sustainability

MDPI

Article

Salutogenic Factors and Sustainable Development Criteria in Architectural and Interior Design: Analysis of Polish and EU Standards and Recommendations

Agnieszka Rek-Lipczyńska

Department of Interior Design, Faculty of Architecture, West Pomeranian University of Technology in Szczecin, Al. Piastów 17, 71-300 Szczecin, Poland; areklipczynska@zut.edu.pl

Abstract

This article examines the integration of salutogenic design principles into the legal and regulatory framework for buildings in Poland, situating the analysis within a broader European and international context. The study combines a systematic literature review, a comparative analysis of Polish building law and technical conditions with international standards and empirical evidence from case studies and Post-Occupancy Evaluations (POE) conducted in hospitals, offices, and schools. This triangulated approach allowed for both qualitative and quantitative assessment of key salutogenic factors, including daylight access, acoustic comfort, air quality, thermal conditions, aesthetics, ergonomics, and opportunities for social interaction. The results demonstrate that Polish regulations continue to focus on minimum hygienic and safety requirements, thereby reflecting a pathogenic rather than salutogenic approach. While some factors—such as daylight and ventilation—are partially included, critical dimensions of psychosocial well-being remain underrepresented. By contrast, both European EN standards and voluntary frameworks such as WELL systematically incorporate broader salutogenic dimensions. Evidence from Polish POE studies further highlights gaps between regulatory compliance and actual user experiences, e.g., excessive hospital noise, insufficient lighting in operating rooms, and the absence of biophilic or therapeutic features. The discussion highlights challenges of measurability, economic feasibility, and stakeholder acceptance, while also emphasizing long-term health and social benefits. The conclusions recommend incorporating salutogenic principles into Polish law and sustainability policies, promoting pilot projects, and strengthening interdisciplinary collaboration. In this way, buildings can evolve from merely preventing harm to actively supporting health, well-being, and resilience—aligning with global trends in human-centered sustainable design.

Keywords: salutogenesis; health-oriented architecture; building law; sustainable construction; WELL Building Standard; salutogenic factors; architecture; interior architecture

check for updates

Academic Editor: Miguel Amado

Received: 30 July 2025
Revised: 16 September 2025
Accepted: 25 September 2025
Published: 30 October 2025

Citation: Rek-Lipczyńska, A. Salutogenic Factors and Sustainable Development Criteria in Architectural and Interior Design: Analysis of Polish and EU Standards and Recommendations. *Sustainability* **2025**, *17*, 9661. https://doi.org/10.3390/su17219661

Copyright: © 2025 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

Modern Approaches to Sustainable Development in the Context of Salutogenesis

Contemporary approaches to sustainable development encompass not only ecological and economic aspects but also human health and well-being, particularly that of building users. In academic literature, there are numerous competing definitions of health—ranging from a negative understanding as the mere absence of disease, through holistic concepts of biopsychosocial well-being, to dynamic models of equilibrium and adaptation. The most

widespread remains the biomedical model, in which health is defined as the absence of illness, i.e., a state in which no identifiable pathological dysfunction occurs in the body [1]. A milestone in this debate was Engel's proposition of the biopsychosocial model, which explicitly integrates biological, psychological, and social determinants of health and is now widely recognized as a more comprehensive framework [2].This model is frequently criticized for its biological reductionism and disregard for social and subjective dimensions of health. An alternative is offered by the World Health Organization (WHO), which defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [3]. While this definition introduces a positive framing of health, it has also been criticized for being utopian and impractical—since it is difficult to objectively define "complete well-being" and measure it in real-world settings [4]. There is growing recognition of dynamic health models that conceptualize health as a balance between individual resources and environmental demands. Socioecological models and processual approaches treat health as a variable potential, conditioned by factors such as the quality of the living environment [5]. In this context, the concept of salutogenesis, developed by Aaron Antonovsky, becomes highly relevant. Salutogenesis shifts the focus from pathogenic medicine to the origins of health. It defines health as a continuum between illness and full well-being, where the key factor in maintaining health is the Sense of Coherence (SOC)—a composite of comprehensibility, manageability, and meaningfulness in life experiences Individuals with a strong SOC cope more effectively with stress and make better use of available health resources [6]. The sense of coherence consists of three components: comprehensibility (belief, that stimuli from the environment are ordered and can be understood), resourcefulness (belief in accessibility resources to meet the requirements) and meaningfulness (the belief that life's requirements are worth the effort). These elements create the theoretical framework of the salutogenic model, in which health is the result of the ability to give meaning and cope with life's challenges, instead of just avoiding disease.

Salutogenesis provides a valuable complement to the paradigm of sustainable environmental design. Instead of merely minimizing pathogenic risks, it promotes the enhancement of health-supportive factors, including the design of environments that foster mental and social well-being. Antonovsky even described salutogenic design as a "measurable aspect of the design process that helps people function with maximum effectiveness and maintain physical and mental well-being" [7]. This means that the built environment can actively support health rather than just prevent disease. The key design question becomes: "How healthy is this place?"—a foundational consideration in salutogenic architectural thinking. Previous research on salutogenic architectural design has primarily focused on conceptual discussions, case studies, and applications within voluntary industry frameworks such as the WELL Building Standard or LEED [8].However, systematic analyses addressing the integration of salutogenic principles into binding legal frameworks remain scarce, particularly in Central and Eastern Europe. Poland, whose building law and technical requirements are still largely based on the so-called "hygienic minimum," illustrates a context where the gap between salutogenic theory and regulatory practice is particularly evident.

Against this background, the following research gap emerges: the lack of comprehensive understanding of the extent to which salutogenic principles have been (or could be) embedded in national legal regulations, and how the Polish situation compares to other European contexts.

Accordingly, this article is guided by the following research questions:

To what extent do current Polish building regulations and technical requirements incorporate salutogenic design principles?

How do these requirements compare with voluntary international standards for indoor environmental quality, such as the WELL Building Standard?

What lessons can be drawn from legislative changes in selected European countries that increasingly align with salutogenic objectives?

What recommendations can be formulated for the Polish legal system to more effectively promote user health and well-being in the built environment?

The salutogenic approach aligns with broader frameworks such as healthy architecture and healing environments, both of which seek to promote health through spatial and environmental quality. Numerous studies indicate that features of the built environment—particularly interior environmental conditions—significantly affect both the physical and mental health of occupants. From indoor air quality and lighting to acoustics, aesthetics, and spatial layout, such factors shape the comfort and condition of users. The environment can function as both a stressor (e.g., noise, crowding, toxins) and a supportive stimulus, reducing negative influences and enhancing positive ones that contribute to well-being. Recent empirical research confirms the positive impact of salutogenic design principles on the physical and mental health of architectural space users. These studies encompass a wide range of architectural interior types, most frequently focusing on public-use facilities such as workplaces, schools, and hospitals. Empirical evidence highlights improvements in user satisfaction and health outcomes within work environments designed in accordance with industry standards such as the WELL certification system. In order to evaluate the salutogenic potential of school buildings—defined as the capacity of the physical school environment to support health and well-being—et al. developed a transdisciplinary research model integrating environmental psychology, public health, and architecture. Within this framework, field studies were conducted in primary schools, analyzing key characteristics of the learning environment, including the quality of classroom acoustic insulation and the visual clarity of interiors, understood as access to daylight, exterior views, and spatial legibility. However, it is frequently noted that traditional building codes focus almost exclusively on the minimum technical requirements for safety and basic health in a pathogenic sense—i.e., avoiding harm (e.g., structural integrity, evacuation routes, hygiene). There is a notable lack of guidelines for salutogenic aspects of design, which would consider the emotional and cognitive impacts of space. In other words, current regulations are primarily concerned with physical parameters (e.g., temperature, ventilation, noise) and risk mitigation, rarely addressing how built environments can actively support health in a positive (psychosocial) sense. In recent years, Northern European countries have witnessed notable shifts in the legislative approach to the hygienic minimum requirements for daylight quality in residential buildings. The new European Committee for Standardization (CEN). (2018). EN 17037:2018 Daylight in buildings. Brussels: "Daylight in Buildings" represents a paradigm shift in the treatment of daylight. Countries such as Sweden and Norway are among the leaders in implementing these qualitative requirements. As noted by in the European comparative context, Northern states (e.g., Sweden) were quicker to adapt user-comfort-oriented elements in daylight regulations, moving beyond the previous "hygienic minimum". In many other European countries, simple quantitative indicators (such as the minimum daylight factor, DF) still dominate, whereas in Northern Europe, aspects such as required sunlight exposure duration, provision of views to the outside, and limitation of glare risk have begun to be incorporated. This shift of emphasis—from the mere quantity of daylight to the quality of spatial experience—is clearly evident in recent legislative changes in Sweden and Norway. Swedish law is moving away from a purely quantitative approach toward health- and well-being-oriented criteria: from the requirement of minimum daylight provision to ensuring that daylight genuinely enhances the comfort and well-being of building users.

The aim of this article is to examine the extent to which the principles of salutogenic design overlap with the legal requirements imposed on buildings and their interiors in Poland, as well as with the recommendations of non-binding building quality standards. A secondary aim is to confront the Polish regulatory framework with that of selected European countries. Although architecture and interior design represent distinct domains of design practice—focusing respectively on the external form and structure of buildings and on the internal spatial experience—this article considers them jointly as part of a coherent regulatory construct. In the Polish legal and normative context, both are governed by the same legislative acts and technical standards (e.g., the Building Law and the Regulation on Technical Conditions), which establish requirements without differentiating between the architectural and interior dimensions of the built environment. For this reason, the comparative analysis presented here addresses architecture and interiors together, with an emphasis on the regulatory dimension of salutogenic factors. This approach allows for a consistent evaluation of how legal frameworks and voluntary standards (e.g., WELL) respond to salutogenic principles, while acknowledging the practical distinctions between architecture and interior design as professional disciplines.

In particular, it compares a set of key salutogenic design factors—identified through literature review—with the relevant provisions in Polish construction law and technical regulations, along with selected professional guidelines for health-promoting architecture. Such an analysis highlights the gaps and opportunities for improving legislation to better serve the health and well-being of building users—thus aligning more closely with the principles of socially sustainable development. Examples of legislation from selected European Union countries are also indicated, where recent changes show a stronger correlation with salutogenic objectives.

2. Materials and Methods

2.1. Identifying the Impact of Interior Building Features on Physical and Mental Health

In the first stage of the study, a review was conducted of research published over the last decade (2015–2025) concerning the impact of various interior design factors—such as air quality, lighting, acoustics, aesthetics (e.g., color schemes and the presence of artworks), ergonomic qualities of furnishings, and the spatial layout of rooms—on human health and well-being. Recent studies consistently indicate that the indoor environment of buildings significantly influences the physical and mental health of their occupants. Key features such as air quality, lighting conditions, acoustic comfort, aesthetic attributes (including color schemes and artistic elements), ergonomic design, and spatial arrangement all affect user comfort and overall condition. This section outlines the current state of scientific knowledge (primarily from 2015 to 2025) on the health-related effects of these factors, providing evidence-based outcomes and references to specific studies.

2.1.1. Indoor Air Quality (IAQ)

Indoor air quality is a key health determinant, particularly given that people spend the vast majority of their time indoors. Common indoor pollutants include carbon dioxide (CO_2), particulate matter ($PM_{2.5}$, PM_{10}), and volatile organic compounds (VOCs) emitted from building materials and furniture [1,2]. Numerous experimental studies have confirmed that deteriorated IAQ leads to reduced subjective comfort and productivity, increased fatigue, and symptoms of Sick Building Syndrome (SBS) in over 20% of exposed individuals [3]. For example, diminished air quality has been associated with decreased performance among students and office workers, alongside a higher incidence of complaints such as headaches and mucosal irritation [4].

