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Exploring the role of ecosystems in enhancing human well-being and promoting positive mental health: A comprehensive review

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ABSTRACT

Mental health is a critical aspect of overall well-being influenced by psychological, biological, and environmental factors. Increasing urbanization and reduce contact with nature have raised concern about raising stress, anxiety and cognitive decline. This review explores the relationship between natural ecosystem and mental health, emphasizing the benefits of green and blue, Spaces, Biodiversity and ecosystem Services. Findings suggest that exposure to nature reduce stress, enhances cognitive functions, and foster emotional resilience. Using a systematic review methodology, this study emphasize peer review journal, articles, books and report to synthesize existing knowledge on the impact of ecosystem on mental health across urban rural contexts. It includes evidence based recommendations for urban planning, public health policies, environmental education and research initiatives to integrate nature-based strategy to mental health intervention. As rapid industrializations continues, incorporating ecosystem into modern living spaces is essential for improving mental health and promoting sustainable well-being.

Keywords: Mental health, Ecosystems, Green spaces, Biodiversity, Stress reduction

Introduction

In the twenty-first century, mental health and human well-being have become major worldwide issues. The quality of human existence has been greatly impacted by rapid urbanisation, environmental degradation, biodiversity loss, climate change, and rising psychological stress levels (Pouso *et al.*, 2021; Marselle *et al.*, 2019) [1]. Increasing evidence shows that natural ecosystems play a key role in promoting positive psychological wellbeing and preventing psychiatric issues; however traditional treatment methods focus mainly on either medical or psychological type treatments (Aerts *et al.*, 2018; Tomasso *et al.*, 2021). Ecosystems provide to sustain life on planet Earth many provisioning services such as clean air, clean water (through purification), regulating the climate, providing food, and creating opportunities for recreational activity (Diaz *et al.*, 2018). In addition to the tangible benefits of ecosystems they also provide intangible benefits such as cultural, spiritual, artistic and psychological benefits that contribute to improved overall wellbeing (Fish *et al.*, 2016).

Universally, all cultures and fields of study recognize how humans relate to the environment around them. Interacting with their environment on a frequent basis can result in decreased anxiety, increased happiness, improved cognitive ability and social cohesion (Meredith *et al.*, 2020; Coventry *et al.*, 2021). Both natural bodies of water—such as rivers and lakes—and natural land features—such as parks, gardens, forests, and other green spaces—have been correlated with improved mental well-being and overall quality of life (Garrett *et al.*, 2019; Wyles *et al.*, 2019).

Mental health is a crucial aspect of overall well-being and is impacted by complex interplay of biological factors (like genetics), psychological factors (like thought patterns), and environmental factors (like social support) within a person's life in recent years, researchers have emphasized the role of nature ecosystem in enhancing mental health (Bratman *et al.* (2019) [2].

There are several approaches in which human well-being is connected to the natural environment, and practical knowledge of these connections is growing across a variety of fields. Reduced routine nature and touch are linked to a number of elements of modern living. One is that metropolitan areas are hubs of wealth, work prospects, educational opportunities, health and human services, and cultural development—all facets of life that could support mental wellness. They may, however, also be linked to less access to nature, particularly for those who reside in urban regions with low economic status. Perceived obstacles (such anxieties), more time spent indoors and on screens, and less outdoor recreational activities are additional variables that lead to a decline in nature contact (Li *et al.*, 2021) [3].

The growing urbanization and disconnection from nature have raised concern about increasing stress, anxiety, and depression. Urbanization is a potential threat to mental health and rapid well-being. Rapid urbanization and urban expansion have led to reduction of green spaces, limiting human interaction with nature

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(Wang *et al.*, 2026) [4]. This lack of exposure to natural environments have been associated with increased prevalence of mood disorder and cognitive decline (White *et al.*, 2013) [5].

