

Review

The Importance of Urban Green Spaces in Enhancing Holistic Health and Sustainable Well-Being for People with Disabilities: A Narrative Review

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Abstract: Urban green spaces have been increasingly evidenced to not only improve human health (both body and mind) and well-being but also promote a sustainable way of living for citizens as well as cities. These positive health and sustainable advantages have even greater impacts when applied to people with disabilities, which can ultimately evaluate their quality of life in the long run. Unfortunately, people with disabilities receive less attention and tend to be disregarded in terms of equal access to public facilities, health-related services, and opportunities in society. Therefore, this article emphasizes the value of having green spaces within cities and acknowledges how people with disabilities gain the benefits through active and passive methods as well as direct and indirect means at the global, population, and individual levels. With that, this article argues that urban green spaces or the development of sustainable urbanism must prioritize and include people with disabilities in the planning process, as this inclusive population has the greatest potential for advancing public resources (e.g., environmentally, socially, and economically) and moving cities closer to being truly sustainable.



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1. Introduction

Great cities offer a wide range of opportunities, wealth, vitality, and a sense of purpose in life [1,2]. Conversely, disorganized planning and management result in problems with overcrowding, dangerous surroundings, pollution, and illness for their residents [3]. In terms of socioeconomic and health outcomes, people with disabilities experience higher rates of poverty, less economic involvement, lower academic achievement, and worse health than those without disabilities [4]. A number of physical, social, and policy barriers exist for people with disabilities in pursuing a livelihood, including limited access to public restrooms and transportation, an absence of effective directory information (e.g., signs and displays) that risks their safety, a lack of job opportunities, and inadequate participation in policy decisions [4,5]. Furthermore, females, the elderly, and low-income households are disproportionately represented in the group of those with disabilities, which exacerbates their difficulties in achieving an adequate livelihood [4]. Access to society and public services should be afforded to all individuals, including those with disabilities [6]. When people are not treated equally, discrimination, which violates basic human rights, begins to take root [7]. Although in some countries the government has issued access regulations, the design of the built environment has remained inconsistent [8]. Urban green spaces are the best example of how access restrictions may make living more difficult for individuals with disabilities [9]. Inadequately designed urban green spaces and city parks deprive people with disabilities of the opportunity to lead independent lives by restricting their access to free spaces for physical activity, recreation, socialization, and nature. This unfavorable

circumstance is one of the reasons why city park design has been unsuccessful in addressing the sustainable city challenge.

According to the World Health Organization (WHO) and the World Bank, over 1 billion individuals throughout the world live with some sort of impairment, of which approximately 200 million face significant challenges in functioning [10]. In addition, by 2050, over 940 million city dwellers may be dealing with a disability [5]. The WHO identifies disability as a public health, human rights, and development issue, emphasizing that the high incidence of persons with disabilities in low-income regions, along with poverty, makes this a worldwide care and urban development priority [5,11]. A sustainable city is one that supports development and growth founded on justice and equality [7]. Thus, a city should be planned and governed based on the values of equality and justice for everyone, which implies that it should be open to all individuals and maintained via democratic and inclusive systems [12]. The city's social growth and physical environment could be improved through democratic and inclusive practices [7]. For people with disabilities to have health equity in cities, their direct, acute care requirements must be taken into account. Simultaneously, the social, physical, and often place-based causes of poor health that have not been resolved must also be addressed [5].

A necessary step towards achieving a city's health equity is to include the social model of disability in all relevant urban policies. According to the social model of disability, impairments are seen as constraints placed on public policy rather than on individuals [5]. For example, a public park without accessible facilities (such as restrooms), an unobstructed pedestrian path, adaptable fitness equipment, or vegetation choices that make it difficult for a person in a wheelchair or with a disability to access services are failures of sustainable design and policy, not the disabled person's failure [5]. By not supporting active participation in city life, these physical borders may cause individuals to lose their dignity and leave them with an emotional stigma [5,13].