Polluted indoor air affects not only subjective well-being but also objective physiological indicators. Elevated concentrations of typical pollutants (CO_2, particulates, VOCs) have been linked to increased heart rate and blood pressure, and reduced heart rate variability (HRV), all of which suggest cardiovascular strain [5]. Exposure to CO_2 concentrations above ~1000 ppm has been shown to cause transient increases in heart rate and decreases in breathing rate and blood oxygen saturation [6]. Electroencephalogram (EEG) studies also suggest that moderate elevations in blood CO_2 reduce alertness and promote drowsiness—manifested by increased alpha and theta wave activity during cognitive tasks conducted in rooms with ~1200 ppm CO_2 [7,8]. Long-term exposure to poorly ventilated indoor environments may eventually lead to irreversible health problems, particularly in the respiratory and cardiovascular systems [9]. Vulnerable populations—such as the elderly, obese individuals, or those with chronic illnesses—are especially susceptible to the adverse effects of poor IAQ [10].

Importantly, there are positive implications: improving IAQ through enhanced ventilation and filtration can yield significant health benefits. Engineering interventions such as high-efficiency ventilation systems or HEPA filters reduce pollutant concentrations, resulting in improved lung function, decreased irritation symptoms, and enhanced cognitive performance among occupants [11]. Reviews of recent studies suggest that maintaining high indoor air quality may potentially lower the incidence of respiratory illnesses and even certain neurological disorders at the population level [12]. In summary, ensuring clean and well-ventilated interiors is a vital element of preventive health strategy in the built environment.

2.1.2. Natural and Artificial Lighting

Daylight plays a fundamental role in regulating human circadian rhythms, influencing sleep, mood, and overall hormonal balance. Modern societies spend the majority of the day indoors, often with limited access to natural sunlight. Field studies have confirmed that increased exposure to daylight indoors improves circadian health and psychological well-being. For instance, an experiment involving residents of apartments equipped with smart electrochromic windows showed that greater exposure to daylight during the day led to a marked improvement in circadian regulation: participants fell asleep approximately 22 min earlier, exhibited more regular sleep patterns, and reported higher levels of energy and positive mood throughout the day [1]. In weeks when the same individuals had reduced light exposure (e.g., covered traditional windows), their evening melatonin onset was delayed by an average of 15 min, and they reported lower vitality and more negative mood during the day [5]. Both interventional and observational studies support the association between interior lighting conditions and mental health. Individuals working in offices with windows and substantial daylight exposure tend to experience better sleep quality, longer nighttime rest, and higher levels of physical activity compared to those working in windowless spaces [3]. In one study, office workers with windows slept longer on average, reported better mood, and experienced less fatigue than their counterparts in artificially lit rooms [3]. Conversely, inadequate access to daylight has been linked to an increased risk of depressive and anxiety symptoms. For example, in a large survey involving 593 adults, those who spent more time outdoors and in brighter interiors were less likely to suffer from anxiety, depression, and insomnia [13]. Proper lighting in educational spaces also contributes to improved learning outcomes, as demonstrated in studies conducted across 12 European countries [14].

2.1.3. Interior Acoustics (Noise and Acoustic Comfort)

Acoustic comfort is another essential dimension of a healthy indoor environment. Excessive indoor noise—whether from loud equipment, reverberation, or conversations—can be a source of stress and reduced well-being. Research indicates that noise levels in many facilities, particularly hospitals and open-plan offices, often exceed the recommendations of the World Health Organization, and individuals exposed to such noise frequently report annoyance manifested as irritability, fatigue, and difficulty concentrating [15,16]. Noise is recognized as a significant environmental stressor; in hospital settings, for example, it is often cited as one of the main factors negatively impacting patients' anxiety levels and psychological comfort [17,18]. The adverse effects of noise on physiological health are well documented. Prolonged exposure to elevated noise levels has been linked to elevated heart rate, increased blood pressure, and dysregulation of the autonomic nervous system. Chronic exposure can lead to cardiovascular strain, reduced sleep quality, and impaired immune function. In educational and workplace settings, poor acoustics contribute to cognitive overload, reduced productivity, and learning difficulties [19].

In summary, noise is not only a nuisance but also a significant risk factor for both mental and physical health. Strategies to mitigate its impact include the use of sound-absorbing materials, zoning of noisy and quiet areas, proper spatial layout, and technological interventions such as active noise control systems. Ensuring acoustic comfort is a key requirement in designing spaces that support human well-being and health.

2.1.4. Interior Aesthetics and Color Design

The aesthetic qualities of interior spaces—particularly color, texture, shape, and the presence of artwork—have a significant impact on users' emotional and cognitive well-being. A growing body of research in environmental psychology and neuroarchitecture indicates that environments perceived as aesthetically pleasing can evoke positive emotions, reduce stress, and improve overall mental health [20]. Color in particular plays a crucial role in shaping mood and psychological response. Warm colors (such as reds and yellows) tend to stimulate and energize, while cool colors (such as blues and greens) generally have a calming and relaxing effect [21]. Studies have shown that blue and green interiors are associated with lower levels of perceived stress, greater feelings of safety, and increased satisfaction with the space [22]. In therapeutic or care settings, the use of calming color palettes has been linked to better emotional regulation among patients and residents. Furthermore, incorporating visual art into interior spaces—such as paintings, sculptures, or installations—can promote cognitive stimulation and emotional reflection. Several studies have demonstrated that exposure to visual art in hospitals, workplaces, or educational institutions is associated with decreased anxiety, improved mood, and a greater sense of identity and belonging [23,24]. In addition to passive viewing, participation in art-related activities (e.g., art therapy) has shown therapeutic benefits, particularly for individuals with mental health challenges or those at risk of social exclusion. Art therapy leverages creative expression as a tool for emotional regulation, social interaction, and self-reflection [25].

In sum, interior aesthetics—including color and the presence of art—should be regarded as more than decorative aspects. They constitute meaningful components of salutogenic design, supporting users' psychological well-being and offering sensory experiences that contribute to a restorative and engaging built environment.

2.1.5. Ergonomics and Spatial Layout

Ergonomics and the spatial arrangement of interior environments play a critical role in ensuring comfort, safety, and the functional efficiency of buildings. Well-designed spaces that account for human scale, natural movement patterns, and accessibility help reduce

physical strain, improve navigation, and foster a sense of autonomy and control over the environment [26]. Poor ergonomic conditions—such as improperly designed furniture, awkward spatial layouts, or inadequate clearance—can contribute to musculoskeletal discomfort, fatigue, and frustration. For example, studies in office environments have shown that improperly adjusted seating and desk heights are associated with increased reports of back and neck pain [27]. Similarly, in residential and healthcare settings, poorly planned layouts can hinder daily functioning, reduce mobility, and elevate the risk of accidents, especially for elderly or disabled individuals [28]. Conversely, environments designed with ergonomic principles in mind improve users' functional independence and satisfaction. For example, clear spatial organization, intuitive circulation paths, and minimized physical barriers facilitate orientation and ease of movement. The concept of "universal design," which emphasizes accessibility for people of all ages and abilities, has been widely adopted in educational and healthcare architecture as a salutogenic approach that supports both physical and psychological well-being [29].

Additionally, spatial layout affects users' cognitive mapping and perception of control. Open, well-structured environments with clear sightlines and logical zoning help reduce spatial confusion and stress, while also promoting a sense of safety and empowerment. In hospital design, for instance, decentralized nursing stations and patient-centered layouts have been associated with reduced anxiety and improved satisfaction among patients [30].

Thus, ergonomic design and thoughtful spatial planning not only contribute to physical comfort and safety but also support cognitive clarity and emotional well-being, making them integral to the salutogenic quality of interior environments.

2.1.6. Spatial Layout and Interior Organization

The final aspect discussed here is the spatial configuration of interiors—including room arrangement, occupant density, and the level of privacy provided by the space. This domain influences health both physically and psychosocially. In office environments, numerous studies have compared open-plan offices with cellular (private) office layouts. Although open spaces promote interaction, they often prove less favorable for employee health. A 2022 systematic review and meta-analysis revealed that employees in open-plan offices were significantly more likely to take sick leave than those working in private rooms. The average risk of taking a sick day was estimated to be approximately 24% higher (OR $\approx$ 1.24) in open-plan offices compared to private offices [31]. Another study reported that individuals in open-plan environments missed 62% more workdays due to illness than their counterparts in enclosed offices [32]. Several factors may explain this phenomenon: increased transmission of infectious diseases in crowded shared spaces (e.g., easier spread of droplet-borne viruses), as well as heightened stress and mental strain caused by noise, lack of privacy, and frequent distractions [33,34]. Support for the infectious disease hypothesis comes from hospital settings—transitioning from multi-bed wards to single-patient rooms has been associated with reduced hospital-acquired infection rates (e.g., MRSA), and improved sleep and rest for patients due to fewer nighttime disruptions [35,36]. Privacy and environmental control are crucial factors influencing mental well-being in spatial contexts. Studies in workplace settings indicate that employees lacking privacy and quiet retreats (common in open-plan layouts) report lower job satisfaction, higher stress, and poorer social relationships than those working in enclosed offices [37,38]. The constant sense of being observed or at risk of distraction can lead to chronic psychological tension and fatigue. Conversely, excessive isolation is also detrimental—contemporary trends such as Activity-Based Working (ABW) seek to balance these needs by providing diverse zones within offices: open collaborative areas alongside small rooms for focused work or rest [39,40]. Preliminary studies suggest that relocating employees to ABW environments reduces

perceived distractions (e.g., noise, movement) while preserving the benefits of enhanced inter-team collaboration [40]. Thus, balance is key—spaces should enable both social interaction and seclusion when needed. This principle also applies to schools (e.g., quiet corners for individual work) and homes (e.g., dedicated private areas within apartments). Another important element of spatial layout is legibility and accessibility—the ease of movement and orientation within a building. Disorganized, crowded layouts can cause disorientation and stress, particularly among older adults or individuals with cognitive impairments. In contrast, thoughtful design with clear sightlines, signage, and logical zoning improves users' sense of safety. For instance, in a Swedish emergency department redesign, strategic use of color schemes to delineate zones (neutral tones in public areas vs. bright colors in staff zones) significantly improved patients' and families' subjective sense of orientation and security [41,42].

In addition to spatial functionality and ergonomics, interior layout plays a vital role in shaping emotional experience and supporting psychosocial well-being. Thoughtful design strategies—such as creating quiet zones, providing restorative spaces, and supporting intuitive wayfinding—can reduce anxiety, promote calmness, and enhance a sense of autonomy and control, particularly in healthcare settings. Research on design for health emphasizes the need to accommodate the diverse needs of patients and visitors, especially in emotionally charged environments like hospitals or rehabilitation centers. Malchiodi points out that spaces enriched with elements of expression and symbolism can serve as emotional anchors and support healing, especially when art is used as a therapeutic medium [43]. Similarly, Carpman and Grant highlight that spatial legibility and supportive environments positively influence not only user orientation but also the quality of interpersonal interactions in healthcare facilities [44].

In summary, architectural layout influences health by modulating social interactions, stress levels, and exposure to harmful factors. Lower occupancy density and increased privacy generally support reduced disease transmission and stress (though potentially at the cost of less social integration). Evolving office concepts and evidence-based healthcare design aim to create environments that are both socially stimulating and psychologically comfortable. Research supports this direction—investments in healthy spatial organization translate into tangible health benefits, including reduced sick leave, lower levels of anxiety and depression, and higher satisfaction and efficiency among building occupants [31,33].

To deepen the analysis and provide it with a stronger empirical foundation, a comparative and triangulated methodological approach was applied, combining the review of literature and legal documents with selected case studies, post-occupancy evaluations (POE), and both quantitative and qualitative indicators.