Studies reveal that being in a natural setting protects people from the negative effects of environmental stressors and restores their attention, emotions, and psychological well-being more than being in an urban setting. Restorative habitats are natural settings that enable people to replenish their adaptive resources to meet the demands of daily living (Kaplan, 1995; Korpela *et al.*, 2010) [7, 6]. According to Berto (2014) [8], there is a general decrease in the psychological symptoms of stress in both urban and natural settings. Moreover, access to natural environment have been linked to lower incidence of stress-related illness and overall improvement of life satisfaction (Twohig & Jones, 2018; Berman *et al.*, 2008) [9, 10].

This paper reviews the existing literature on how ecosystems contribute to mental health and human well-being, with a particular focus on the psychological, emotional, cognitive, and social benefits of exposure to natural environments. It examines the ways in which ecosystems support good mental health, lessen psychological distress, and improve general quality of life by synthesising data from environmental psychology, public health, ecology, and related fields. The review also covers practical methods for integrating natural settings into community-based, therapeutic, and preventive mental health initiatives as well as possible nature-based interventions. In order to support sustainable and comprehensive public health results, it also identifies current research gaps, policy implications, and future prospects for combining environmental protection with mental health promotion.

Background

Ecosystems are dynamic sets of living things interacting as functional units with their physical surroundings (Díaz *et al.*, 2018). Forests, grasslands, marshes, rivers, seas, agricultural landscapes, and urban green areas are examples of ecosystems.

Ecosystems are responsible for many of the essential functions that we depend on as humans in order to survive and thrive. These functions include provisioning, regulating, supporting and cultural services (Fish *et al.*, 2016). More recently, the cultural and recreational benefits of ecosystems have gained particular focus in relation to their impact on our mental health and psychological well-being (Fish *et al.*, 2016). The Biophilia Hypothesis posits that humans experience a fundamental need to connect with the natural environment and other organisms (Wilson, 1984). Similar evidence exists to support the notion that natural environments help to replenish cognitive resources and alleviate physiological stress responses.

Theoretical frameworks contribute to our understanding of the psychological benefits associated with interaction with the natural world. A large volume of research shows that individuals with greater access to natural spaces have higher levels of psychological well-being, happiness, and life satisfaction (Martin *et al.*, 2020; Brito *et al.*, 2022). Evidence has demonstrated that time spent in green or blue settings (e.g., parks and gardens) results in reduced stress hormone levels, improved mood, enhanced cognitive function, and increased physical activity. In addition, objective and subjective measures have indicated that frequent exposure to these settings has positive effects on social relationships and overall health (Garrett *et al.*, 2019; Meredith *et al.*, 2020). Further, therapies based on ecosystems, such as horticultural therapy, nature-assisted therapy, forest bathing, and green exercise, are effective in promoting mental health and wellness (Coventry *et al.*, 2021; Mygind *et al.*, 2019).

The mechanisms through which ecosystems impact mental health can be complex and multi-faceted with a growing body of evidence supporting the existence of these effects. To take into account the wide variation in the extent of the benefits provided by ecosystems, several contextual factors must be considered. These include the amount of biodiversity present, how easy the ecosystem is to access, the quality of the environment, socioeconomic circumstances, and cultural set-

tings (Pett *et al.*, 2023). Moreover, continuing to face increased threats from environmental challenges, such as loss of habitat, climate change, and urban sprawl, the availability and quality of many of the natural ecosystems that contribute to human well-being will likely continue to decline (Marselle *et al.*, 2019) [1].

Ecosystems provide a variety of benefits to the environment and society, and they provide multiple benefits to economic welfare from both physical and psychological perspectives. In addition, they can offer numerous benefits to physical and psychological well-being. Humans have relied on nature for health, recreation, and healing long before modern industrialization and urbanised society developed. Subsequently individual detachment from nature has continued to grow and simultaneously, more people are beginning to experience some form of mental illness (Maller *et al.*, 2006; Bowler *et al.*, 2010) [11, 12].

