nature, fostering improvements in both planetary and human well-being. Research on the health co-benefits of global climate action has increased in recent years, while less research has been done on the impacts at the local level. This article explores the connection between climate action and health through a literature review and a case study on climate practices of an ecovillage. Three climate action tracks are presented that have the biggest potential to create health co-benefits on a global level: air quality, urban planning, and food systems. Implemented specific climate practices at the ecovillage show an individually perceived impact on the health of the residents due to physical activity, healthy nutrition, and mental health. The authors argue that the implementation of small-scale collective climate practices within ecovillages can play a significant role in addressing the climate crisis, while simultaneously promoting health. These practices provide valuable insights into evaluating and implementing tangible climate solutions. This article shows the importance of small-scale initiatives for global change. Given the limited existing literature and research on this particular topic, this article holds significant value as it contributes to a growing research field at the interface of climate action, ecovillage, and health studies.

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INTRODUCTION

In 2021, the Lancet Countdown on health and climate change stated: “Climate change is the greatest global health threat facing the world in the 21st century”¹. This shows that climate change is already changing the world as we know it, with drastic consequences for millions of people. Its impacts will intensify in the coming decades, with profound consequences for all aspects of human life around the world². The World Health Organization (WHO) estimates that between 2030 and 2050 climate change will cause approximately 250,000 additional deaths per year from malnutrition, malaria, diarrhea, and heat stress, among other causes³.

Even though negative statements regarding the acceleration of climate change and its consequences dominate the daily news, climate change can also be seen as an opportunity. In 2017, WHO acknowledged that “tackling climate change can also be considered the greatest global health opportunity of the century”⁴ and the Lancet Countdown¹ stated that climate change is “the greatest opportunity to redefine the social and environmental determinants of health”. If climate change is mitigated, it will not only have a positive impact on the planet but also on human health. These health co-benefits can result in healthier, more resilient, low-carbon, and equitable societies with high well-being for all².

Unfortunately, the world is off track to meet its climate targets⁵. The 2021 Emission Gap Report published by the United Nations Environmental Program⁶ states that there is a 50% chance that global warming will exceed 1.5 °C in the next two decades. Without immediate, rapid, and comprehensive reductions in greenhouse gas emissions, limiting warming to 1.5 °C or even 2 °C by the end of the century will not be achievable⁶.

Even though the implementation of mitigation solutions has been slow at the global level, there are local initiatives that are far ahead in putting solutions into practice and taking climate action

while striving for a healthier life. One example is ecovillages, which have been promoting a life in harmony with nature for decades. Existing data suggest that ecovillages often have over 50% reduction in their ecological footprint (a measurement of environmental sustainability) when compared to average communities^{7,8}. Community-led initiatives in general, and specifically ecovillages, are laboratories for sustainable ways of living. While the window for climate action is closing, research on ecovillages is still in its infancy, and data on them is limited. Therefore, it would be extremely irresponsible and devastating to rely only on the top-down climate movement. Local grassroots and bottom-up initiatives can complement global efforts to mitigate climate change by providing important knowledge on how to assess and implement concrete climate solutions.

This article argues that mitigating climate change has a profound impact at the local level, specifically on the physical and mental health of those people who are actively involved in climate action. It also aims to show how local initiatives, such as ecovillages, offer valuable insights into solutions that can make an important contribution to tackling the climate crisis, while simultaneously promoting health. Therefore, a case study was conducted to examine the climate practices within an ecovillage and to explore how these practices determine the residents’ self-perceived health outcomes. In particular, the study aims to answer two research questions:

1. What climate practices are implemented in the ecovillage?
2. What are the health implications of these climate practices for the ecovillage residents?

To better understand the links between climate change and health, the following literature review will focus on the determinants of health and examine the issue of climate change and health from a global perspective. The health co-benefits of climate mitigation measures are discussed in detail. This is

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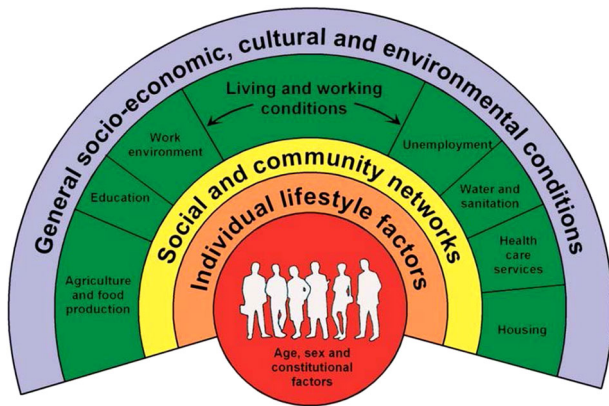


Fig. 1 The main determinants of health. The model tries to illustrate the complex relationship between an individual's health and its influencing factors. The inner circle represents the biological determinants of age, sex, and constitutional factors. Four layers shaped as a semicircle enclose the inner circle. These four layers are individual lifestyle factors, social and community networks, living and working conditions, and, as the outermost layer, general socio-economic, cultural, and environmental conditions⁹.

followed by a brief introduction to ecovillages as one example of local initiatives promoting sustainable living.