Case studies. The study incorporated examples of buildings from Poland and other European countries (hospitals, schools, and office buildings) where health-promoting, salutogenic solutions had been implemented and documented in scientific literature or professional reports. The analysis of these cases made it possible to capture differences between minimum legal requirements and voluntary standards (e.g., WELL, BREEAM), as well as to highlight their practical implications for users.

Post-Occupancy Evaluations (POE). The research was further supplemented with qualitative and quantitative data concerning user experiences of buildings. Available surveys and reports assessing satisfaction with indoor air quality, acoustics, lighting, thermal comfort, and ergonomics were included. Such evaluations enabled the juxtaposition of legal regulations with the actual experiences and perceptions of building occupants.

Quantitative and qualitative indicators. The analysis also relied on empirical findings published between 2015 and 2025 that reported measurable environmental and health-related parameters. Examples include CO_2 and particulate matter concentrations (IAQ),

noise levels in decibels, daylight and artificial lighting intensity (lux), absenteeism rates in open-plan offices, and self-reported well-being and stress among building users. By comparing these data with legal requirements and voluntary standards, it was possible to identify gaps and areas where legislation does not yet account for salutogenic factors, despite their proven significance for health.

2.2. Identification of Salutogenic Design Factors

In the second stage, a literature review was conducted to explore the concepts and guidelines of salutogenic design in architecture. This concept has been developed, among others, by Alan Dilani and Jan A. Golembiewski in the context of healthcare architecture. Based on the publications by Dilani (2008) and Golembiewski (2017), a set of the most commonly proposed salutogenic factors influencing building design was identified [8,9].

These factors include the following:

F1 Access to nature and restorative environments,
F2 Access to daylight,
F3 Thermal comfort and air quality,
F4 Space for social support,
F5 Control over the environment and a sense of privacy,
F6 Acoustic comfort,
F7 Sensory stimulation,
F8 Spatial legibility and navigation,
F9 Diversity and encouragement of physical activity,
F10 Sense of identity and meaning of place.

Access to nature and restorative environments: Incorporating elements of nature (vegetation, water, natural materials) and providing visual and physical contact with nature facilitate psychological regeneration. Studies show that people perceive natural environments as more conducive to relaxation and stress reduction than urban settings. This is confirmed by the theory of Restorative Environments, which states that natural settings allow for mental rest through the mechanism of "effortless attention" [45]. Contemporary research in environmental psychology, biophilic design theory, and neuroscience confirm that contact with nature—both direct and indirect—has a strong restorative effect on the human psyche, reduces stress levels, lowers blood pressure and heart rate, and improves concentration and general psychological well-being [46,47]. The Japanese practice of Shinrin-yoku, also known as forest bathing, has been shown to reduce stress and boost the immune system. According to researchers including these effects can be simulated in interior environments using biophilic stimuli [25].

Access to daylight and appropriate lighting: Maximizing natural light and ensuring adequate artificial lighting (in terms of spectrum and intensity) support circadian rhythms, well-being, and overall health. Access to daylight has been shown to improve mood and performance in office workers [48,49], while dynamic lighting supports night-time sleepiness and daytime alertness in older adults [50,51]. Systematic reviews also confirm the role of natural light exposure in accelerating patient recovery and improving well-being in hospital environments.

Thermal comfort and air quality: Maintaining optimal temperature, humidity, and air purity (through proper ventilation and pollution control) enhances physical comfort and, from the salutogenic perspective, is a prerequisite for long-term mental well-being [52]. Studies show that improving indoor air quality, especially in offices, increases productivity and reduces respiratory symptoms. Thermal comfort affects mood and cognitive functions, especially in educational settings, and occupants of naturally ventilated buildings report greater satisfaction with indoor conditions [11,12].

Spaces for social support: Designing environments that foster interpersonal interactions, integration, and the building of social bonds. This includes common areas (e.g., lounges, cafés, plazas) that encourage both formal and informal social encounters. Social support is a powerful moderator of environmental stress and significantly affects both physical and mental health. Shared spaces in residential areas increase social interaction and positively influence perceived quality of life. The presence of green spaces in communal areas has also been shown to foster social bonding and reduce loneliness in urban populations [53–55].

Control over the environment and a sense of privacy (crowding reduction): Design should enable users to choose whether to engage in social interaction or retreat to private zones. Avoiding overcrowding through spatial generosity and appropriate ceiling height reduces stress and feelings of claustrophobia. For example, research in student housing shows that the length of corridors and room layouts affect users' sense of control and perception of crowding [56,57]. The classic concept of the "behavioral sink," introduced by ethologist based on experiments with rodents, illustrates the detrimental effects of overcrowding and lack of social control [39]. Though conducted on animals, these findings are often cited in relation to human environments, particularly overcrowded and poorly designed institutional or residential spaces.

Acoustic comfort (low noise levels): Minimizing unwanted noise and vibration and ensuring good sound insulation. Excessive noise is linked to irritability, impaired communication, and hindered rest. As one of the key components of a salutogenic environment, noise reduction supports mental focus, regeneration, and general well-being [58].

Sensory stimulation: Color and art in the environment: Conscious use of colors, materials, and forms to evoke positive visual and emotional responses. Warm colors (reds, yellows) are stimulating, while cool colors (blues, greens) are calming. Art elements (paintings, sculptures, installations) enhance cognitive and emotional experiences and are used therapeutically (art therapy) to support mental health [25,46]. Aesthetic surroundings foster attention restoration [45] and reduce stress levels. Engaging with beauty activates brain areas associated with pleasure, reflection, and meaning-making. Spatial legibility and wayfinding (landmarks): Use of distinct visual cues (e.g., architectural elements, artworks, color-coded signage) to facilitate navigation and orientation [59]. A well-organized layout reduces stress and boosts autonomy. In hospitals and elder care settings, accessible navigation systems—based on color, texture, and light—are essential for safe, independent functioning [60,61].

Diversity and promotion of physical activity: Providing varied spatial experiences (e.g., surprise elements, spatial discovery) and encouraging movement through well-designed staircases, walking paths, or public spaces. Physically active environments improve mood, reduce stress, and support physical health. According to spatial variety and opportunities for movement contribute to both physical and cognitive well-being [48,49].

A sense of identity and meaning of place: Creating environments that evoke meaningfulness—by referencing local culture, history, and values. Spaces that tell a story or incorporate symbolic architecture enhance users' sense of belonging and purpose. Antonovsky (1988) emphasized meaningfulness as a pillar of the sense of coherence, and architectural spaces reflecting cultural identity can reduce stress and strengthen psychological resilience [7]. He above list formed the basis for further analysis.

It is important to emphasize that salutogenic factors are complementary in nature—only their holistic integration enables the creation of environments that comprehensively support health. In practice, implementing all of these elements simultaneously can be challenging. However, it is increasingly common to include at least some of them—especially in buildings such as hospitals, schools, and offices, where the health and well-being of users are critical.

2.3. Analysis of Legal Regulations and Industry Guidelines

In the next stage, the identified set of salutogenic factors was compared with the requirements of Polish law and selected industry standards.

National legal framework: The analysis included the Act of 7 July 1994—Construction Law, which constitutes the primary legal act regulating the design, construction, maintenance, and demolition of buildings. It provides general requirements regarding safety, hygiene, health, functionality, and accessibility. Particular attention was paid to the related executive regulation: Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location, which contains detailed technical and construction requirements related to daylight access, ventilation, usable space, noise, temperature, accessibility, etc. Another key regulation was the Regulation of the Minister of Health of 26 June 2012 on the detailed requirements for premises and equipment of healthcare entities (Dz.U. 2012 poz. 739, as amended), which is especially relevant in the context of healthcare facilities, as it indirectly addresses issues of comfort, functionality, and hygiene.

Also included was the Regulation of the Minister of Labour and Social Policy of 26 September 1997 on general provisions of occupational health and safety (Dz.U. 2003 No. 169, item 1650, as amended), which applies to public-use and office buildings, including requirements concerning lighting conditions, noise, ventilation, and ergonomics.

The primary focus of this legal analysis was on regulations concerning the hygienic and health conditions of building use, protection against noise, daylight access, and other aspects of user experience and functionality.

Industry standards and guidelines: As a representative example of non-legally binding initiatives promoting healthy buildings, the WELL Building Standard (WELL v2 version) was selected. This international certification system, developed by the International WELL Building Institute, emphasizes the health, comfort, and well-being of building users. In addition, guidelines from related certification systems (e.g., LEED, BREEAM) were considered in terms of user well-being, along with relevant World Health Organization (WHO) recommendations for healthy residential environments where applicable.

The following diagram presents the research process used in this article. To clarify the research method adopted, a step-by-step flowchart was created [Figure 1].

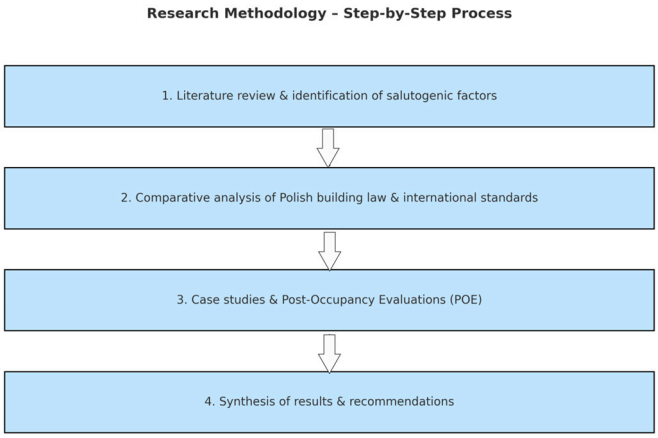


Figure 1. Research methodology applied in the study. The process consisted of four stages: (1) literature review and identification of salutogenic factors; (2) comparative analysis of Polish building law and international standards; (3) case studies and post-occupancy evaluations (POE); and (4) synthesis of results and formulation of recommendations.

3. Results

3.1. The Impact of Building Interior Features on Physical and Mental Health

Across the reviewed evidence (2015–2025), interior environmental quality emerges as a robust determinant of both physical and mental health. Deteriorated indoor air quality (elevated CO2, PM, VOCs) consistently predicts reduced cognitive performance, increased SBS symptoms, and adverse physiological responses, while improvements via ventilation/filtration yield measurable benefits. Adequate daylight and lighting support circadian alignment, sleep quality, mood, and learning outcomes; insufficient exposure is associated with higher risks of anxiety, depressive symptoms, and fatigue. Excess noise is a pervasive stressor in healthcare, education, and offices, impairing sleep, autonomic balance, concentration, and productivity; targeted acoustic strategies are therefore health-critical.

Beyond physical parameters, aesthetics and color (including the presence of art) contribute to reduced stress, improved affect, and greater spatial satisfaction, underscoring their role as nontrivial salutogenic inputs. Ergonomics and spatial layout affect safety, autonomy, wayfinding, and perceived control; user-centered layouts (clear sightlines, intuitive circulation, minimized barriers, universal design) enhance comfort and functional independence. Finally, interior organization and privacy—including density, zoning, and availability of retreat spaces—modulate infection risk, stress, and social functioning; evidence favors configurations that balance interaction with access to seclusion (e.g., ABW in offices; single-patient rooms in hospitals).

In sum, health-supportive interiors require an integrated approach that couples baseline hygienic/safety provisions with psychosocial and experiential qualities. The literature provides both objective metrics (e.g., CO2 ppm, dB, lux) and subjective indicators (well-being, stress, satisfaction) suitable for post-occupancy evaluation and for benchmarking salutogenic performance in subsequent analyses.

