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REVIEW ARTICLE



# Unveiling the nexus: the intersection of environmental medicine and mental health in the era of climate change

## Odkrywanie powiązań: wzajemne oddziaływanie medycyny środowiskowej i zdrowia psychicznego w dobie zmian klimatycznych

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## Abstract

**Introduction and Objective.** The article delves into the intricate relationship between environmental medicine and mental health, highlighting the interconnecting aspects in the face of the growing climate crisis. The aim of the study is to examine the impact of climate change on mental health, explore existing interventions, and propose comprehensive strategies to address this significant issue.

**State of Knowledge.** Recent research has revealed profound implications of climate change on mental health. Rising temperatures, extreme weather events, and environmental degradation contribute to increased psychological stress and vulnerability among affected populations. Individuals with pre-existing mental health disorders are particularly at risk. Promoting interventions and educational initiatives for key stakeholders, such as healthcare leaders, policy makers, educators, and mental health specialists, is essential. Integrating mental health aspects into climate actions can yield benefits for both environmental protection and psychological well-being.

**Conclusion.** The nexus between environmental medicine and mental health in the era of climate change necessitates a holistic approach. By raising awareness, enhancing institutional capabilities, and implementing innovative interventions, we can mitigate the mental health burden resulting from climate-related disasters. Adopting sustainable policies and practices is crucial. A collective effort is indispensable to forge a more resilient future for the mental health of our planet and communities. Safeguarding both the health of our planet and the well-being of individuals is our shared responsibility, one that we must undertake.

### Key words

mental health, climate changes, environmental medicine, mental disorders, climate action

## Streszczenie

**Wprowadzenie i cel pracy.** Artykuł zgłębia skomplikowaną relację między medycyną środowiskową a zdrowiem psychicznym, podkreślając ich wspólne aspekty w obliczu narastających zmian klimatycznych. Celem pracy jest zbadanie wpływu zmian klimatycznych na zdrowie psychiczne ludzi, określenie możliwych do wdrożenia interwencji oraz zaproponowanie kompleksowych strategii mających na celu rozwiązanie tego istotnego problemu.

**Stan wiedzy.** Ostatnie badania wykazały poważne konsekwencje wpływu zmian klimatycznych na zdrowie psychiczne społeczeństwa. Wzrastające temperatury, ekstremalne zjawiska pogodowe i degradacja środowiska przyczyniają się do wzmożonego stresu psychicznego i zwiększonej podatności na zachorowanie. Grupę szczególnie narażoną na negatywny wpływ zmian klimatu stanowią osoby z zaburzeniami zdrowia psychicznego. Niezbędne jest promowanie wśród kluczowych interesariuszy możliwych do podjęcia interwencji, a także inicjatyw edukacyjnych. Integracja aspektów zdrowia psychicznego w działaniach klimatycznych może przynieść korzyści zarówno dla ochrony środowiska, jak i dobrostanu psychicznego ludzi.

**Podsumowanie.** Związek między medycyną środowiskową a zdrowiem psychicznym w erze zmian klimatycznych wymaga podejścia holistycznego. Poprzez zwiększenie świadomości w społeczeństwie w tym zakresie, a także podnoszenie kwalifikacji instytucji i innowacyjne działania możemy zredukować obciążenie zdrowia psychicznego wynikające z katastrof klimatycznych. Wdrażanie zrównoważonych polityk i praktyk w tym zakresie jest kluczowe. Wspólny wysiłek jest niezbędny, aby zwiększyć odporność psychiczną obywateli na zmiany klimatu. Ochrona zarówno zdrowia planety, jak i dobrostanu jednostek to nasz wspólny obowiązek, który należy wypełnić.

### Słowa kluczowe

zdrowie psychiczne, zmiany klimatyczne, medycyna środowiskowa, zaburzenia psychiczne, działania klimatyczne

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## INTRODUCTION

In recent years, the growing recognition of the intricate relationship between the environment and human health has propelled the field of environmental medicine to the forefront of public health research. Environmental medicine encompasses a wide range of topics, including the epidemiology of environmental risk factors, preventive medicine, and the impacts of physical and biological hazards on health. As we navigate the complex challenges posed by the rapidly changing climate, the intersection of environmental medicine and mental health emerges as an area of paramount importance.