What determines health

Individual and community health is a complex system, influenced by many factors. Where people live, their genetics, income, education level, the state of the environment, and relationships with family and friends are just a few examples. Models of these determinants of health try to illustrate this complex relationship between health and its influencing factors. Back in 1991, Dahlgren and Whitehead⁹ published the 'rainbow framework' (Fig. 1), consisting of five layers. The inner circle represents the biological determinants of age, sex, and constitutional factors. Four layers shaped as a semicircle enclose the inner circle. These four layers are individual lifestyle factors, social and community networks, living and working conditions, and, as the outermost layer, general socio-economic, cultural, and environmental conditions⁹. Dahlgren and Whitehead, as well as many other academics during that time, placed particular emphasis on the social determinants of health. However, as the environment has continued to change more rapidly and its impact on our health became more evident, later published models gave greater importance to the environmental determinants of health. One example is the 'Meikirch Model of Health' published by Bircher and Kuruville in 2014¹⁰ (Fig. 2). It is shaped like a circle and consists of four layers: demands of life, individual determinants (including biologically given and personally acquired potentials), social determinants, and environmental determinants of health as the outermost layer that enclose the other three. The authors recognize that health is a complex adaptive system where social and environmental determinants interact and determine each other. Combined with the individual determinants and demands of life, the four create a system that "can develop a high degree of adaptive capacity, resulting in resilience and the ability to address ongoing and new challenges"¹⁰.

Climate change and health – A global perspective

For some time, scientists have known that our environment shapes us during our lifespan, and therefore it has a profound impact on our health. In 2012, the European health report "Charting the Way to Well-being" stated that environmental determinants of health are estimated to be responsible for

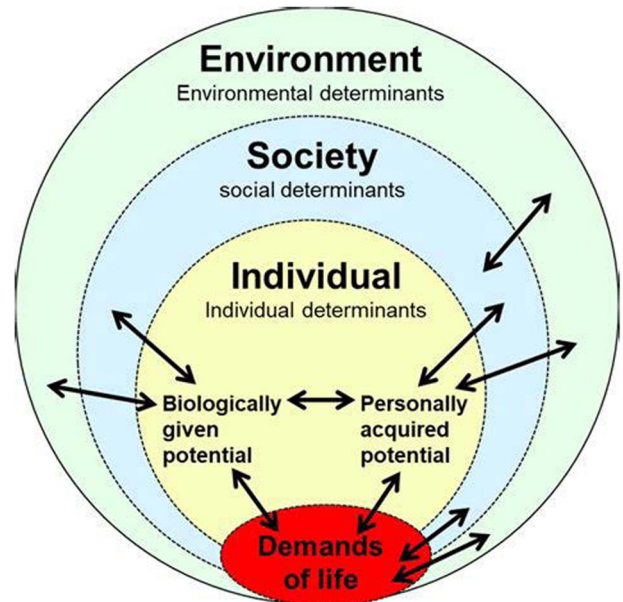


Fig. 2 Meikirch model of health. The model tries to illustrate the complex relationship between an individual's health and its influencing factors. It consists of four layers: demands of life, individual determinants (including biologically given and personally acquired potentials), social determinants, and environmental determinants of health as the outermost layer that enclose the other three. The arrows symbolize the interaction between the different layers⁴⁰.

13–20% of the burden of disease in Europe¹¹. Climate change rapidly intensifies the burden of disease, for example through polluted air, unsafe drinking water, and heat waves.

How exactly climate change affects our health is part of the research of Working Group II (WG II) of the Intergovernmental Panel on Climate Change (IPCC). In its fifth assessment report, chapter 11 is dedicated to the issue of climate change and health¹². In summary, it indicates three pathways by which climate change affects health:

1. Direct impacts, which relate primarily to changes in the frequency of extreme weather including heat, drought, and heavy rain.
2. Indirect impacts from environmental and ecosystem changes, for example, disease vectors, water-borne diseases, and air pollution.
3. Indirect impacts are mediated through societal systems, such as occupational impacts, undernutrition, and mental stress.

The magnitude of these impacts depends on the exposure to hazards and vulnerabilities, as well as social, economic, and geographical factors of societies. Climate events can occur with varying frequencies and intensities. This affects human exposure and determines the risk of climate-related diseases, injuries, and mortality rates¹².