3.1.1. Case Studies and Post-Occupancy Evaluations (POE)

In Poland, there is a growing interest in evaluating hospital buildings after their commissioning from the perspective of users, in line with the Post-Occupancy Evaluation (POE) approach and Evidence-Based Design (EBD). Researchers emphasize that architectural solutions in hospitals—including functional and spatial layout—have a significant impact on patients' healing processes and comfort, as well as on the well-being and efficiency of medical staff. In recent years, Polish research centers have undertaken studies addressing the needs of three main user groups: patients, medical (and auxiliary) staff, and visitors. The following section presents selected studies and reports published after 2015 that focus on post-occupancy assessments or related evaluations of the hospital environment in Poland, with particular attention to environmental factors (acoustics, lighting, indoor climate, ergonomics, and contact with nature) and to public and university hospitals (including those located in Kraków).

Lighting comfort is another important aspect of the hospital environment assessed in post-occupancy studies. Pilot measurements conducted by CIOP-PIB in selected hospital rooms demonstrated that illuminance levels in key spaces were often insufficient. In the examined operating theatre, sterilization room, and histopathology laboratory, under-illumination was recorded—lighting levels did not meet the required standards and required improvement [62].

Increasing attention is being paid to thermal comfort and indoor air quality in hospitals, as these factors affect both patients' well-being and staff performance. A recent example is a comprehensive survey published in Building and Environment in 2023, which investigated patients' perceptions of inpatient rooms in Polish [63]. The aim of this study was to determine how hospitalized patients perceive their room conditions—particularly thermal

aspects (temperature, drafts) and air quality—and whether individual characteristics (e.g., age, gender) influence these perceptions. The research also examined patients' subjective evaluation of how environmental conditions affect the healing process. The findings demonstrated that patients place significant importance on microclimatic parameters, with thermal comfort emerging as a key factor for overall well-being. At the same time, it was noted that in multi-bed hospital rooms it is very difficult to ensure ideal thermal conditions for every patient due to individual differences (e.g., health status, medication. The authors suggest developing design solutions that enable more individualized control of the environment around each patient (e.g., regulating temperature/airflow at the bedside), which would support recovery. Similarly, the study emphasized the need to update existing regulations, as current standards often remain limited to general ranges of temperature and humidity without fully accounting for the impact of the indoor environment on the healing process.

The body of research indicates that favorable thermal–humidity conditions and clean air are crucial both for patients—accelerating recovery and increasing satisfaction with care and for staff, as they enhance work performance and reduce fatigue. In Poland, work is underway on new design guidelines for ventilation and air-conditioning systems in healthcare facilities, since the currently applicable national recommendations are outdated (some originating as far back as the 1980s) and do not reflect current scientific knowledge. Recent studies (such as the aforementioned patient and staff surveys) provide data that will inform the development of standards ensuring a safe and comfortable indoor environment in hospital wards.

Inadequate lighting at workstations can deteriorate staff comfort and compromise patient safety. The aforementioned survey among surgeons confirmed this issue—nearly two-thirds of operators considered the lighting in operating rooms insufficient and potentially detrimental to the precision of surgical procedures. In response to these problems, many Polish hospitals are modernizing their lighting systems, introducing, for example, LED lighting with adjustable intensity, aimed at improving patients' visual comfort and reducing staff fatigue (as indicated in professional practice reports).

Serious problems with excessive noise, negatively affecting both patients and staff, have been identified in Polish hospitals. A 2017 study conducted by the Regional Sanitary and Epidemiological Station in Rzeszów covered 26 patient rooms in four district hospitals (Podkarpackie Voivodeship) [64].

Measurements of sound levels (day/night) revealed that permissible noise thresholds were exceeded in as many as 58% of the rooms. Three primary sources of noise were identified: medical staff (activities and communication), technical building equipment (e.g., elevators, doors, air-conditioning systems), and the external environment (traffic, parking areas). These findings confirm that patients perceive silence as a key factor of comfort, crucial for recovery. The authors recommended implementing organizational and technical changes in hospitals to reduce noise—often feasible at relatively low cost—since ensuring quiet and calm conditions is conducive to more effective treatment.

The issue of acoustics also extends to the working environment of hospital staff. A survey conducted among surgeons working in operating theatres revealed that more than 86% of surgeons rated the environmental conditions in operating rooms as uncomfortable, and as many as 76% demanded improvements. The most burdensome factors were reported to be the indoor climate and environmental conditions such as noise and lighting—both of which over 62% of surgeons assessed as uncomfortable during their work. Insufficient lighting in operating rooms was noted as a factor that can directly affect the quality of surgical procedures. These conclusions are consistent with international research findings and with WHO guidelines, which recommend very low noise levels in hospital

environments (around 30–40 dB) in order to safeguard patient well-being and support staff concentration [65].

Subjective assessment of indoor air quality and thermal comfort in hospital rooms plays a key role in patients' perceived well-being and may influence the healing process. A recent survey conducted in Polish hospitals revealed that patients are particularly sensitive to factors such as air quality, drafts, and difficulties in maintaining individualized thermal comfort—especially in multi-bed rooms. Diverse needs stemming from patients' health status, age, or medication use mean that standardized parameters often fail to accommodate everyone. The authors suggest that hospital environments should be designed to enable more personalized microclimate control at the bedside [66].

In 2020, an analysis of hospital functionality and workplace ergonomics was published in the context of an aging medical workforce [67]. The author argued that the traditional approach to hospital design as merely a "building with infrastructure for carrying out medical procedures" is insufficient; instead, a more humanistic approach is required, one that takes into account the needs and limitations of users (physicians and nurses). It was emphasized that improving working conditions (ergonomics) can help prevent professional burnout and positively influence the quality of patient care. Recommendations include optimizing the work environment by improving hospital circulation systems, eliminating unnecessary noise and stressors, providing rest areas for staff, and adapting workstations to ergonomic requirements—all of which, in turn, enhance patient safety.

Contact with nature and the therapeutic hospital environment promotes stress reduction, alleviates pain, and may shorten recovery time. In Poland, the idea of creating hospital gardens with therapeutic functions is also gaining importance. A review of the literature and case studies conducted by Czałczyńska-Podolska and Rzeszotarska-Pałka (West Pomeranian University of Technology in Szczecin) illustrated how hospital gardens can become spaces of therapy and convalescence for patients [68]. The authors identified features that a hospital garden with high therapeutic potential should fulfill: a sense of familiarity and safety, provision of diverse stimuli and environmental variety, and rich sensory qualities (visual, olfactory, and auditory stimuli). These three components—integrated into appropriate spatial arrangements—determine the friendliness of a garden for different user groups (chronically ill patients, rehabilitation patients, visitors, as well as staff seeking respite). The publication also presented specific examples of such gardens, emphasizing that fulfilling these criteria makes a garden an integral part of the therapeutic process, enhancing patients' well-being and psychological comfort [69].

In clinical practice in Poland, these recommendations are increasingly being implemented. A recent example is the sensory garden opened in 2025 at the Małopolska Rehabilitation Center in Radziszów near Kraków. This project—designed for children and adolescents undergoing long-term rehabilitation—aims to provide a safe green space offering relief from hospital routines while stimulating the senses through horticultural therapy. As the hospital's deputy director stressed, "Nature has an extraordinary power to support healing and reduce stress. . . Contact with nature is not only a moment of respite, but also an important element of rehabilitation". The establishment of such gardens responds to the needs expressed by specialists and users alike, demonstrating an understanding that the quality of the healing environment extends beyond the walls of the building, encompassing outdoor spaces that provide patients with psychological comfort.

Although formal POE projects in Polish hospitals are only beginning to gain momentum, several completed evaluation studies of this type can already be identified that address the overall assessment of healthcare facilities. Between 2015 and 2021, a research team from Poznań University of Technology, led by Professor Ewa Pruszewicz-Sipińska, conducted a multi-stage study on contemporary trends in healthcare architecture, incorporating the

philosophy of Evidence-Based Design (EBD) As part of this work, new hospital projects were analyzed with regard to user comfort and functionality [70]. The 2021 report summarizing this project highlighted the strong potential of applying POE/EBD in the design of hospitals in Poland, as well as the need for broader use of scientific knowledge by investors and decision-makers. The authors emphasized that the conscious use of research findings (e.g., on the impact of noise, interior color schemes, or access to daylight) can significantly improve both patients' experiences and staff working conditions—an approach reinforced by increasing social pressure to raise the quality of healthcare services.

3.1.2. Results of Empirical Research Published in 2015–2025

The study by (Ildiri et al. 2022) examined the effectiveness of WELL certification in improving working conditions from the perspective of office employees, while the study by (Marzban et al. 2023) compared 14 open-plan offices in the Asia–Pacific region (Australia, New Zealand, Hong Kong) [71,72]. The authors of the first study analyzed more than 1300 survey responses collected before and after relocating the same group of employees (from six North American companies) from uncertified offices to WELL-certified offices. The results demonstrated a significant improvement in workplace satisfaction, self-reported health, well-being, and productivity after the transition to WELL offices. For example, the percentage of employees satisfied with their workplace increased from 42% before relocation to 70% after relocation (an increase of about 28%); the overall well-being index increased by 26%, while mental health and self-rated productivity indicators improved by about 10% each. Statistical analyses indicated that most aspects of workplace satisfaction improved significantly—the mean ratings increased by about 1.1 points on a 7-point scale, and large effects (practically meaningful changes) were observed for 8 out of 12 satisfaction parameters. In the second study cited above, 1403 survey responses from employees in the examined offices were analyzed, focusing on factors affecting work efficiency and well-being. The objective was to identify the key drivers of productivity, creativity, and health in high-performance office environments and to compare satisfaction and perceived health among employees in WELL-certified versus uncertified offices, in order to assess whether WELL certification translates into improved user outcomes. The findings revealed that the primary factors supporting productivity were contact with the external environment (e.g., views of greenery, access to nature) and visual privacy in the workplace. For creativity, the most critical factor was the layout and interior design of the office; for mental health, organizational factors (e.g., management style and workplace culture) played the key role; for physical health, privacy and indoor air quality were most important; and for overall health, again, contact with the external environment was the most important factor. The key results of the WELL certification studies discussed here are presented in the diagram below [Figure 2].

Research by developed a transdisciplinary research model combining environmental psychology, public health, and architecture [15]. Within this framework, field studies were conducted in primary schools to analyze features of the learning environment (e.g., the quality of classroom acoustic insulation and visual clarity, understood as access to daylight, outdoor views, and spatial legibility). At the same time, children's stress levels were assessed via cortisol samples (saliva tests), and their attention capacity was measured using standardized tests and behavioral observation during lessons. Correlational analyses showed that better acoustics (lower noise, good sound insulation) and higher quality of visual conditions (abundant daylight, views of greenery, orderly space) were associated with lower cortisol levels during classes and with better concentration and reduced impulsivity. In other words, children learning in classrooms with quieter, calmer surroundings and better natural lighting exp—such as ensuring acoustic comfort and high-quality visual

conditions in classrooms—can help reduce stress in children (as reflected by lower cortisol) and enhance their ability to focus and learn. The findings provide policymakers and school designers with scientific evidence to treat the school building as an active ally in promoting health: through appropriate architecture, it is possible to support children's well-being and cognitive functions, which in the long term may contribute to better educational and health outcomes in younger generations.