Studies suggest that exposure to nature have restorative effects on cognition, moods and social interactions, underscoring the necessity of reintegrating ecosystems on modern living spaces (Berto, 2014; Nisbet *et al.*, 2011) [8, 13]. Studies have indicated that people who interact with natural settings have better attention spans, more emotional stability, and lower levels of stress (Ohly *et al.*, 2016; Stevenson *et al.*, 2018) [14, 15].

People are becoming more and more cut off from their natural experiences due to rapid urbanisation (Wilson 1984; Miller 2005). For many people, remaining or managed public urban green spaces are actually one of their final chances to engage directly with nature (Monteiro *et al.*, 2020; Lee *et al.*, 2011) [17, 16]. We are deeply concerned about this since such interactions result in a number of terrible advantages for both individuals and society as a whole. From the perspective of many people's everyday interactions with nature, urban public green spaces offer quantifiable psychological and physical advantages (Hartig *et al.*, 2014) [18].

Additionally, biodiversity plays an important impact in mental wellness. Exposure to high exposure to variety of plant and animals species have been linked to enhance mood and emotional resilience (Fuller *et al.*, 2007) [19]. Ecosystems having diversity offer sensory stimulation and help develop a sense of belonging and connectiveness to nature (Dallimer *et al.*, 2012) [20]. On the other hand, destruction of natural surroundings owing to deforestation, pollution, and climatic changes lead to an increased sense of distress, anxiety, and feeling of alienation (Wigand *et al.*, 2022; Richardson *et al.*, 2020) [21, 22].

In addition, the extent to which people are able to benefit from the ecosystems is also determined by their socioeconomic status. Members of marginalized communities do not usually have access to green and blue spaces, making the problem of health inequality worse (Kabisch *et al.*, 2016) [23]. Urban planning techniques that allow incorporating nature into everyday life, such as rooftop gardens, green corridors, and waterfront development can fill in this gap (Wolch *et al.*, 2014; Shanahan *et al.*, 2015) [24, 25].

There has been an increasing demand for environmental scientists, therapists, public health experts, urban planners, and legislators to work together to develop and implement sustainable nature-based interventions because of the growing body of research showing the important role ecosystems play in fostering psychological well-being. By integrating natural surroundings into healthcare systems, educational institutions, businesses, and urban planning projects, these interdisciplinary endeavours can improve mental health outcomes for a variety of populations. In addition to improving emotional resilience, cognitive functioning, social connectedness, and general quality of life, nature-based approaches, such as the creation of accessible green spaces, ecological restoration, forest therapy, community gardening, and conservation initiatives, have the potential to lower stress, anxiety, and depression. Collaborative policies should also prioritise promoting biodiversity conservation, guaranteeing fair access to natural environments, and educating the public about the advantages of ecosystems for mental health. Developing successful preventive and therapeutic strategies that concurrently promote human well-being, environmental sustainability, and long-term public health will need bol

stering research, evidence-based policymaking, and cross-sector collaborations.

Objectives

To conduct an analysis of existing scientific literature and data on the relationship between human mental well-being and the natural environment.

To assess how ecosystem services, biodiversity, and greenspaces influence mental health and well-being.

To offer evidence-based recommendations on including ecosystem-based interventions in therapy, city design, and legislation on mental health. Theoretical Framework

Attention restoration theory (ART)

According to ART, natural environments play a key role in rejuvenating the depleted cognitive functions. This theory suggests that sustained exposure to cognitively demanding activities leads to directed attention fatigue and results in diminished mental effectiveness and focus (Berto, 2005) [26]. Yet, natural settings provide what is known as soft fascination – stimuli that automatically attract attention without requiring any cognitive effort. Thus, the executive attentional system gets an opportunity to recover. Hence, being in nature increases mental efficiency, improves concentration abilities, and promotes problem solving and creativity. It has been proved through research that even brief exposure to green spaces such as gardens and parks significantly boosts cognitive functioning (Kaplan & Kaplan, 1989).