Mental health disorders continue to impose a substantial burden on societies worldwide, with an estimated one billion people affected globally [1]. The World Health Organization (WHO) reports that approximately 800,000 individuals commit suicide each year, emphasizing the urgent need to address mental health issues on a global scale [2]. Furthermore, within the WHO European Region alone, mental disorders affect 110 million individuals, comprising 12% of the entire population [3]. Disturbingly, mental health concerns extend beyond numbers, as they permeate every facet of society, including education, employment, and overall well-being.

The impact of climate change on mental health is a pressing issue that warrants comprehensive exploration. As the 'Lancet Countdown on Health and Climate Change' highlights, rigorous research in this domain faces unique methodological challenges due to the complex nature of the topic and limited data availability [4]. Climate change, often characterized by gradual shifts occurring on a large scale, can present difficulties in immediately detecting the associated mental health implications. Moreover, the biopsychosocial pathways linking climate change and mental health outcomes are intricate, as mental health effects can arise from events or circumstances triggered or exacerbated by climate-related factors, such as displacement, poverty, and trauma [1].

While the scientific literature on the association between climate change and mental health is expanding, there remains a need to delve deeper into this complex relationship. Understanding the direct and indirect effects of climate change on mental health necessitates robust methodologies, innovative theoretical models, and comprehensive datasets [1]. Large-scale studies utilizing extensive datasets have become instrumental in detecting subtle changes in temperature and their impact on mental health outcomes at a population level [4]. Through such approaches, researchers can elucidate the key findings, identify knowledge gaps, and inform future studies in this evolving field.

The multifaceted effects of climate change on mental health encompass both direct and indirect pathways. Direct effects often encompass stress-related and trauma-related consequences stemming from acute climate-related events, such as hurricanes or floods. Indirect effects manifest through a range of insidious mental health changes linked to physical health implications, including increased ambient temperature, heightened exposure to pollutants, and community-level disruptions resulting from economic damages and resource scarcity [5]. Moreover, climate change can amplify existing disparities and vulnerabilities, disproportionately affecting marginalized populations already at risk for mental health disorders [6]. This intersectionality necessitates an exploration of health inequities, structural inequalities, and the role of public policy in addressing climate change associated mental health challenges.

In the light of these challenges and opportunities, this article aims to unveil the intricate nexus between environmental medicine and mental health in the era of climate change. By critically examining the existing literature, incorporating methodological advancements, and identifying research gaps, the aim is to contribute to the growing body of knowledge on this crucial topic. Furthermore, there is the search to underscore the need for interdisciplinary collaborations, policy reforms, and innovative interventions that prioritize mental health in the face of climate change.

Through this exploration, it is hoped that light will be shed on the complex dynamics at the intersection of environmental medicine and mental health, informing evidence-based strategies for mitigating the adverse effects of climate change on mental well-being. By prioritizing this vital aspect of public health, efforts can be made towards a more resilient and equitable future for individuals and communities worldwide.

### The Significance of Mental Health in Society

According to the WHO definition, 'Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community' [7]. Achieving this state among the population is a significant challenge, given that over one billion people worldwide live with mental disorders and addictions [8, 9]. Moreover, in 2019, one in every eight people in the world lived with a mental illness [10]. Despite the existence of effective prevention and treatment methods, the majority of individuals with mental disorders lack access to appropriate care. Many of them often experience discrimination, human rights violations, and stigmatization [11].

There are numerous types of mental disorders and their occurrence has serious consequences [11]. Patients suffering from severe mental health issues, including depression, have a shorter life expectancy compared to the general population, with reductions ranging from 10–25 years [12, 13]. Moreover, these disorders impose significant financial burdens, including direct costs of medical care, hospitalizations, outpatient visits, and indirect costs, such as income loss resulting from absenteeism at work [9, 14]. According to Arias et al., Global Burden of Disease (GBD) 2019 attributed over 125 million disability-adjusted life-years (DALYs) to mental disorders, accounting for approximately 5% of the global burden [9]. Special attention is also directed towards mental disorders in children, adolescents, and young adults, which may lead to an increased risk of clinical, functional, and socio-economic impairments even many years after the initial onset of the disorder [15–18]. These may include unemployment, lower educational and occupational attainment, reduced socio-economic status, substance abuse, impaired social functioning, and unfavourable outcomes related to sexuality and parenthood [15].