In its latest IPCC report, published in early 2022, WGII looks at the "Co-benefits of Climate Actions for Human Health, Wellbeing and Equity"². It concludes that implementing climate change mitigation practices can result in healthier, more resilient, low-carbon, and equitable societies with high well-being for all. Taking a closer look at the health co-benefits of climate action on a global scale, the results can be broadly grouped into three categories: (a) air quality, (b) urban planning (including infrastructure and transport), and (c) food systems. The next chapters will present a short literature review about these three categories, while a summary of the findings is illustrated in Fig. 3.

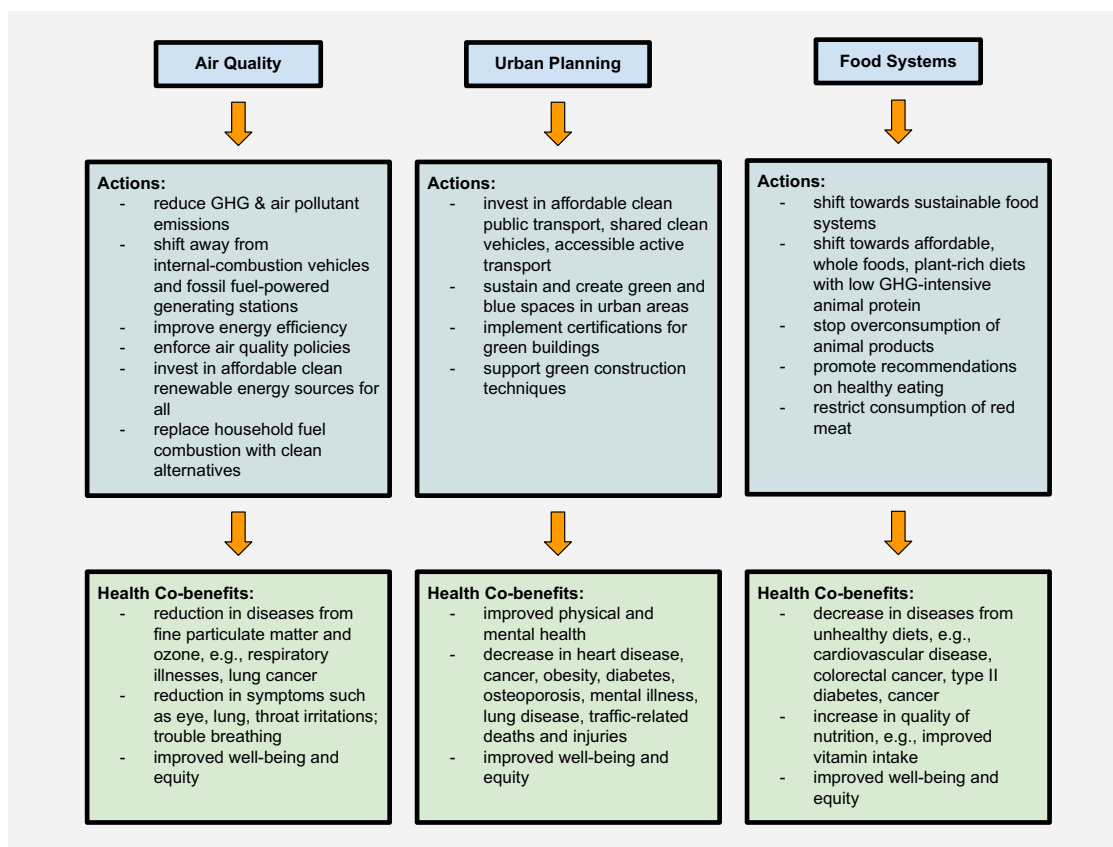


Fig. 3 Climate actions tracks and their health co-benefits. Summary of the three main climate action tracks with the identified greatest impact on health co-benefits. Source: edited by the author.

Clean air for healthy people

Air pollution is a major public health and environmental problem. It is killing 500,000 people in the European Region alone each year^{13,14}. Therefore, improving air quality can save thousands of lives. Given the overlap in the sources of greenhouse gases (GHG) with co-pollutants within energy systems, strategies focused on both reducing GHG emissions and improving energy efficiency hold substantial promise in yielding health co-benefits through the mitigation of air pollutant emissions¹⁵. Through the large number of lives and disability-adjusted life years (DALYs) saved, improving air quality is highly cost-effective as well. Markandya et al.¹⁶ show that health co-benefits from addressing air pollution substantially outweigh policy costs. Furthermore, the 2022 IPCC report states: “Air quality improvements alone can substantially offset, or most likely exceed, mitigation costs at the societal level”².

Results from an analysis of the air quality in Europe and related health impacts show that only by enforcing current European air quality policies and no further climate policies, the health impacts from PM_{2.5} (particles less than 2.5 mm in diameter) in Europe can decrease life years lost from exposure to PM_{2.5} by 78% between 2005 and 2050. The same study shows that ambitious climate mitigation policies could reduce ozone-related premature deaths from 48,000 in 2005 to 7000 in 2050. Preventing deaths and diseases from fine particulate matter and ozone could generate health benefits of 62 billion euros per year in 2050¹⁷.