As the world's population ages, the number of people 60 years of age and older is also increasing [14]. Estimates predict that by 2030, the number of people over 65 will have doubled, and the number of people over 80 will have tripled [3]. The demographics of aging will continue to change over the next 30 years, and those individuals are more likely to be impaired, which would lead to an increase in the number of people with disabilities [3,11]. With this demographic shift, there will likely be an increase in the number of citizens who have limited access to urban services and public green space facilities due to existing visible and invisible barriers. This problem will only worsen in the coming years unless action is taken and appropriate solutions are developed. Moreover, urban green spaces are still not widely recognized or comprehended, and legal papers and administration downplay their significance [15]. Therefore, this article aims to provide a review of existing studies that should be given greater attention on the impact of urban green spaces for people with disabilities based on long-term usage in order to overcome urban health inequities and improve holistic health as a further step towards sustainable city planning.

2. Methods

This article employed the guidelines for conducting a narrative literature review in the context of health-related research [16,17] and defined the search topic as 'urban green space for people with disabilities.' The following concept terms were used to construct the search design: (1) urban green space, city park, or nature; (2) disability, disabled, or inclusive; (3) health or well-being; and (4) sustainability. Please note that the plural form was applied to all nouns where applicable. Literature searches were conducted on two electronic academic databases through the online search engines Scopus and Google Scholar. In the preliminary phase, the search was limited to the past decade. Since this article concentrates on a particular population, the quantity and quality of the available documents were both unsatisfactory. The literature search timeframe was subsequently extended to two decades. As a result, any documents published prior to 2003 with a non-English version or unrelated contents were eliminated. The documents with a clear

emphasis on connecting with the objective of this article were recruited. After scrutinizing abstracts and conclusions, the most pertinent and appropriate documents were selected on the basis of researchers' disciplines, such as human factors in medical engineering, interdisciplinary health sciences, landscape architecture, and built environment design. All the selected documents were manually reviewed and organized according to the framework analysis technique. With that, themes (and sub-themes) were categorized as a conceptual theory: design for sustainability; pieces of evidence: benefits of green spaces for people with disabilities (on a nationwide, population, and personal scale); and implementations for sustainable neighborhoods (vibrant street life, walkability, and affordability) and further works (design standard, public awareness, and potential research suggestions). Finally, this article comprised several source and document types, including peer-reviewed original and review research from journals, electronic books, book chapters, conference proceedings, gray literature, reports, and others (as shown in Figure 1).

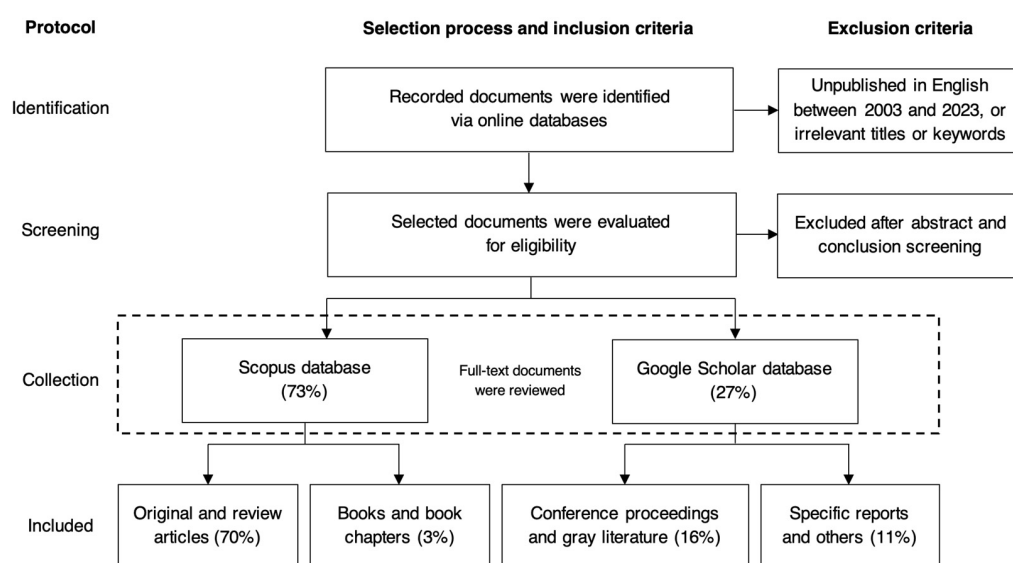


Figure 1. A flow diagram showing the literature search and selection process.