Stress reduction theory (SRT)

As per the Stress Reduction Theory (SRT), there are immediate mental and physical benefits associated with being in natural surroundings. The theory was formulated by Ulrich, who stated that humans have been biologically programmed to respond positively to natural stimuli that facilitate relief and aid in the process of relaxation (Twohig-Bennett *et al.*, 2018) [9]. Besides, it improves the positive feelings such as peace and happiness and reduces the negative feelings such as anxiety, anger, and stress. As per the SRT, natural surroundings are helpful for stress recovery more efficiently than urban ones.

Biophilia hypothesis

According to E.O. Wilson's Biophilia Hypothesis, human beings have an innate physiological need to relate to the natural environment and life forms. Due to human beings depending on nature to live over several years, it has been argued that such a feeling was instilled in humans. Well-being, stress management, and cognition are some ways that natural elements, which include plants, water, and fauna, contribute positively towards people. Contrarily, a feeling of psychological dissatisfaction and poor wellbeing arises due to a lack of connection with the environment (Capaldi *et al.*, 2015; Nisbet *et al.*, 2011) [27, 13].

Thus, the biophilia concept shows the importance of having natural components within daily activities and environments.

Ecological perspective

The interactive and reciprocal relationship between people and their environment is emphasized through the ecological approach. The ecological approach suggests that there is a strong connection between ecological systems and well-being of individuals and that the health of the environment is vital for the mental well-being of people (Stokols, 1992; Tretter *et al.*, 2019) [29, 28]. The ecological perspective draws attention to the positive effects of interacting with the environment actively and the importance of environmental sustainability for one's psychological well-being. Interaction with nature is believed to enhance the sense of meaning in life, resilience, and self-awareness through approaches such as ecopsychology (Softas-Nall *et al.*, 2017) [30]. Moreover, being involved in activities that are beneficial for the

environment such as gardening in the community can help develop feelings of belonging and social ties.

Place attachment theory

Factors that help create such attachments include personal experience, social relationships, cultural significance, and the frequency of interaction with the environment. Parks, forests, rivers, and other natural environments are some of the environments where these kinds of attachments are common. Attachment to a certain place can provide feelings of safety, emotional stability, and pleasure in life. Studies show that attachment to nature is associated with better psychological well-being, self-confidence, and environmental stewardship. The theory focuses on the importance of creating meaningful interactions between people and their natural environment for mental well-being and quality of life.

Nature connectedness theory

The feeling that one has with respect to his emotions and experiences with the natural world is termed as the Nature Connectedness Theory. This suggests that happiness and psychological well-being is generally higher among people who feel as if they belong to nature. Nature connectivity entails the experience of nature through admiration, compassion and sense of connection beyond mere contact with nature. Strong levels of nature connectivity have been associated with pro-environmental behavior, resilience, positive emotion and high self-respect, according to research. According to the theory, having close relationships with environment can greatly benefit one's mental health and general well-being.

Salutogenic theory

The concept of "salutogenesis" was introduced by Antonovsky in 1979 and highlights the factors that contribute towards promoting health and wellness rather than contributing to diseases. The concept of "Sense of Coherence," which refers to an individual's ability to find meaning, control and understand life, is central to this theory. Natural environments can act as devices for promoting health because they reduce stress, restore psychological balance and improve coping mechanisms. Having access to green and blue environments can increase people's ability to cope with daily challenges and improve their overall quality of life. Ecosystems can act as resources for promoting resilience, sustainability, and positive mental health.

Social-ecological systems perspective

According to Social-Ecological Systems Theory, both the ecosystem and humanity form part of an integrated whole wherein social, economical, and psychological outcomes depend on ecological factors. Healthy ecosystems offer vital functions such as clean water, purification of air, regulation of climate, and recreational opportunities that ensure people are healthy and happy. Environmental degradation may sometimes result in the impairment of one's physical and psychological well-being. The theory brings out the need to maintain ecological sustainability to secure people's well-being in the future. It is particularly relevant when it comes to understanding the relationship between ecosystems and mental health because the theory recognizes that one's well-being depends on ecological and broader social settings as well.