There are many factors known to affect mental health, among them climate change is gaining increasing attention. According to research, as many as 93% of Europeans consider climate change a serious issue, with 78% considering it a very serious problem. One out of four respondents asked to select the most serious global issue, indicated climate change (29%) [19]. There is also a growing discussion about the negative emotional reactions associated with awareness of climate change [20].

## Climate Change and Mental Health

According to the definition provided by the Intergovernmental Panel on Climate Change (IPCC), climate change is defined as 'a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer' [21]. This involves extreme weather events characterized by long-term changes in seasonal patterns and anticipated catastrophic impacts in the future. They have been recognized by many scientists and healthcare professionals as a health threat [1].

Climate change affects various aspects of human functioning. A lesser-known and often overlooked issue is its impact on mental health. This oversight may result from a general lack of attention to mental health in broader health concepts, as well as challenges associated with assessing, monitoring, and predicting the consequences of climate change on mental health [22]. Climate change can influence mental health in various ways [22–24].

Direct causes include any traumatic weather-related events, such as fires, hurricanes, or floods, and the associated resulting stress. Indirect causes encompass changes related to political, socio-economic, and social factors, such as unemployment, poverty, migration, as well as those linked to physical health including increased pollen concentrations, pollution, and higher ambient temperatures. Special attention is also drawn to indirect chronic effects, which include solastalgia, eco-anxiety, and climate grief, signifying fear and helplessness in the face of rapid climate change [25, 26]. The association between different types of climate change and their impact on mental health is presented in Table 1.

There is a strong correlation between high temperatures, heat waves, and adverse health effects, which have been described in the context of many diseases [27]. Thompson et al. conducted a review in 2018, demonstrating an increased risk of suicide due to heat, and an elevated risk of hospital admissions related to mental health and emergency department visits in higher temperatures [28]. Liu et al. in 2021 found that each 1-degree Celsius increase in outdoor temperature is associated with a 2.2% increase in mortality, and a 0.9% increase in mental health-related illnesses [27]. Bundo et al. suggested in their 2021 study that psychiatric patients are particularly vulnerable as rising temperatures can negatively impact their mental well-being, emphasizing the need for public health actions to protect them from the consequences of climate change [29].

Numerous consequences of climate change affecting mental health are related to extreme weather events, including tropical storms, hurricanes, heat waves, storms, and floods. The frequency and severity of these events are increasing worldwide, with projections indicating that this trend will persist for decades [30–33]. Lamond et al. conducted a cross-sectional study to examine the long-term impact of floods on the mental health of affected individuals. They found that six years after floods, victims experienced anxiety (>60%), increased stress levels (<40%), more frequent flashbacks (23%), insomnia (18%), depression (18%), and nightmares (<10%) [34, 35]. It is estimated that the number of flood-affected individuals reporting psychological side-effects in Europe from 1998–2018 ranged from 1.72–10.6 million [23, 36]. Exposure to extreme weather events is often traumatic, leading to psychomotor disturbances and developmental delays in youth [37, 38]. This issue is particularly relevant in children, as even 71% of children report post-traumatic mental health problems after disasters [37, 39, 40]. Many studies also confirm the correlation of these events with the occurrence of post-traumatic stress symptoms [33, 37, 41].

According to WHO, environmental, social, and economic determinants of mental health include factors such as water quality and quantity, air quality, food safety, income, and ecosystem changes [42]. Other authors list migration among the socio-economic disorders negatively affecting mental health [1]. Munro et al., in their analysis in 2017, found a strong connection between forced displacements and depression, anxiety symptoms, and post-traumatic stress [43]. In a review conducted in 2019, Yazd et al. identified drought as one of the factors most affecting the mental health of farmers[44]. Results from Clayton et al. in 2020 suggest that climate change anxiety is not uncommon, especially among younger adults. The growing public awareness of climate change can also lead to stress, as confirmed by the "Stress in America" survey, in which 51% of respondents indicated climate change as a "somewhat or significant source of stress" [20, 45]. A summary of selected research findings regarding the impact of climate change on mental health is presented in Table 2.