For clean air, a transition to affordable clean energy sources for all is essential. When this transition is completed, there will be, with high confidence, “opportunities for substantial wellbeing, health, and equity co-benefits”². Especially in low- and middle-income countries, household air pollution is a serious health concern. Fuel combustion generated by household cooking, for

example, leads to indoor air pollution and contributes to outdoor air pollution. According to WHO, this makes household air pollution one of the largest environmental contributors to ill health and responsible for 7.7% of global mortality¹⁸. Vandyck et al.¹⁹ researched the potential of the transformation of energy systems and their implications for health. They found that meeting the Paris Agreement emission reductions related to renewable energy would improve air quality and could prevent 71,000 to 99,000 premature deaths annually by 2030. Furthermore, the researchers say in their study that “air quality co-benefits on morbidity, mortality, and agriculture could globally offset the costs of climate policy”¹⁹. The path of transitioning away from fossil fuels to affordable renewable energy sources for all is a path away from internal-combustion vehicles and fossil fuel-powered generating stations and aims to help mitigate GHG emissions, improve air quality, and lower risks of respiratory illnesses².

Public health and sustainable urbanization

To achieve an environment with clean air and high living standards, one in which the health of people and nature is supported, urban planning, including our infrastructure and transport systems, needs to be modernized. Sanitation, clean drinking water, drainage, electricity, and land rights must be considered in universal basic infrastructures. If this is done, it can lead to developmental opportunities, increased adaptive capacity, and reduced vulnerability to climate-related risks²⁰. However, as it is projected that an additional 2.5 billion people will live in urban areas by 2050, rapid urbanization presents a major challenge and limits the remaining time to transform cities into adaptive and climate-resilient places. Therefore, it is imperative to invest now in urban planning that combines clean, affordable public transport, shared clean vehicles, and accessible active transport. This can

improve air quality and create a healthy, equitable society with greater physical and mental well-being for all²⁰. Active mobility (walking and bicycling) can promote both physical and mental health while saving healthcare costs and reducing GHG emissions, especially when switching short car trips to walking or cycling^{21,22}. By increasing physical activity in the population, while reducing air pollution through active mobility, health risks for heart disease, cancer, obesity, diabetes, osteoporosis, mental illness, lung disease, and traffic-related deaths and injuries can be minimized²³.

Another aspect of urban planning that has been shown to improve climate change adaptation and mitigation, as well as improve human health, is the importance of green (e.g., parks and gardens) and blue (e.g., rivers and lakes) spaces in urban areas. Urban green and blue spaces can mitigate the health impacts of heat waves through multiple mechanisms, including temperature reduction and alleviation of mental health consequences associated with extreme heat, thus improving overall mental and physical well-being^{20,24}. Psychological studies exploring the effects of nature exposure on mental health can provide valuable insights into the specific ways in which these spaces contribute to mental well-being during heat waves. For example, a study from 2008 investigated the impact of nature exposure on cognitive function and mental well-being²⁵. The findings revealed that participants who walked in the natural environment showed significant improvements in attention and working memory compared to those who walked in the urban environment. Moreover, individuals who experienced nature reported lower levels of stress and improved mood compared to their urban counterparts.

Lastly, the design and construction of buildings is both a threat as well as an opportunity to the health of the planet and people. The 2018 Global Status Report of the Global Alliance for Buildings and Construction acknowledged that in 2017: “Buildings construction and operations accounted for 36% of global final energy use and nearly 40% of energy-related carbon dioxide (CO₂) emissions”, therefore, “buildings play a dominant role in the clean energy transition”²⁶. A study conducted by MacNaughton et al. in 2018²⁷ found that certified energy-efficient buildings in the United States, China, Germany, Brazil, India, and Turkey saved \$7.5 billion in energy costs and cut down on 33 megatons of CO₂ from 2000 to 2016. The 2022 IPCC report concluded that green buildings and construction techniques bring significant health benefits, such as improved indoor air quality, a reduction in the heat island effect, and improved social well-being by energy poverty alleviation. At the same time, workplaces are created that allow longer productivity periods, thanks to greater thermal comfort, improved indoor lighting, and reduced noise pollution. The same economic principle applies here: “The value of these multiple co-benefits associated with climate actions in buildings is equal or greater than the costs of energy savings”²⁰.