Methodology

The present study adopted a qualitative review design relying on secondary data sources to investigate how ecosystems support mental health and human well-being. Using databases including Google Scholar, Scopus, Web of Science, PubMed, SpringerLink, ScienceDirect, and Taylor & Francis Online, pertinent literature was gathered from peer-reviewed articles from journals, books, review papers, and reports. 38 publications published between 1992 and 2026 were chosen for inclusion after titles, abstracts, and full texts were screened. Unrelated, duplicate, and non-scientific papers were deleted, but studies pertaining to ecosystems, biodiversity, outdoors exposure, ecosystem services, and mental health were included. The

review provides a thorough understanding of the connection between ecosystems and mental health by synthesising data from studies in environmental psychology, public health, ecology, and sustainability.

Empirical evidence from previous studies

Ecosystems and mental health are positively correlated, according to an increasing amount of empirical study. According to Fuller *et al.* (2007) [19], those who were able to visit urban green spaces rich in biodiversity had improved their psychological well-being. Similarly, Dallimer *et al.* (2012) [20] found a positive association between life satisfaction, psychological restoration, and the perception of species richness of urban green spaces.

There is also scientific evidence of the benefits of biodiversity for the psychological well-being of individuals. The interaction with biodiverse environments improves psychological resilience and creates positive emotions, according to Marselle *et al.* (2019) [1]. Additionally, regular exposure to nature has beneficial impacts on human mental health irrespective of the age and cultural background, Hartig *et al.* (2014) [18]. Thus, it is possible to state that the findings presented above provide strong support to the idea that ecosystems play an important role in creating good psychological well-being of humans.

Discussion

Green and blue spaces

Green spaces such as parks, forest and community gardens provide physiological relief by reducing stress level and enhancing moods (Bratman *et al.*, 2015) [31]. Research studies show that people living around natural environments tend to have better health and well-being as well as less anxiety and depression (Twohig-Bennett *et al.*, 2018) [9]. In the same way, blue space which includes lakes, rivers and coastal areas has been found to have cognitive and emotional benefits.

Biodiversity and psychological well-being

Biodiversity contributes to mental health by promoting sensory stimulation and emotional engagement with nature (Marselle *et al.*, 2019) [1]. Exposure to diverse plant and animal life enhances positive emotions and foster a sense of connection with the environment (Fuller *et al.*, 2007) [19]. Studies suggest that green special with higher biodiversity offer greater mental health benefits compared to less diverse environments (Dallimer *et al.*, 2012) [20].

Ecosystem services and mental health

Natural ecosystems provide essential services such as air purification, climate regulation, and noise reduction, which indirectly support mental well-being (Costanza *et al.*, 1997) [32]. In urban areas, green infrastructure reduces heat stress and pollution, improving overall health outcomes (Kabisch *et al.*, 2016) [23]. Moreover, natural species out encourages physical activity and social interactions, reduce the risk of mental health disorder such as depression and loneliness (Pretty *et al.*, 2005).

Mechanisms of nature's impact on mental health

Research highlights several mechanism through which ecosystem influence psychological well being, natural environment, reduce mental fatigues and restoration attempts attention as explained by ART (Kaplan & Kaplan, 1989). Furthermore, SRT suggests that nature exposure. Elicit positive new physiological responses including lower cortisol level and improved cardiovascular function (Ulrich, 1983). Additionally the Biofilia hypothesis emphasizes the innate human needs for connections with nature, fostering positive emotions and resilience (Wilson, 1984).

Recommendation

1. Urban planning and green infrastructure

- Encourage fair distribution of green areas so that marginalised and low-income communities can enjoy nature as well.
- Create urban biodiversity networks & green corridors to link parks, gardens, and natural areas inside cities.
- To increase the amount of green space in highly populated places, promote rooftop gardens, vertical vegetation, and urban woods.
- To improve the ecological and psychological benefits of green spaces, incorporate blue infrastructure (lakes, marshes, and rivers) beside them.
- Reduce heat islands and enhance air quality by implementing solutions based on nature in climate-resilient urban planning.