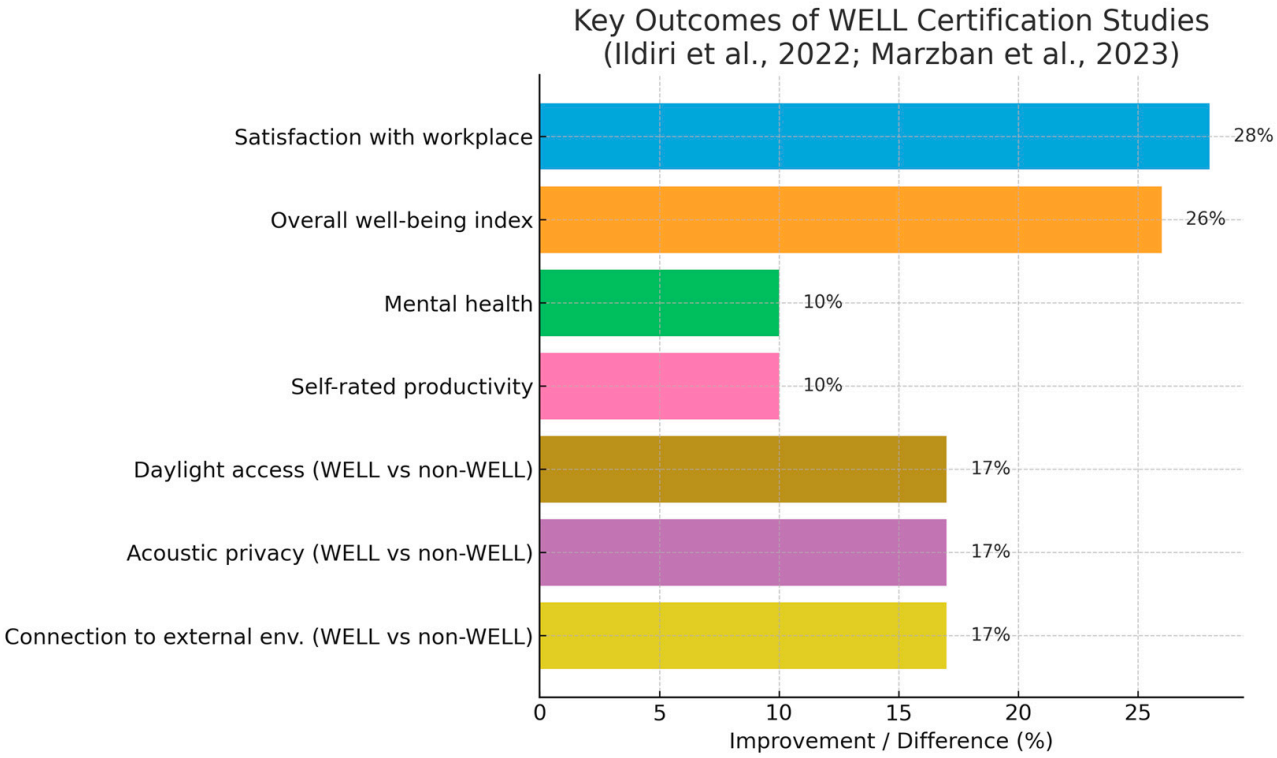


Figure 2. Key outcomes of WELL certification studies. Comparison of user-reported improvements in workplace satisfaction, overall well-being, mental health, and productivity after relocation to WELL-certified offices, as well as differences in daylight access, acoustic privacy, and connection to the external environment between WELL-certified and non-certified offices in the Asia–Pacific region [71,72]. Author: Agnieszka Rek-Lipczyńska.

3.2. Comparison of Legal Requirements and Salutogenic Design Factors

The analysis followed a qualitative comparison methodology, examining whether each salutogenic design factor:

(a) is strictly required by national legislation (or normative acts with legal force),
(b) is recommended or indirectly required by industry standards,
(c) is not present in any official legal or professional requirements.

In Poland, voluntary certification systems such as the WELL Building Standard are currently the most commonly applied benchmarks for health-oriented building design. Unlike in some other European countries, Poland does not yet have widely adopted national standards addressing salutogenic factors beyond the minimum building law requirements. For this reason, WELL is used here as a representative international framework. To provide a broader regulatory context, an additional comparative table (Table 1) has been included, juxtaposing Polish regulations with selected European EN standards relevant to salutogenic design.

Table 1. Inclusion of Salutogenic Design Factors in Legal Regulations and Industry Standards. Author: Agnieszka Rek-Lipczyńska.

No.	Salutogenic Factors	Inclusion in Polish Mandatory Regulations (Construction Law, Technical Conditions)	Inclusion in Industry Standards (e.g., WELL Building Standard)
1	Access to nature and restorative environments	No—direct requirements (there is no obligation to have internal greenery or a view to the outside, apart from the standards regarding plot sunlight).	Yes—the standards recommend biophilic elements (e.g., WELL Feature Biophilia).
2	Access to daylight	Yes—requirement for daylighting of rooms intended for people (condition: minimum window area and sunlight).	Yes—emphasis placed on access to daylight (WELL Light category)
3	Air quality	Yes—mandatory requirements regarding natural or mechanical ventilation, pollution limits (CO_2, other) in rooms.	Yes—very strongly emphasized (WELL Air category—air quality control, filtration, etc.).
4	Thermal comfort	Yes—requirements regarding thermal insulation and heating; minimum temperature in utility rooms (e.g., 20 °C) specified in the regulations.	Yes—recommendations regarding thermal comfort (WELL Thermal Comfort—compliance with comfort standards).
5	Acoustic comfort	Yes—standards for acoustic insulation of partitions and permissible noise levels in residential and public buildings.	Partially—the standards recommend good acoustics (e.g., WELL Sound), although not always obligatory.
6	Common and social space	No—the regulations do not require the creation of additional integration spaces (apart from, for example, the requirement for a common room in boarding schools or a playground in larger housing estates).	Yes—WELL and other recommendations promote recreational spaces and common areas for users (impact on the Community).
7	Possibility of privacy, avoiding crowds	Partially—indirectly through the standards of minimum living space per person (e.g., at least 8 m^2 per person in a living room), but the lack of regulations regarding the subjective sense of privacy.	Yes—the standards suggest designing taking into account various zones (public, semi-private, private) for the comfort of users.
8	Readability of orientation (wayfinding)	No—apart from the requirements regarding marking escape routes, there are no regulations regarding orientation facilities (e.g., there is no requirement for "landmarks").	Yes—good layout design and space marking recommended (e.g., Design for mind in WELL).
9	Aesthetics, colors, art	No—aesthetic and color issues are not subject to legal standards (except, for example, safety colors for occupational health and safety markings).	Yes—e.g., WELL in the Mind category encourages you to include art, biophilic design, and elements that improve the mood of user.
10	Physical activity and movement	Partially—the regulations require infrastructure for activities only in specific cases (e.g., playgrounds at schools). Generally, there is no requirement, e.g., to encourage the use of stairs.	Yes—the standards (WELL Fitness) promote solutions that encourage exercise: availability of stairs, physical activity zones in buildings.

To organize the results, a summary comparison table was developed (Table 1), (Figure 3), presenting the classification of each design factor. Table 1 presents a comparative summary of key salutogenic design factors in relation to the corresponding requirements of Polish construction law (including relevant executive regulations) and the recommendations found in professional industry standards, using the WELL Building Standard as a representative example.

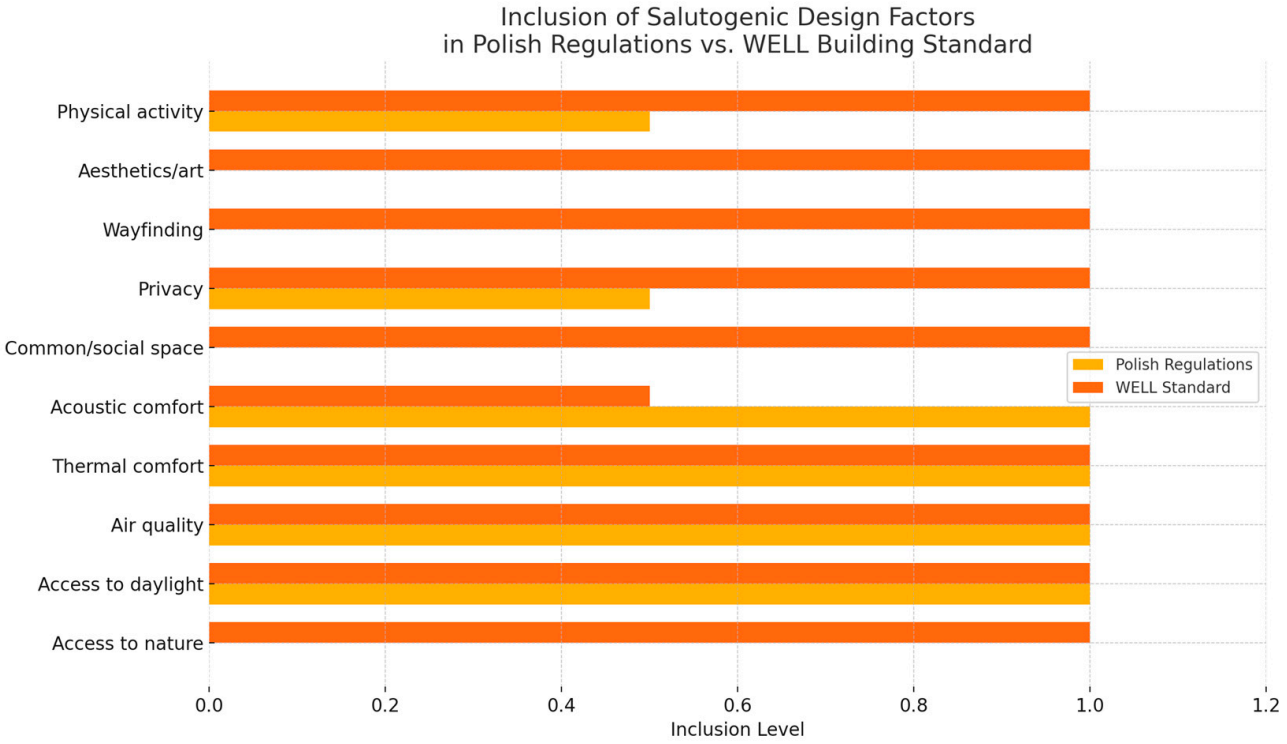


Figure 3. Showing the degree of consideration of the postulated salutogenic factors in Polish construction law and industry standards. Author: Agnieszka Rek-Lipczyńska.

The comparison presented in the table and diagrams clearly indicates that Polish legal regulations concerning building design primarily focus on the physical and hygienic aspects of the environment (lighting, ventilation, heating, noise) and on user safety, while they only marginally address psychological and social salutogenic factors. Certain elements—such as the required minimum daylighting or ventilation—can be considered consistent with the salutogenic approach. However, these are minimum requirements aimed more at preventing harm (e.g., hypoxia, darkness) than at maximizing positive health outcomes. Other factors, such as the integration of nature into interiors, the provision of social spaces, or the use of decoration and color schemes to enhance well-being, are not covered by any mandatory regulations. As a result, their implementation depends largely on the awareness and initiative of the investor or designer. In contrast, industry standards such as the WELL Building Standard cover nearly all of the identified salutogenic factors (divided into categories such as Air, Light, Thermal Comfort, Sound, Community, and Mind), though their application is voluntary. The WELL standard explicitly places user health and comfort at the center of its framework: it is a certification system specifically designed to improve the health and well-being of people spending time in buildings.

In Northern European countries, the integration of salutogenic design principles and WELL certification requirements is increasingly evident. Countries such as Sweden have long required, through their building regulations (Boverkets Byggregler, BBR), that every habitable room provide access to daylight through windows, with glazing corresponding to at least 10% of the floor area (equivalent to a daylight factor of approximately 1% [1]). However, the current approach goes further. In recent years, Sweden has updated the BBR in line with EN 17037:2018 Daylight in buildings. Brussels: CEN., placing greater emphasis on the quality of daylight. References to EN 17037:2018 Daylight in buildings. Brussels: CEN [73].now appear as both an assessment method and as design guidance—for example, Boverket documents highlight new recommended daylight illuminance levels (lux) instead of relying solely on a fixed daylight factor value [3]. Importantly, Swedish regulations

now also incorporate the concept of "utblick"—the requirement to ensure a view to the outside. Every dwelling room must have a window with a view of an open outdoor space, reinforcing a sense of connection with the environment and supporting the salutogenic aspects of comprehensibility and meaningfulness of space. Although the BBR has not yet established criteria for glare protection from daylight, regulatory trends indicate a growing interest in this issue.