A sustainable production of healthy and sufficient food

Food, agriculture, and land use combined are responsible for about 24% of total global GHG emissions that are released into our atmosphere, ranking them second after electricity production with about 25% of global emissions²⁸. A shift towards sustainable food systems is an easy but highly effective solution for climate change mitigation and improving human health. According to the 2022 IPCC report of WG II², affordable, diverse, plant-rich diets with moderate amounts of GHG-intensive animal protein are part of the solution and can deliver health co-benefits and significantly reduce GHG emissions. This is especially true in high-income countries where health problems are associated with over-consumption of animal products². Studies that demonstrate the benefits of shifting towards sustainable food systems found that a transition towards less meat consumption and more plant-based diets, in line with WHO recommendations on healthy eating, could

reduce global mortality by 6–10%, while simultaneously bringing GHG emissions down by 29–70%²⁹. Specifically, consumption of red meat is associated with cardiovascular disease and colorectal cancer, whereas an increased consumption of fruits and vegetables “can reduce the risk of cardiovascular disease, type II diabetes, cancer, and all causes of mortality”². Furthermore, solutions for growing food and managing land sustainably, such as permaculture or agroforestry, have long existed in agriculture. The researchers Rosenstock et al.³⁰ found in 2019 that agroforestry (the management of trees with crops and livestock), alters microclimates, hydrology, biogeochemistry, and biodiversity, which in turn leads to mitigation and adaptation potential, an increase in biodiversity, livelihoods, and benefits to nutrition, health, and equity. Again, the economic benefits of improving health through the shift to more sustainable food systems outweigh the costs of that shift. Springmann et al.²⁹ estimated that “the economic benefits of improving diets to be 1–31 trillion US dollars, which is equivalent to 0.4–13% of global gross domestic product (GDP) in 2050”.

Ecovillages and climate action

The above-mentioned climate change mitigation strategies are often looked at on a global scale. Less attention is paid to the various community-led initiatives which are taking climate action in their local communities. Ecovillages are one of the oldest initiatives actively working towards establishing a harmonious and sustainable relationship with nature. Some of their roots go back to the early 19th century. An ecovillage is defined as an “intentional or traditional community that is consciously designed through locally owned, participatory processes to regenerate their social and natural environments”³¹. There are more than a thousand such communities worldwide. The exact number is unknown as it relies on self-reported and self-identification of communities as ecovillages. Nevertheless, the network around ecovillages has become globally widespread. It is organized by the Global Ecovillage Network (GEN) with five broad regional organizations: GEN Europe, CASA Latina, GENNA (North America), GEN Africa, GENOA (Oceania & Asia), and a Youth Network (NextGEN). Different alliances between these organizations and, among others, the United Nations, national governments, academic researchers and institutions, and other corporations exist to support the implementation of the Paris Agreement and the Sustainable Development Goals³¹.

Ecovillages are defined by their focus on healthy lifestyles and environmental sustainability. As a main part of their identity, Gilman sees the establishment of a “healthy human development”, meaning that all aspects of human life (physical, emotional, mental, and spiritual) develop in a balanced and integrated way. To achieve this healthy development, it must be expressed in the life of each individual, as well as in the life of the community as a whole³². Other researchers acknowledge that ecovillages have the “intention to live in a healthy, democratic and ecological community”³³. Environmental sustainability is put into practice through climate practices, for example, the generation and use of energy from renewable sources, self-sufficiency in nutrition, organic agriculture, organic gardening, and permaculture³⁴. Since ecovillages can vary greatly in their population, sustainable practices, and time of establishment, it is difficult to make a general statement about their environmental impact. Existing data however suggests that ecovillages manage to create a more sustainable environment than average communities. Studies that look at the ecological footprint of ecovillages, found a reduction of about 50% of their environmental impact, compared to the average of the same area^{7,8}. Ecovillages can be seen as climate activists because they not only implement and experiment with climate solutions, but they also aim to share their learnings with the ecovillage network, as well as the public. In this way, they

generate valuable knowledge and insights about a way of life that claims to be good for the climate and to promote people's health, well-being, and social cohesion.

METHODS

To further examine the climate actions implemented in ecovillages and their impact on residents' health, a study was conducted between April 3rd and 10th, 2022. Since ecovillages are a fairly new field of research, an exploratory qualitative research design was chosen with a single case study of the ecovillage Sulzbrunn in southern Germany. The advantage of quantitative research is that it provides insight into everyday life, processes, and individual views. "Qualitative research (...) has a strong orientation to everyday events and/or the everyday knowledge of those under investigation"³⁵. Furthermore, this scientific work does not claim to record the measurable health status of the ecovillage inhabitants. Rather, it aims to provide a first impression of the residents' self-perceived health and explore the links with environmental practices.

Sulzbrunn was chosen as the study object because it met the predefined selection criteria, which were: being a GEN member, having existed for at least five years, having at least 30 residents, and having a focus on environmental sustainability. Among the ecovillages that met these criteria, Sulzbrunn showed the highest degree of motivation and interest to participate in the study. This factor holds significance as the study's efficacy relied upon the active cooperation of its residents. At the time of the research, 40 community members and 14 children were living in the community. Qualitative semi-structured interviews ($n = 9, 22, 5\%$ of adults living in the ecovillage) with residents were conducted on-site, combined with participatory observation during community engagement of the researcher. The primary selection criteria for the interview participants included their membership status in the Sulzbrunn ecovillage, current residency within the community, and regular engagement in community activities, with a minimum frequency of once per week. The interviews were analyzed based on the theory of inductive qualitative content analysis by Mayring³⁶. Prior to the interviews, an informed consent form was signed from each participant.