## Prevention in the Context of Climate Change and Mental Health

In the face of climate change, prevention plays a crucial role in minimizing the risk of mental disorders. The evidence presented in this review indicates the need to consider the hidden costs of climate change related to mental health, as well as the benefits of climate actions. Actions aimed at mitigating climate change (both policies and behaviors) can improve mental health outcomes by reducing the intensity of

**Table 1.** Types of climate changes and their impact on human mental health

| Type of climate changes | Impact on human mental health |
|---|---|
| Direct climate changes – extreme weather events (e.g. floods, hurricanes). | • PTSD<br>• Anxiety, fear, and distress related to extreme weather events.<br>• Increased risk of experiencing stress and trauma related to direct climate disasters.<br>• Difficulty accessing basic climate-related services.<br>• Difficulty accessing basic healthcare services. |
| Indirect climate changes – increased awareness of climate changes and ecological threats. | • Anxiety and concerns about the future of the planet and future generations.<br>• Depression and feelings of helplessness in the face of global environmental issues.<br>• Stress related to the uncertainty and unpredictability of climate changes.<br>• Increased tension and social conflicts related to environmental threats.<br>• Increased risk of conflicts associated with migration and displacement.<br>• Solastalgia - sadness and disorientation due to negative environmental changes related to climate and ecology.<br>• Eco-anxiety - anxiety and concerns related to environmental threats and natural environmental changes.<br>• Climate grief - a sense of sorrow, loss, and helplessness towards climate and ecological changes. |

**Table 2.** Studies on the impact of climate change on mental health: selected findings

| Authors | Year of study publication | Research topic | Conclusions |
|---|---|---|---|
| Thompson et al. | 2018 | Impact of heatwaves on mental health. | Heightened risk of suicide due to heatwaves, along with an increased likelihood of hospital admissions and emergency room visits, is associated with mental health issues in higher temperatures. |
| Liu et al. | 2021 | Temperature changes and mental health. | An increase in external temperature by 1°C is associated with a 2.2% increase in mortality, and a 0.9% increase in the incidence of mental health disorders. |
| Bundo et al. | 2021 | Impact of temperature on psychiatric patients. | Increase in temperature may negatively affect the mental state of psychiatric patients; public health measures are necessary to protect them from the impacts of climate change. |
| Lamond et al. | 2015 | Long-term impact of floods on mental health. | After 6 years from the occurrence of a flood, the victims reported experiencing anxiety (>60%), increased stress levels (<40%), insomnia (18%), and depression (18%). |
| Munro et al. | 2017 | Impact of forced displacements on mental health. | Forced displacements are associated with depression, symptoms of anxiety, and post-traumatic stress. |
| Yazd et al. | 2019 | Impact of drought on mental health. | Drought is one of the factors that most impact the mental health of farmers. |
| Clayton et al. | 2020 | Fear related to climate change. | Climate change anxiety is particularly prevalent among younger adults, and increasing awareness of climate change can lead to stress. |

climate change and/or its consequences, thereby preventing some of the previously discussed health effects [25, 26]. Key aspects of prevention in the context of climate change and mental health are presented in a Table 3.

**Table 3.** Key Aspects of Prevention in the Context of Climate Change and Mental Health

| Prevention aspect | Description |
|---|---|
| Education and awareness | Information campaigns, training, and awareness of climate-related risks. |
| Psychological support | Access to psychotherapeutic support for individuals coping with stress. |
| Monitoring and research | Systematic scientific research aimed at understanding the effects of climate change on mental health. |
| Early detection and intervention | Identification of early symptoms of climate-related mental disorders. |
| Actions at different levels | Collaboration between societal sectors in developing effective preventive strategies. |

At the heart of this matter lies the imperative for sectors to collaborate harmoniously, removing any hindrances that stand in the way of attaining positive outcomes for both mental well-being and the preservation of the natural environment. Engagement of communities affected by climate change is essential, including co-development of policies and interventions, making decisions jointly, and exchanging knowledge with local and indigenous communities that are already experiencing and responding to climate impacts [46].