To complement the tabular comparison, Figure 4 illustrates the extent to which salutogenic factors are reflected in Polish regulations compared with European EN standards. The results indicate that Polish technical requirements cover mainly basic hygienic parameters—such as minimum daylight factors, ventilation rates, or acoustic insulation thresholds—without addressing broader qualitative aspects of user well-being. In contrast, European EN standards (e.g., EN 17037, EN 15251/EN 16798, EN ISO 3382) provide more detailed and holistic criteria, encompassing daylight quality, access to external views, acoustic comfort, thermal categories, and indoor air quality thresholds [74–76]. This divergence highlights a regulatory gap: while European frameworks increasingly align with salutogenic principles, Polish regulations remain limited to pathogenic protection.

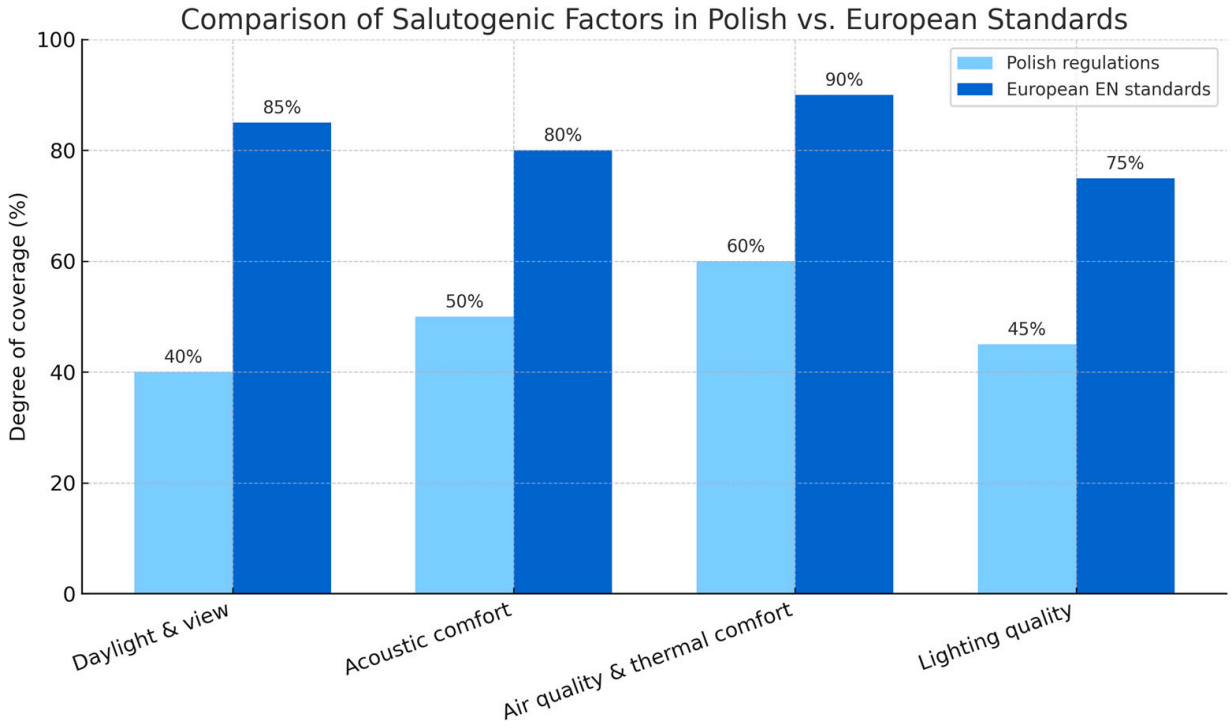


Figure 4. Comparison of salutogenic factors in Polish regulations versus European EN standards. Author: Agnieszka Rek-Lipczyńska.

The diagram illustrates the relative degree to which selected factors are addressed: daylight and access to view, acoustic comfort, indoor air quality and thermal comfort, and lighting quality. Polish regulations reflect mainly basic hygienic and technical requirements, while European EN standards provide broader, more detailed coverage, aligning more closely with salutogenic design principles.

In practice, this means that buildings aspiring to WELL certification must meet a number of criteria that go beyond legal requirements—for instance, ensuring access to relaxation areas, providing views of greenery from workspaces, using low-toxicity finishing materials, introducing biophilic design (nature-based elements within interiors), and implementing programs that promote physical activity among users. Comparable requirements can be found in other green certification systems such as LEED or BREEAM, particularly in the

category of Indoor Environmental Quality (IEQ), although their emphasis on salutogenic aspects is generally less pronounced than in the WELL framework. In Poland, similar approaches are occasionally observed in the design of modern, ecologically certified hospitals and office buildings, but they have not yet become common practice in mainstream building standards. It is worth emphasizing that certifications such as WELL, LEED, or BREEAM are voluntary—meaning their application is not legally mandated and depends entirely on stakeholder initiative.

Limitations and criticism of industry standards:

The adoption of such standards depends largely on investor decisions—in the public sector, certification is less frequently pursued due to cost considerations.

In Poland, the use of WELL or BREEAM is still gaining traction, primarily within the office and hospitality sectors.

There is also a lack of mandatory post-occupancy evaluation mechanisms unless the certification process was commissioned from the outset.

As noted in an article published in Building Research & Information, many building certification systems (e.g., LEED, BREEAM) have been criticized for focusing too heavily on measurable indicators and procedural compliance, while paying insufficient attention to actual user experience or long-term health and environmental outcomes [50]. In a literature review by Zuo and Zhao (2014), the authors highlight that the effectiveness of implementing standards such as LEED or BREEAM is often limited in developing countries or localized contexts where resources, expertise, or regulatory frameworks may be insufficient and sustainable development goals tend to be secondary to cost constraints [53].

3.3. Identification of Gaps and Opportunities for Improvement

The comparative analysis outlined above reveals several concrete gaps in current Polish regulations in the context of salutogenic design: Lack of requirements related to nature and biophilic design: Polish law does not mandate the inclusion of greenery or nature-based elements inside or around buildings, beyond general land-use planning requirements concerning biologically active surface area on a plot. Meanwhile, research strongly emphasizes the health benefits of contact with nature in living or working environments—including stress reduction and improved cognitive functioning.

Opportunity for improvement: Introducing recommendations (even if non-binding) regarding the inclusion of green elements—such as green courtyards, plant walls, or visual access to trees from windows—especially in public-use buildings (e.g., schools, hospitals). This approach aligns with the strategic direction of the European Union, which promotes holistic indoor environmental quality through funding research and implementation projects.

One of the key initiatives in this field is COST Action CA16114 "RESTORE—Rethinking Sustainability Towards a Regenerative Economy," funded under the Horizon 2020 programme. The initiative aimed to establish a regenerative design framework for indoor environments, covering not only physical aspects (thermal comfort, air quality, acoustics, lighting), but also psychosocial values such as sense of place, aesthetics, and spaces for rest and social integration [64]. The project developed a set of Key Performance Indicators (KPIs) for health-promoting architecture, including visual access to nature, use of biophilic materials, spatial diversity, and inclusion of art. Insufficient consideration of social spaces: Polish Building Law does not require the design of shared spaces for social interaction beyond circulation areas. Multifamily housing and office buildings can meet legal standards with just corridors and staircases, lacking any spaces that encourage interaction. Suggested improvement: Introducing incentives for designing communal spaces (e.g.,

lounges, terraces, courtyards) in residential and office buildings, to support social capital and indirectly enhance mental well-being.

Lack of criteria addressing aesthetics and psychological comfort: Interior color schemes, presence of art, or efforts to create a welcoming atmosphere are not addressed in legal requirements. Although most legal systems do not regulate such aspects, an increasing number of researchers argue for their inclusion in planning regulations or spatial policy frameworks. Rezafar and Sence analyze the need to formally integrate aesthetics into planning law [55]. Vartanian et al. demonstrate that architectural form directly influences users' emotional and behavioral responses to space [56]. Similarly, Ionescu emphasizes that emotional and aesthetic dimensions of interior environments are underrepresented in formal standards, despite their relevance for mental [57] Ward et al. explores links between aesthetics, sensory and synesthetic perception, reinforcing the argument for multisensory design standards [58]. These conclusions are consistent with WHO guidelines, which acknowledge the impact of environmental quality—including aesthetics—on mental and physical health, particularly in vulnerable populations.

Opportunity for improvement: Development of soft guidelines (e.g., in the form of industry standards or universal design manuals) that highlight the importance of aesthetic factors for well-being, intended for voluntary application by designers.

Minimal compliance vs. health optimization: Current legal requirements establish only the minimum acceptable conditions (e.g., minimum daylighting or minimum apartment area). They do not encourage exceeding these thresholds. As a result, many designs merely meet the legal minimum without necessarily offering high-quality living environments. For instance, current regulations mandate only 3 h of direct sunlight in a single room per day around the equinox, effectively allowing most apartment spaces to remain sunless for much of the year.

Recommendation: Introducing motivational mechanisms (e.g., tax incentives or certification schemes) for developers who exceed minimum standards in favor of improving residents' health—e.g., by designing homes with better access to light, quieter interiors, or views of nature.

The literature indicates that effective implementation of salutogenic design strategies requires broad stakeholder involvement—from architects and developers to policymakers and regulatory authorities. An interdisciplinary approach is needed, combining knowledge from architecture, environmental psychology, medicine, and environmental sciences. Although the number of related initiatives and studies is growing internationally, comprehensive legal frameworks promoting health-oriented architecture remain rare. Poland is no exception: there are some isolated recommendations (e.g., by the State Sanitary Inspection regarding lighting and air quality), but no integrated regulatory approach. Standards such as WELL represent progress in the right direction, yet their impact depends on voluntary market adoption.

4. Discussion

The results of the analysis clearly show that current building regulations in Poland provide only a basic level of health protection, primarily focusing on eliminating hazards and ensuring minimal comfort. This approach aligns with the traditional pathogenic model—protecting users from disease, injury, or discomfort. In contrast, the salutogenic concept asks what more can be done to actively enhance people's health and well-being through space. In this perspective, the building is no longer seen as a neutral backdrop but as a tool for health promotion. From a sustainable development standpoint, health should be regarded as a pillar equal to environmental and economic concerns. Sustainable buildings are not only those that consume little energy and have a low carbon footprint, but

also those that positively affect their users—ensuring comfort, well-being, and even supporting community development. This approach represents a holistic vision of sustainable architecture, combining environmental goals with health-promoting strategies. Integrating the salutogenic dimension complements the concept of green building by adding a social (well-being) aspect, consistent with the idea of the well-being economy and healthy cities.

Feasibility and measurability. One of the key challenges in integrating salutogenic principles into legal frameworks is their quantification. While it is relatively straightforward to define a minimum daylight factor or ventilation rate, it is much more complex to legislate for qualities such as "a sense of calm" or "aesthetic conditions that foster reflection." Excessive rigidity in regulating these aspects could even be counterproductive. Therefore, qualitative guidelines rather than rigid numerical standards are recommended. Tools such as the Design for Wellbeing Toolkit or the Perceived Restorativeness Scale (PRS) can serve as practical methods of translating qualitative aspects into design guidance.

Costs and economic feasibility. Another crucial dimension relates to costs. Many health-promoting design solutions—such as indoor gardens, more generous spatial layouts, or higher-quality materials—are associated with increased upfront investments. Developers and hospital managers may perceive these as additional burdens. On the other hand, evidence shows that salutogenic interventions can generate long-term savings by reducing disease burdens, lowering healthcare expenditures, and improving staff retention and productivity. Consequently, policy frameworks could combine requirements with incentive mechanisms (e.g., tax relief, subsidies, or preferential loans for projects that incorporate salutogenic design).