The purpose of the interviews was to acquire knowledge regarding climate practices in the ecovillage and their potential health implications for the residents. In addition, the interviews provided insights into life in a community that strives for ecological and social sustainability, as well as its opportunities and challenges. The personal stay in the ecovillage made it possible to informally take part in activities and discussions with residents in addition to the interviews. This led to deeper knowledge and insights into the everyday life and activities of the residents.

RESULTS

Climate practices in the ecovillage

Sustainable agriculture practices. Agriculture and the supply of nutritious food is an important component of the Sulzbrunn community. A large part of the food for the residents is grown on the property of the ecovillage, in greenhouses, fields, and gardens. The community pays significant attention to ensuring that the grown food and the careful treatment of animals and nature lead to high-quality yields. Agriculture is designed according to Demeter and permaculture principles, which aim to preserve the natural cycles of nature. This also implies the inclusion of animals in agriculture. In Sulzbrunn, one can find sheep, pigs, horses, and rabbits helping to graze the land. In addition, the fur of the sheep is reused, and the dung of the animals is used as fertilizer. The quantity of animals being slaughtered for consumption depends on the needs of the residents. Each household indicates how

much meat it wants to consume in a year, which then determines how many animals are kept. Care is also taken when slaughtering the animals to ensure that they are not under stress and suffer unnecessarily in the process. One interviewee sees another advantage of animal husbandry: "We don't use big machines to take care of our meadows and lands, but it all works with sheep".

The grown vegetables and fruits, as well as the meat from the animals, are distributed to the residents in their own village store. Through a social farming concept, residents pay a monthly contribution, depending upon their own needs, and can thus get food from the store at any time. In addition to the self-produced food, products are purchased for the store in bulk quantities. Where possible, food and other products are distributed to individual residents package-free, which has the advantage of cutting back on packaging waste, especially plastic. Additionally, the ecovillage receives organic fruits and vegetables that can no longer be sold in stores by a company. This ensures that these foods are not thrown away. The offer of the village store is very well accepted by the ecovillage residents. One interviewee stated that people buy 80–90% of what they eat in the village store. This is because the distance to the village store is short, and groceries can be bought 24/7. Another advantage of a central store is that not every resident has to drive their car to a supermarket. Finally, the high quality of the food is highly appreciated by all residents. One interviewee stated: "To eat organic is a given, I think, we only have organic products in our own store and most people eat organic food".

Green energy supply. Another significant aspect in which the Sulzbrunn community strives for sustainability in preserving the environment is energy production. When the community bought the property in 2015, everything was heated with oil. In just seven years, they have completely moved away from fossil fuels by installing solar panels, photovoltaics, and a wood chip heating system. When the weather is sunny, the ecovillage produces up to 80% of its own energy. The electricity that is purchased comes from renewable energy sources. This makes the community 100% independent of fossil fuels. With the help of an app, residents can view the energy production of the ecovillage and adjust their electricity consumption accordingly to use as much of their self-produced electricity and heat as possible. The energy generated not only supplies the households but also the e-bikes and a cellphone solar station at the village square are supplied with self-generated energy. Another point where energy is saved is the renovation and the organic insulation of the buildings. In some cases, the roofs and exterior walls were insulated with softwood panels, a sustainable alternative to Styrofoam.

Sustainable use of resources. The use of resources is another important aspect of sustainability in Sulzbrunn. On one hand, an attempt is made to separate waste as strictly as possible. On the other hand, materials such as wood and metal are reused, and water is treated in the village's own sewage treatment plant. Rainwater is also collected and used, for example to water plants. If material must be bought or labor is needed, great importance is attributed to regionality. The Sulzbrunn community is well-networked with the surrounding villages. Resources are also conserved in the individual residential communities, for example by cooking together: "In the individual houses, it is usually the case that not one person has a kitchen for themselves, but rather we have shared kitchens wherever possible". In addition, cooking is done at scale twice a week for everyone in the community house, thus saving energy and time. Even though everyone in the community can decide for themselves what they consume, sustainability is consciously considered in decisions made for the whole community.

Furthermore, the Sulzbrunn community has established various sharing models. The most important of these is car sharing. Private

cars can be shared with community members, which leads to a small demand for private or new cars. Quite a few people do not have a car at all and use the car sharing when they need it. Recently, they have implemented a sharing model for e-bikes. Other things, such as tools, lawnmowers, or furniture are also shared. An equipped wood and metal workshop is available to all residents, saving additional costs for all residents. Finally, shared living is not only cost-effective but also resource-efficient. Residents typically share their apartments, following a general guideline that ensures no one occupies more than 40m² of space individually.