Interdisciplinary research can make the hidden costs of climate inaction and the benefits of climate actions more tangible, enabling the development of "win-win" policies. There is a need to take action in line with current research gaps and priorities concerning climate change and mental health, to understand the nature and prevalence of the impact of climate change on mental health, which will enable effective action in this area. Effective actions require a clear understanding of the links between impact pathways, to ensure that policies are designed and implemented with evidence-based goals, emphasizing prevention over treatment and avoiding unintended side effects [47, 48].

Efforts to educate and train key stakeholders, including healthcare leaders, policymakers, educators, mental health specialists, and first responders, are vital to increase awareness about climate change's impact on mental health. These initiatives should align with principles of sustainable development and mental health protection. Upskilling relevant institutions and community leaders will enable better support for individuals and communities facing the challenges of the climate crisis. The review emphasizes how climate change exacerbates inequalities and negatively affects mental health and well-being through various pathways. In the subsequent sections, examples of interventions and policies benefiting both mental health and the climate are presented.

## Integrating Mental Health into Crisis Response and Interventions

By incorporating mental health as a vital element in crisis response, relief organizations dealing with disasters can offer timely and adequate support following extreme weather events, reducing the risk of negative mental health consequences, both short- and long-term [49]. This approach may entail identifying and actively assisting high-risk groups, such as individuals with pre-existing mental health conditions or from ethnic minority backgrounds, and providing comprehensive support to alleviate secondary stressors, such as housing quality, financial assistance, and accessible healthcare [50]. To respond effectively to weather- and climate-related disasters, it is crucial to establish collaborative plans involving governments, private sectors, and local organizations before such events occur. This ensures a well-organized and comprehensive response, with the active participation of educators, and local and religious leaders [49].

To address the mental health impact of climate-related disasters, interventions must be developed or adapted. These efforts should not only target the effects of specific events, but also address the ongoing stress caused by increased climate change risks and recurring crises. Pro-active investment in resilient communities can promote post-traumatic growth [51, 52]. Despite disaster management investments, many affected individuals still lack access to mental health support; therefore, empowering individuals with preventive tools should be a key focus to provide them with the necessary resources to cope with such challenges.

### Re-designing Healthcare Systems and Providing Climate-Supportive Mental Health

Mental health professionals and healthcare leaders play a vital role in re-designing mental healthcare systems to be environmentally sustainable. This involves transitioning to zero-emissions health systems and finding effective ways to deliver mental healthcare amidst the climate crisis. Integrating mental healthcare within local communities can enhance social connections and community resilience to climate change [53]. By integrating mental healthcare within local communities, social connections can be strengthened and communities can better adapt to climate change. This approach not only benefits mental health, but also fosters positive outcomes through community-based nature-prescription initiatives that promote well-being, social bonding, nature engagement, and climate action [54].

Climate actions, whether focused on mitigation or adaptation, must consider their impact on mental health and take steps to mitigate any negative consequences. For example, healthcare services should plan for extreme heat periods to ensure indoor temperatures do not worsen mental health symptoms or exacerbate existing physical conditions. Public health campaigns should also consider the vulnerability of individuals with mental health conditions to heat-related risks. First responders and healthcare professionals need to be aware of these vulnerabilities and receive training to effectively detect, respond to, and address mental health needs related to climate change [55].

### Supporting Individuals and Communities in Coping and Taking Action

Communities and individuals must be adequately prepared to cope with the diverse mental health impacts of the climate crisis and contribute to positive changes. Taking individual and collective climate actions can strengthen community cohesion, social well-being, and the ability to address climate-related issues. Although interventions addressing climate impacts on mental health already exist, they are in need of better organization, evaluation, and broad scalability. It is essential to adapt these interventions to different groups, cultures, and contexts to ensure effectiveness.