2. Public health policies

- Incorporate nature prescriptions, often known as "green prescriptions," written by medical specialists to treat depression, anxiety, and stress.
- Incorporate horticulture treatment and ecotherapy into mental health and rehabilitation programs.
- Create community wellness initiatives that blend exposure to environment with physical activity (such as walking groups or yoga in parks).
- Work together with local governments to develop green projects that are health-focused and target vulnerable groups including children and older persons.
- Use public health data systems to track and assess the health effects of nature-based treatments.

3. Education and awareness

- To encourage nature-based learning, including outdoor classrooms and experiential learning in school curricula.
- Encourage youth participation in conservation and environmental volunteer activity.
- To increase knowledge of the benefits of nature for mental health, use digital platforms and social media campaigns.
- Provide local communities with seminars and workshops focusing on sustainable living and ecological well-being.
- Promote interdisciplinary education that links psychology, environmental science, and public health.

4. Research and development

- Examine the psychological processes (such as stress reduction and attention restoration) that underlie the positive effects of nature on mental health.
- Examine how exposure to environment affects individual characteristics (personality traits, age, cultural background, etc.).
- Examine how biodiversity abundance and quality affect outcomes related to well-being.
- Create technology-assisted nature interventions for people with limited mobility, like virtual reality-based nature therapy.
- Promote international and cross-cultural comparative research to learn how various settings affect mental health.
- Encourage more multidisciplinary cooperation between ecologists, psychologists, urban planners, and legislators.

5. Community engagement and social support

- Encourage shared green areas and community gardens to improve social contact and lessen loneliness.
- Promote group environmental initiatives like eco-clubs, clean-up campaigns, and tree planting.

- Increase perceived social support using group-based nature activities, which can enhance community cohesion and mental health.

6. Policy implementation and governance

- Create precise legislative frameworks for incorporating nature into good health and urban planning.
- Assure multi-sector cooperation between the public, corporate, and non-profit sectors.
- Provide financing and incentives for nature-based initiatives and green infrastructure.
- Create mechanisms for evaluation and monitoring to gauge how well strategies are working.

Conclusion

To conclude, there is an abundance of proof that indicates that natural environments, specifically green and blue spaces, are vital when it comes to promoting mental wellness and health. Apart from the instant psychological benefits that include stress relief and even mood improvement, being exposed to nature also builds up one's resilience to anxiety, depression, and cognitive problems. Furthermore, the existence of biodiversity within the natural environment makes people emotionally engaged and connected to the environment. Due to the constant development of our world, characterized by the rise of cities and industry, disconnection from the natural world becomes one of the biggest threats to mental health. Loss of green and blue spaces together with destruction of biodiversity leads to increased stress and development of mental health issues, particularly in urban areas. Thus, the return of the natural environment to urban life becomes one of the key steps toward solving the problem of poor mental well-being. Public policies and urban planning approaches that will pay attention to developing green infrastructure, including parks, green roofs, and waterfront developments, should be developed in order to create the environment that contributes to psychological well-being. Integration of nature-based interventions into mental health treatment programs provides a unique way to solve the problem of mental health crisis by offering a cheap and easy way of solving the global issue. Therapeutic activities involving nature, nature walks and education on environment provide an opportunity for individuals to connect with nature, building their mental resilience and well-being. Finally, there is a need for collaboration in research carried out by environmental scientists, psychologists, urban planners and politicians due to increasing numbers of research in ecology and mental health. For us to ensure that people from highly urbanized environments also benefit from the mental health advantages of nature, we need to continue exploring other innovative ways like technology-based green spaces.

In essence, the integration of the ecosystem within urban and rural environments is not only important from an ecological perspective—rather, it is necessary to ensure the building of psychological resilience, improved quality of life, and protection of the mental health of generations now and to come. The protection of the restored natural environment must be viewed as an investment in the mental well-being of the individual and community at large. A more sustainable world can be created through the commercialization of ecology and mental well-being.

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