Perceived health effects of climate practices

Residents of Sulzbrunn perceived the health co-benefits of applied climate practices (CPs) in three main direct ways: (a) increased physical activity, (b) healthy diets, and (c) mental health. Physical activity is promoted during the many tasks outdoors like gardening, walking, biking, and construction work. Gardening, digging up the soil, planting, harvesting, and taking care of the animals is physically challenging. Spending four to five hours on a Saturday in the garden is not a rare occurrence. Moreover, ecovillage residents walk a lot and ride bicycles: “We try to drive as little as possible and to cycle instead”. This keeps them fit and promotes good health.

The diet of the residents is characterized by organic and local foods from their own agriculture and village store. Moreover, the food consumed in the village is pesticide-free, high in vegetables, and meat consumption is low. If residents consume meat, it primarily comes from their own livestock. Accessibility to healthy food is high thanks to the village store only being a short walk away. Therefore, the results indicate that people in Sulzbrunn follow a healthy diet, rich in vegetables and low in processed foods and meat.

Furthermore, all interviewees reported the influence of the CPs on their mental health in addition to physical health. By protecting the natural surroundings of the ecovillage and activities that directly deal with nature, animals, and soil, residents feel connected to nature, which in return is perceived as beneficial to their mental health. There is a high amount of green space in the ecovillage which increases the mental well-being of the residents. Awareness of the natural environment with its animals and various plants, is associated with a feeling of satisfaction and mental health. In addition, physical activity through the many tasks associated with maintaining the garden, facilities, caring for animals, etc., provides a balancing force to sedentary activities. For example, an interviewee who works in an office job reported: “You work in the soil, you see things grow, or you just have the physical activity (...). It’s enough for me if I spend 4–5 h in the garden on Saturday. This gives me mental and physical balance”.

Health co-benefits of the CPs exist in indirect ways as well. Many of the tasks performed in ecovillages are only possible in the community as they require teamwork, motivation, commitment, and effective communication. The focus on social interaction and community creates familial relationships: “I see each housemate as a family member”. This in turn creates an atmosphere that promotes physical, mental, and social well-being and sets the foundation for the success of the ecovillage. Furthermore, the tasks provide a daily structure, which is especially beneficial for people who have retired. Finally, the variety of topics people engage with nudge them to break out of their habitual structures. The results indicate that people in ecovillages deal with a wider variety of tasks and topics throughout their daily lives, which they say keeps them mentally fit.

Especially during the Covid-19 pandemic, ecovillage residents perceived living in a community as an advantage. For example, the children could continue to play with their friends in the ecovillage. Interviewees stated that also without the pandemic,

children can thrive in ecovillages. On the one hand, children are outside a lot, they have playmates, and learn by watching the adults. On the other hand, children look out for each other while the parents work in the garden and thus learn to organize themselves. In ecovillages, children have a place to try out things, they are independent and can develop freely. One interviewee is of the opinion that growing up in a sustainable, community-focused environment has an influence on children’s mindset, which they will then carry out into the world.

The results suggest that physical health and mental health are both equally affected by the CPs in place. Mental health is perceived by the residents as a state of well-being when they are connected and engaged with nature. Physical health comes as a ‘byproduct’ while engaging in CPs, as most of these tasks require physical work. Ultimately, it can be said that CPs change the environment of ecovillage residents in such a way that health-promoting behavior is made easy and often happens unconsciously while engaging in daily tasks.

DISCUSSION

This study explores the intricate relationship between climate practices and their associated health co-benefits. Local initiatives, such as the ecovillage studied here, underscore the manifold solutions aimed at promoting sustainability and fostering environmentally conscious lifestyles.

In the ecovillage, climate action could be observed in many areas, such as sustainable agriculture practices, usage of renewable energy, providing easy access to healthy foods, and therefore supporting healthy diets, as well as sustainable and mindful usage of resources. In a world still dominated by fossil fuels and environmental degradation, ecovillages show a practical way out of climate-harmful practices and a way toward a more sustainable future.

A holistic approach emerges as the key to safeguarding both our environment and our health, encompassing climate-friendly actions in many parts of our daily lives. These efforts pay off and are rewarded by health co-benefits. As this study shows, health co-benefits of CPs were reported by the residents, particularly in three main areas: increased physical activity, the adoption of healthy diets, and enhanced mental well-being.

Physical activity is supported by the daily physical tasks that come with activities like gardening, cycling, or walking. Because the ecovillage grows a large amount of their produce itself, while attaching great importance to organic and high-quality foods, most ecovillage residents follow a diet rich in vegetables and fruits, while low in meat. Mental health is not only improved by the time spent outdoors but also by the feeling of connection with nature and the close-knit community.