Stakeholder acceptance. Successful implementation also depends on broad stakeholder buy-in. Participatory design and Post-Occupancy Evaluation (POE) methods allow patients, staff, and visitors to directly assess environments and provide feedback for improvements. Such approaches enhance acceptance, ensure that solutions are user-centered, and provide valuable data for the further development of regulatory frameworks. Involving different stakeholders early in the design process reduces resistance and increases the legitimacy of salutogenic strategies.

Implementation challenges and cultural context. Salutogenic solutions must be adapted to local conditions and cultural expectations. What is considered restorative or privacy-enhancing in one context may not translate directly to another. For example, daylight access and greenery are universally valued, but aesthetic preferences, privacy norms, or the balance between individual and social needs differ across societies. Polish regulations should therefore be based on universal principles but implemented in ways tailored to national needs and expectations.

Pathways for integration. In conclusion, the findings highlight the importance of balancing mandatory and voluntary approaches. An optimal solution may involve integrating general health-promoting objectives into the Building Law (e.g., explicitly including user well-being alongside safety), while leaving detailed design strategies to voluntary standards and certifications such as WELL or LEED. In this way, the market can gradually adapt salutogenic innovations, while legal frameworks provide guidance and direction without imposing rigid mandates.

5. Conclusions

The conducted analysis reveals a significant gap between the principles of salutogenic design and the minimum requirements imposed by current Polish building regulations. The law focuses primarily on ensuring structural safety and meeting basic hygienic and health-related conditions (in the traditional sense: lighting, ventilation, temperature, noise), while key factors supporting broader well-being—such as contact with nature, sensory

stimulation, social support, and the creation of friendly and meaningful spaces—remain largely unregulated. On the other hand, the dynamic development of voluntary building standards (e.g., the WELL Building Standard) and the growing number of health-oriented architectural projects demonstrate both the need and the potential for creating buildings that are more user-friendly than what current legal frameworks require. Such buildings yield measurable benefits: increased productivity in workplaces, improved treatment outcomes in hospitals, and higher residential comfort. This aligns with global trends advocating for human-centered design in buildings and cities—an approach that complements the goals of sustainable development.

The potential costs of implementing salutogenic solutions may be offset by lower expenditures on healthcare and by the broader social benefits of improved well-being. In this context, the principle of "prevention is better than cure" gains special significance—health-supportive buildings represent an investment not only in users but in the economy as a whole. The inclusion of the principles of salutogenesis into construction law in Poland is not only possible but also advisable in the face of the health challenges of modern society. International studies show that a well-designed environment can become a protective factor for health at the population level, reducing the burden of lifestyle diseases and improving the quality and length of life. The 2024 Polish reform of technical conditions represents a promising step in this direction, although it currently addresses only selected aspects.

The results of the author's comparative analysis—including a detailed matrix of regulatory coverage of salutogenic factors—demonstrate that while Polish technical standards address some physical determinants of comfort (light, air, thermal conditions), they fail to incorporate essential psychological, social, and aesthetic components. The model-based study further shows that the integration of salutogenic features (e.g., biophilic elements, clear spatial orientation, zones of rest and privacy, sensory stimulation) enhances users' perceived sense of coherence (SOC)—including comprehensibility, manageability, and meaningfulness—in architectural spaces.

As confirmed by qualitative pilot studies carried out by the author in immersive environments simulating different design parameters, even subtle changes in layout logic, access to nature, acoustic climate, and material expression can significantly affect the perception of space as understandable, supportive, and valuable. These findings support the hypothesis that salutogenic design contributes not only to well-being but also to users' psychological resilience and cognitive orientation in space.

This study demonstrates that a significant gap remains between the principles of salutogenic design and the minimum requirements of current Polish building regulations. While the law ensures structural safety and covers basic hygienic conditions (lighting, ventilation, temperature, noise), it does not adequately address psychosocial and experiential dimensions of health, such as contact with nature, sensory stimulation, social support, or restorative aesthetics.

By integrating findings from post-occupancy evaluations (POE), case studies of hospitals, schools, and offices, as well as international benchmarking, the analysis provides evidence that salutogenic environments generate measurable health, well-being, and productivity benefits. For example, improved acoustic and lighting conditions reduce stress and enhance surgical precision, while therapeutic hospital gardens or WELL-certified office spaces demonstrate tangible psychosocial and economic advantages.

The results highlight three main implications:

Regulatory innovation: Polish building law should move beyond a pathogenic focus and include explicit well-being objectives, aligning with European trends such as the adoption of EN 17037:2018 Daylight in buildings. CEN.daylight standards and user-centered healthcare design [73].

Economic and social value: While salutogenic features may increase upfront investment, they can yield long-term savings in healthcare costs, enhance staff retention, and improve societal well-being—making preventive architecture a viable public health strategy.

Implementation pathways: A balanced approach is required, combining general legal provisions for user well-being with voluntary standards (e.g., WELL, BREEAM) and soft guidelines to ensure flexibility, stakeholder acceptance, and adaptation to local cultural contexts.

Overall, integrating salutogenic thinking into mainstream architectural practice and legislation represents the next step in sustainable development. Future Polish reforms should seize this opportunity by embedding salutogenic principles in technical standards, promoting pilot projects, and fostering interdisciplinary collaboration. Buildings of the future should not merely prevent harm but actively promote health, resilience, and meaningful human experience—thus strengthening both individual well-being and collective societal sustainability.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original work presented in this study can be found in the article. If you have any further questions, please contact the corresponding author.

Acknowledgments: While preparing this manuscript, the author used the Chat GPT 4 tool for data collection, generating a diagram and language translation. The author reviewed and edited the results and takes full responsibility for the content of this publication.

Conflicts of Interest: The author declares no conflicts of interest.

References

1. Domaradzki, J. O skrytości zdrowia. O problemach z koncepcją zdrowia. *Hygeia Public Health* **2015**, *50*, 441–447.
2. Engel, G.L. The need for a new medical model: A challenge for biomedicine. *Science* **1977**, *196*, 129–136. [CrossRef]
3. WHO. Constitution of the World Health Organization. 1946. Available online: https://www.globalhealthrights.org/instrument/constitution-of-the-world-health-organization-who/ (accessed on 21 July 2025).
4. Jadczyk, M. *Zdrowie Jako Kategoria Filozoficzna i Pedagogiczna*; Oficyna Wydawnicza Uniwersytetu Zielonogórskiego Publishing: Zielona Góra, Poland, 2009.
5. Antonovsky, A. The salutogenic model as a theory to guide health promotion. *Health Promot. Int.* **1996**, *11*, 11–18. [CrossRef]
6. Eriksson, M.; Lindström, B. Antonovsky's sense of coherence scale and the relation with health: A systematic review. *J. Epidemiol. Community Health* **2006**, *60*, 376–381. [CrossRef]
7. Antonovsky, A. *Unraveling the Mystery of Health. How People Manage Stress and Stay Well*; Jossey-Bass: San Francisco, CA, USA, 1988.
8. Golembiewski, J.A. Salutogenic Architecture in Healthcare Settings. In *The Handbook of Salutogenesis*; Mittelmark, M.B., Sagy, S., Eriksson, M., Bauer, G.F., Pelikan, J.M., Lindström, B., Espnes, G.A., Eds.; Springer Publishing: Cham, Switzerland, 2017; pp. 267–276.
9. Dilani, A. Psychosocially Supportive Design: A Salutogenic Approach to the Design of the Physical Environment. *Des. Health Sci. Rev.* **2008**, *1*, 47–55.
10. Izadpanah, S.; Majedi, H.; Zabihi, H. Wprowadzenie zmiennych architektonicznych zdrowych szkół, zgodnych z teorią salutogeniczną w poprawie jakości umysłowej uczennic szkół średnich w mieście Gorgan. *J. Conserv. Archit. Iran* **2024**, *14*, 103–124.
11. Nie, T.; Zhang, G.; Sun, Y.; Wang, W.; Wang, T.; Duan, H. Effects of Indoor Air Quality on Human Physiological Impact: A Review. *Buildings.* **2025**, *15*, 1296. [CrossRef]
12. Nagare, R.; Woo, M.; MacNaughton, P.; Plitnick, B.; Tinianov, B.; Figueiro, M. Access to Daylight at Home Improves Circadian Alignment, Sleep, and Mental Health in Healthy Adults: A Crossover Study. *Int. J. Environ. Res. Public Health* **2021**, *18*, 9980. [CrossRef] [PubMed]
13. Landvreugd, A.; Nivard, M.G.; Bartels, M. The Effect of Light on Wellbeing: A Systematic Review and Meta-analysis. *J. Happiness Stud.* **2025**, *26*, 1–24. [CrossRef]