Experts in climate science, social science, media, and mental health can play crucial roles in supporting communities. They can share inspiring narratives about climate initiatives and system transformation, highlighting the involvement of diverse individuals and communities. Mental health specialists can contribute by developing interventions that help people process climate-related emotions, learn coping strategies, and take appropriate climate actions. Training tool kits should be implemented to in crease the skills of community leaders and institutions, allowing them to create supportive spaces for individuals and communities to address climate-related stress. Climate-related topics should be integrated into education at all levels, while also offering emotional processing opportunities, coping strategies, and opportunities for relevant climate engagement [26, 56].

### Prioritizing Policies and Practices for Mental Health and Climate Benefits

To effectively address climate change and mental health, policy makers should prioritize identifying policies that bring benefits in both areas. This shift will move societies away from viewing climate change as a risk amplifier, to recognizing climate actions as opportunities for positive change. Below are sample policies that can achieve such dual benefits:

1. Reducing emissions from industries and transportation can lead to improved air quality, positively impacting mental health [57, 58]. Promoting active transportation options, e.g. walking and cycling, can not only reduce emissions but also enhance physical activity, social interactions, and accessibility for low-income individuals. Active commuting has shown to have positive effects on mental health and well-being [52, 59].
2. Increasing green spaces, particularly in cities, and engaging in re-wilding efforts can sequester carbon, combat climate change, and provide better access to nature. Nature-based solutions like urban tree planting and green roofs offer climate adaptation benefits, while spending time in green spaces has been linked to reduced psychological distress and increased happiness. Access to green spaces should be improved, considering the inequalities in urban environments [60, 61].
3. Ensuring safe and stable housing is vital for good mental health. Improving housing conditions, such as better insulation, can positively impact mental health and physical health by facilitating easier home heating and reducing energy poverty [62–64].
4. Addressing food security is essential for promoting good mental health and well-being. Adopting sustainable agricultural practices that improve ecosystem health and reduce greenhouse gas emissions can also enhance the nutritional value of food, benefiting human well-being [5, 65, 66].
5. Creating a 'Just Transition' to a low-carbon economy is crucial to avoid leaving marginalized communities behind and exacerbating social inequalities. Proportional, inclusive, and fair climate actions can serve as mental health interventions, building trust in leaders and preventing climate-related distress and anxiety [67].

By implementing these policies, policymakers can foster a positive and equitable response to the climate crisis while simultaneously promoting mental well-being and resilience.

## CONCLUSION

In the face of the escalating climate crisis, the intersection of environmental medicine and mental health has emerged as a critical area for study and action. The evidence presented in this article illuminates the profound impacts of climate change on mental health and well-being, underscoring the urgency of addressing this nexus for the well-being of individuals and communities worldwide.

The relationship between climate change and mental health is complex and multifaceted, with various impact pathways affecting individuals from the individual to the global level. Rising temperatures, extreme weather events, environmental degradation, and the psychological distress arising from the awareness of increased climate risks all contribute to the growing burden on mental health. Vulnerable populations, including those with pre-existing mental health conditions and marginalized communities, face disproportionate challenges in coping with the climate crisis.

To effectively tackle the intertwined challenges of climate change and mental health, a holistic and collaborative approach

is paramount. Healthcare leaders, policy makers, educators, mental health specialists, first responders, and community leaders all play integral roles in shaping policies and practices aligned with principles of sustainable development and mental health protection. Education and training initiatives should be prioritized to raise awareness of the climate-mental health connection, enabling the increase in skills in relevant institutions and fostering community cohesion to cope with the crisis while promoting collective climate action.

Innovative interventions that support healthy psychological responses, promote hopeful perspectives, enable community building, and enhance coping strategies are essential to alleviate the mental health burden associated with climate-related disasters. Existing interventions need to be further evaluated and modified to suit diverse groups and contexts, ensuring scalability and effectiveness.

As the nexus of environmental medicine and mental health in the era of climate change is revealed, it is evident that a collective effort is imperative. The mental well-being of individuals and communities must be prioritized as an integral part of climate action. By fostering awareness, collaboration, and innovative interventions, a path can be forged towards a more sustainable and mentally resilient future. It is our shared responsibility to navigate the challenges ahead, ensuring that no one is left behind in this critical journey of safeguarding the health of our planet and our minds.

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