The ecovillage can effectively implement climate actions because the residents are empowered to actively shape and change their environment. They are responsible for their land and are aware of this responsibility. One can observe a high sense of duty in the residents towards nature and animals. It can be discussed whether this sense of duty also comes from the fact that the inhabitants have recognized a health benefit in the sustainable use of nature.

In summary, this study unequivocally demonstrates the reciprocal relationship between residents’ perceived health and environmental protection within an ecovillage setting. In a nurturing environment, health-promoting behaviors emerge organically and effortlessly.

For decades, scientists have been warning about the effects of climate change on human health. Possible solutions have existed for a long time and are being implemented around the world³⁷. Often, rapid implementation fails due to top-down climate policy decisions without citizen participation. Therefore, to achieve rapid change, democratized citizen involvement in policy formulation is

needed³⁸. The IPCC Special Report on the impacts of global warming highlights the vital role of enhancing climate action capacities of “national and sub-national authorities, civil society, the private sector, Indigenous peoples and local communities”³⁹. Ambitious climate policy objectives to limit warming below 1.5 by 2100 can only be achieved through collective efforts.

There are several limitations to this study. A key limitation is its small sample size which hinders the generalization of the findings. At this point, it should also be emphasized once again that this study only qualitatively investigated the health influences reported by the ecovillage residents themselves and therefore does not offer any quantitative data on measurable health indicators. However, the aim was to gain a deeper insight into the daily lives and tasks of the ecovillage residents. The results from this work can be seen as indicative and guiding, yet they also demonstrate the importance of further research.

As ecovillages can be quite diverse in their practices, future studies should include a larger sample-size. Some ecovillages might have implemented different CPs with different health implications. Based on this, the extent to which these sustainable lifestyles and practices can be transferred to the general population should be investigated. It is particularly interesting to examine what conditions must be in place for climate practices to be implemented and under what circumstances they lead to increased positive health outcomes. Because of the urgency of addressing the climate crisis, more attention should be paid to the efforts of ecovillages and other local initiatives put into the implementation of solutions.

One final limitation is the partial misalignment between the global health co-benefits categories discussed in the literature review and the specific climate actions described in the ecovillage case study. The literature primarily emphasizes urban planning, air quality, and food systems which cannot be directly applied to rural ecovillages due to the need for different political governance in areas such as urban planning, mobility, construction, and agriculture. As a result, there is a gap between the theoretical background and the findings of this study.

We conclude that, on a global scale, science could prove many health co-benefits of international climate change mitigation practices. Cleaning the air we breathe, providing green and affordable public transport, and shifting towards sustainable food systems, are effective solutions for climate change mitigation while they improve human health. The economic benefits of improving health through these climate practices outweigh the costs.

While global efforts to tackle climate change are slow, local initiatives have implemented solutions and are experimenting with sustainable practices and lifestyles. In this article, we introduced ecovillages as one of those initiatives. The two research questions posed at the beginning about the implemented climate actions and their perceived health implications were answered based on a case study in the Ecovillage Sulzbrunn. The results show implemented climate practices in the ecovillage centered around sustainable agriculture practices, green energy supply, and a sustainable use of resources. The integration of sustainability into the concept of the ecovillage creates an independent mechanism where sustainability is always considered. This leads to resident’s perception of health co-benefits stemming from these CPs, particularly in the domains of increased physical activity, healthier diets, and improved mental health.

Ecovillages are just one example of many other grassroots initiatives that promote both the health of humans and nature, pursuing a harmonious balance³⁷. These community-driven initiatives challenge the status-quo, which in turn creates new models of life that are less attached to endless economic growth and consumption. Their solutions are often creative and adapted to the local circumstances and needs.

In the face of pressing global challenges, notably the climate crisis, it is unmistakably clear that community-driven initiatives play a pivotal role in our collective efforts to combat these issues while simultaneously fostering improved public health. By serving as practical hubs of knowledge and experience in implementing tangible climate solutions, initiatives like ecovillages underscore their vital importance. Therefore, we strongly advocate for the increased recognition and active inclusion of ecovillages and similar community-driven endeavors within governance frameworks designed to address our most pressing challenges.

Reporting summary

Further information on research design is available in the Nature Research Reporting Summary linked to this article.

DATA AVAILABILITY

The data that supports the findings of this study are available from the corresponding author upon reasonable request.

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AUTHOR CONTRIBUTIONS

S.R.: Corresponding author. Development of study design and research questions. Development of interview questions. Execution of interviews and participatory observation in the ecovillage. Transcription and analysis of the interviews. Analysis and interpretation of results. Manuscript writing and discussion. Final approval of the manuscript. B.G.: Contribution to the conception and the design. Contribution to acquisition, analysis, and interpretation. Critically revised the manuscript. Final approval of the manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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