14. Zhou, T.; Wu, Y.; Meng, Q.; Kang, J. Influence of the Acoustic Environment in Hospital Wards on Patient Physiological and Psychological Indices. *Front. Psychol.* **2020**, *11*, 1600. [CrossRef]
15. Sander, E.J.; Marques, C.; Birt, J.; Stead, M.; Baumann, O. Open-Plan Office Noise Is Stressful: Multimodal Stress Detection in a Simulated Work Environment. *J. Manag. Organization.* **2021**, *27*, 1358–1376. [CrossRef]
16. Lee, H.; Lee, Y. Effects of Postural Changes Using a Standing Desk on the Craniovertebral Angle, Muscle Fatigue, Work Performance, and Discomfort in Individuals with Forward Head Posture. *Healthcare* **2024**, *12*, 2436. [CrossRef] [PubMed]
17. Rodriguez, T. Color in Health Care: How Mindful Design Can Improve Clinical Spaces. Psychiatry Advisor. 2024. Available online: https://www.psychiatryadvisor.com/features/color-in-health-care-design-spaces/ (accessed on 13 July 2025).
18. Dawood, S. Filling Hospitals with Art Reduces Patient Stress, Anxiety and Pain. 2019. Available online: https://www.designweek.co.uk/issues/22-28-july-2019/chelsea-westminster-hospital-arts-research// (accessed on 11 July 2025).
19. Ustawa z Dnia 7 Lipca 1994 r.–Prawo Budowlane (Tekst Jednolity: Dz.U. 2023 poz. 682 z późn. zm.). 2023. Available online: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20230000682 (accessed on 11 July 2025).
20. Rozporządzenie Ministra Infrastruktury z dnia 12 Kwietnia 2002 r. w Sprawie Warunków Technicznych, Jakim Powinny Odpowiadać Budynki I Ich Usytuowanie (Tekst Jednolity: Dz.U. 2022 poz. 1225 z późn. zm.). Available online: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20220001225 (accessed on 11 July 2025).
21. International WELL Building Institute (IWBI). WELL Building Standard v2. IWBI: Nowy Jork. 2020. Available online: https://www.wellcertified.com/ (accessed on 15 July 2025).
22. Kaplan, R.; Kaplan, S. *The Experience of Nature: A Psychological Perspective*; Cambridge University Press Publishing: Cambridge, UK, 1989.
23. Ulrich, R.S.; Simons, R.F.; Losito, B.D.; Fiorito, E.; Miles, M.A.; Zelson, M. Stress recovery during exposure to natural and urban environments. *J. Environ. Psychol.* **1991**, *11*, 201–230. [CrossRef]
24. Berto, R. Exposure to restorative environments helps restore attentional capacity. *J. Environ. Psychol.* **2005**, *25*, 249–259. [CrossRef]
25. Li, Q. Effect of forest bathing trips on human immune function. *Environ. Health Prev. Med.* **2010**, *15*, 9–17. [CrossRef]
26. Viola, A.U.; James, L.M.; Archer, S.N.; Dijk, D.J. Blue-enriched white light in the workplace improves self-reported alertness, performance and sleep quality. *Scandinavian. J. Work. Environ. Health* **2008**, *34*, 297–306. [CrossRef]
27. Cook, M.B.; Smallman, H.S.; Lacson, F.C.; Manes, D.I. Situation displays for dynamic UAV replanning: Intuitions and performance for display formats. *Proc. Hum. Factors Ergon. Soc.* **2010**, *54*, 492–496. [CrossRef]
28. Figueiro, M.G.; Plitnick, B.; Lok, A.; Steverson, B. Tailored lighting intervention improves sleep and mood in older adults with Alzheimer's disease and related dementia. *Sleep Health* **2017**, *3*, 214–221.
29. Czeisler, C.A. Perspective: Casting light on sleep deficiency. *Nature* **2013**, *497*, S13. [CrossRef]
30. Wargocki, P.; Wyon, D.P.; Sundell, J.; Clausen, G.; Fanger, P.O. The effects of outdoor air supply rate in an office on perceived air quality, sick building syndrome (SBS) symptoms and productivity. *Indoor Air* **2000**, *10*, 222–236. [CrossRef] [PubMed]
31. Zhang, H.; Arens, E.; Kim, D.; Buchberger, E.; Bauman, F.; Huizenga, C. Comfort, perceived air quality, and work performance in a low-power task–ambient conditioning system. *Build. Environ.* **2011**, *46*, 1001–1009. [CrossRef]
32. Frontczak, M.; Wargocki, P. Literature survey on how different factors influence human comfort in indoor environments. *Build. Environ.* **2011**, *46*, 922–937. [CrossRef]
33. Evans, G.W. The built environment and mental health. *J. Urban Health* **2003**, *80*, 536–555. [CrossRef]
34. Kim, J.; Kaplan, R. Physical and psychological factors in sense of community: New urbanist Kentlands and nearby Orchard Village. *Environ. Behav.* **2004**, *36*, 313–340. [CrossRef]
35. Kweon, B.-S.; Sullivan, W.C.; Wiley, A.R. Green common spaces and the social integration of inner-city older adults. *Environ. Behav.* **1998**, *30*, 832–858. [CrossRef]
36. Altman, I. *The Environment and Social Behavior: Privacy, Personal Space, Territory, Crowding*; Brooks/Cole Publishing: Monterey, CA, USA, 1975.
37. Evans, G.W.; Wener, R.E. Crowding and personal space invasion on the train: Please don't make me sit in the middle. *J. Environ. Psychol.* **2007**, *27*, 90–94. [CrossRef]
38. Sundstrom, E. Privacy protection in a behavioral world. *J. Soc. Issues* **1978**, *34*, 47–65. [CrossRef]
39. Calhoun, J.B. Gęstość zaludnienia i patologia społeczna. *Sci. Am.* **1962**, *206*, 139–149. [PubMed]
40. Haapakangas, A.; Hongisto, V.; Varjo, J.; Lahtinen, M. Benefits of quiet workspaces in open-plan offices–Evidence from two office relocations. *J. Environ. Psychol.* **2014**, *38*, 38–44. [CrossRef]
41. Burry, M. Wrażenie Barwne–Wpływ Kolorów Na Ruch I Emocje. In *Konsekwencje Pracy Nad Świadomością Ciała: Podejścia, Doświadczenia, Praktyki*; Tatar, M., Ed.; Wydawnictwo Uniwersytetu Śląskiego Publishing: Katowice, Poland, 2020; pp. 114–116.
42. Ziat, M.; Balcer, C.A.; Shirtz, A.; Rolison, T. The hue-heat hypothesis: Does color truly affect temperature perception? *Sci. Rep.* **2014**, *4*, 5527. [CrossRef]
43. Malchiodi, C.A. *Art Therapy and Health Care*; Guilford Press Publishing: New York, NY, USA, 2012.

44. Carpman, J.R.; Grant, M.A. *Design That Cares: Planning Health Facilities for Patients and Visitors*; John Wiley & Sons: Hoboken, NJ, USA, 2001.
45. Lynch, K. *The Image of the City*; MIT Press Publishing: Cambridge, MA, USA, 1960.
46. Passini, R. Wayfinding design: Logic, application and some thoughts on universality. *Des. Stud.* **1996**, *17*, 319–331. [CrossRef]
47. Carpman, J.R.; Grant, M.A. *Design That Cares: Planning Health Facilities for Patients and Visitors*, 3rd ed.; John Wiley & Sons: Hoboken, NJ, USA, 2016.
48. Frumkin, H.; Bratman, G.N.; Breslow, S.J.; Cochran, B.; Kahn, P.H.; Lawler, J.J.; Levin, P.S.; Tandon, P.S.; Varanasi, U.; Wolf, K.L.; et al. Nature contact and human health: A research agenda. *Environ. Health Perspect.* **2017**, *125*, 075001. [CrossRef] [PubMed]
49. Sallis, J.F.; Cerin, E.; Conway, T.L.; Adams, M.A.; Frank, L.D.; Pratt, M.; Salvo, D.; Schipperijn, J.; Smith, G.; Cain, K.L.; et al. Physical activity in relation to urban environments in 14 cities worldwide: A cross-sectional study. *Lancet* **2016**, *387*, 2207–2217. [CrossRef]
50. Lengen, C.; Kistemann, T. Sense of place and place identity: Review of neuroscience evidence. *Health Place* **2012**, *18*, 1162–1171. [CrossRef]
51. Manzo, L.C. For better or worse: Exploring multiple dimensions of place meaning. *J. Environ. Psychol.* **2005**, *25*, 67–86. [CrossRef]
52. Cole, R.J.; Valdebenito, M.J. The importation of building environmental certification systems: International usages of LEED. *Build. Res. Inf.* **2013**, *41*, 662–676. [CrossRef]
53. Zuo, J.; Zhao, Z.Y. Green building research–current status and future agenda: A review. *Renew. Sustain. Energy Rev.* **2014**, *30*, 271–281. [CrossRef]
54. Mfon, I.E. Aesthetic considerations in architectural design: Exploring pleasure, arousal, and dominance. *Int. J. Res. Publ. Rev.* **2023**, *4*, 923–935.
55. Rezafar, A.; Turk, S.S. Czynniki urbanistyczne wpływające na ocenę estetyczną nowo wybudowanych środowisk i ich uwzględnienie w ustawodawstwie: Przykład Stambułu. *Urbani Izziv* **2018**, *29*, 83–95. [CrossRef]
56. Vartanian, O.; Navarrete, G.; Chatterjee, A.; Fich, L.B.; Leder, H.; Modroño, C.; Skov, M. Wpływ konturu na osądy estetyczne i decyzje o podejściu lub unikaniu w architekturze. *Proc. Natl. Acad. Sci. USA* **2013**, *110* (Suppl. S2), 10446–10453. [CrossRef] [PubMed]
57. Ionescu, A.M. The interior as interiority: Architecture, affect, and the aesthetics of experience. *Palgrave Commun.* **2018**, *4*, 1–9. [CrossRef]
58. Ward, J.; Moore, S.; Thompson-Lake, D.; Salih, S.; Beck, B. Atrakcyjność estetyczna percepcji synestetycznych słuchowo-wzrokowych u osób bez synestezji. *Perception* **2008**, *37*, 1285–1296. [CrossRef] [PubMed]
59. World Health Organization. Environment and Health Risks: A Review of the Influence and Effects of Social Inequalities. WHO Regional Office for Europe. 2010. Available online: https://iris.who.int/server/api/core/bitstreams/ca617634-4487-40f0-a5b9-7babeb66bc82/content (accessed on 15 July 2025).
60. Deuble, M.P.; de Dear, R.J. Czy tu jest gorąco, czy tylko ja tak mam? Walidacja oceny poeksploatacyjnej. *Intell. Build. Int.* **2014**, *6*, 112–134. [CrossRef]
61. Hartig, T.; Korpela, K.; Evans, G.W.; Gärling, T. A measure of restorative quality in environments. *Scand. Hous. Plan. Research.* **1997**, *14*, 175–194. [CrossRef]
62. Smagowska, B. Wyniki Badań i Oceny Hałasu, Oświetlenia i Mikroklimatu na Wybranych Stanowiskach Pracy. Cent. Inst. Ochr. Pr.–Państwowy Inst. Badaw. (CIOP-PIB). 2018. Available online: https://m.ciop.pl/CIOPPortalWAR/file/91827/NA_hlalas_oswietlenie_mikroklimat_na_wybranych_stanowiskach_pracy_wyniki_badan.pdf (accessed on 15 July 2025).
63. Carpman, J.R.; Grant, M.A. *Design That Cares: Planning Health Facilities for Patients and Visitors*, 2nd ed.; American Hospital: Chicago, IL, USA, 1993.
64. Norberg-Schulz, C. *Genius Loci: Towards a Phenomenology of Architecture*; Rizzoli: New York, NY, USA, 1980.
65. Joarder, M.A.R.; Price, A.D.F.; Mourshed, M. Systematic Study of the Therapeutic Impact of Daylight Associated with Clinical Recovery. In Proceedings of the PhD Workshop of HaCIRIC's International Conference 2009: Improving Healthcare Infrastructures Through Innovation, HaCIRIC, Brighton, UK, 2 April 2009; pp. 25–31.
66. Uścinowicz, P.; Bogdan, A.; Szyłak-Szydłowski, M.; Młynarczyk, M.; Ćwiklińska, D. Subjective assessment of indoor air quality and thermal environment in patient rooms: A survey study of Polish hospitals. *Build. Environ.* **2023**, *228*, 109840. [CrossRef]
67. Szuba, A.; Martynowicz, H.; Zatońska, K.; Iłów, R.; Regulska-Iłów, B.; Różańska, D.; Zatoński, W. Częstość występowania nadciśnienia tętniczego w populacji polskiej badania PURE Poland. *J. Health Inequalities* **2017**, *2*, 157–162. [CrossRef]
68. Czałczyńska-Podolska, M.; Rzeszotarska-Pałka, M. Ogród szpitalny jako miejsce terapii i rekonwalescencji. Kosmos. *Probl. Nauk. Biol.* **2016**, *65*, 609–619.
69. Carroll, C.; Higgs, J.; McCray, S.; Utter, J. Implementation and Impact of Health Care Gardens. *J. Integr. Med.* **2024**, *30*, 431–449. [CrossRef]

70. RESTORE COST Action CA16114. *Rethinking Sustainability Towards a Regenerative Economy: Report on Regenerative Design and Assessment*; European Cooperation in Science and Technology: Brussels, Belgium, 2020. Available online: https://www.eurestore.eu (accessed on 11 July 2025).
71. Ildiri, N.; Bazille, H.; Lou, Y.; Hinkelman, K.; Gray, W.A.; Zuo, W. Impact of WELL certification on occupant satisfaction and perceived health, well-being, and productivity: A multi-office pre-versus post-occupancy evaluation. *Build. Environ.* **2022**, *224*, 109539. [CrossRef]
72. Marzban, S.; Candido, C.; Avazpour, B.; Mackey, M.; Zhang, F. The potential of high-performance workplaces for boosting worker productivity, health, and creativity: A comparison between WELL and non-WELL certified environments. *Build. Environ.* **2023**, *243*, 110708. [CrossRef]
73. *EN 17037:2018*; Daylight in Buildings. European Committee for Standardization: Brussels, Belgium, 2018.
74. *EN 16798-1:2019*; Energy Performance of Buildings–Ventilation for Buildings–Part 1: Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings Addressing Indoor Air Quality, Thermal Environment, Lighting and Acoustics. European Committee for Standardization: Brussels, Belgium, 2019.
75. *EN ISO 3382-1:2009*; Acoustics–Measurement of Room Acoustic Parameters–Part 1: Performance Spaces. International Organization for Standardization: Geneva, Switzerland, 2009.
76. *EN ISO 3382-2:2008*; Acoustics–Measurement of Room Acoustic Parameters–Part 2: Reverberation Time in Ordinary Rooms. International Organization for Standardization: Geneva, Switzerland, 2008.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.