3. Design for Sustainability

Design for sustainability is an encompassing concept that is increasingly applied in multiple fields and can refer to a design practice, research, or knowledge across multidisciplinary lines that attempts to achieve sustainable development by improving holistic health for all [18]. The design for sustainability pays more attention to strategies to mitigate or eliminate existing problems while also establishing the foundations to foster promising alternatives that extend well into the future and far beyond [8]. This illustrates the expression that is not only meant to elevate overall health but also to build a successful life that is sustainable and can be transmitted to the next generation.

Greenery, including urban greening and nature, is one of the major keys to the design of sustainability, which helps contribute to making a city more environmentally sustainable [19]. The design for sustainability approaches all people, with particular attention given to those who are considered sensitive populations, such as the elderly and people with disabilities [8]. By addressing the design for sustainability, urban green spaces play a significant function within the framework of city design planning and sustainable urbanism, serving as an excellent complement for successful living among the disabled population.

In addition, the integration of public green spaces into the urban fabric influences the townscape by enhancing the aesthetic allure of cities and contributing to ecological conservation and biodiversity by providing habitat for a diverse range of flora and fauna, thereby preserving and restoring ecological balance within urban ecosystems [20]. Urban green spaces play a vital role in long-term urbanization, as they contribute to the development of green infrastructure networks and the promotion of compact and mixed-use urban

designs [21]. The addition of nature preserves to traditional methods of urban planning makes it possible for neighborhoods to strengthen their capacity for sustainability, lessen the amount of urban sprawl that occurs, and cultivate biological communities that are both more habitable and more robust [21,22]. Thus, the design for sustainability places a strong emphasis on the significance of urban green spaces for people with disabilities as important elements of a sustainable city. These spaces provide a multitude of benefits across a variety of dimensions, which is why incorporating them into the design of sustainable urbanization is absolutely essential. Additionally, the design for sustainability enhances the positive impacts of urban green spaces for people with disabilities in a manner that establishes a harmonious balance between nature and the built environment. This results in contexts that are more inclusive, resilient, lively, and livable [23].

4. Advantages of Urban Green Spaces for People with Disabilities

Worldwide rates of mortality and morbidity from extreme heat events have been increasing, and a quantifiable percentage can be attributed to anthropogenic climate change [24]. Problems with social cohesiveness and health are also on the rise in metropolitan areas, and this is occurring simultaneously with the heat crisis [24,25]. This article argues that urban green space can help to address these issues, and this is supported by the fact that urban development continues to apply such planning principles to increase natural greenery, including facilities, in cities [26]. Because of the benefits they provide to cities, social opportunities, and the wellness of body and mind for citizens, decent urban green spaces are important in making cities more sustainable and increasing the quality of life for individuals with disabilities.

4.1. Urban Green Spaces—Global Issues

Urban green spaces can alleviate pollution-related impacts for cities as well as minimize the occurrence of the urban heat island effect, which is associated with heat being trapped in urbanized centers or built-up regions [27]. Urban green spaces are regarded as an effective approach to reducing urban heat islands and promoting natural ventilation for local residents and surrounding areas through the urban green space cooling effect [28,29]. When it comes to the cooling impacts of green spaces in cities, the intensity and density of the cooling are among the most crucial factors to consider [28]. These factors can play a significant part in how city developers and urban architects approach the problem of urban heat islands [27,28]. Based on the outcomes of the recent literature, large urban parks with a size greater than 10 ha have had the strongest cooling impacts in terms of distance and intensity. Rather than the size of green spaces, factors such as climatic conditions, natural qualities, and features also have a significant impact on the cooling effect of urban green space [28,30].

Urban green spaces have a number of elements/features that have a positive impact on the urban microclimate [30]. These features include a high rate of absorption of solar radiation, a lower heat capacity and thermal conductivity in comparison to the structural materials of buildings and urban impervious surfaces, and a reduction in air temperature generated by transpiration [29]. In addition, urban green spaces contribute to the decrease of infrared radiation, the lowering of wind speed in the trunk space below the tree canopy, the retention of dust and pollutants from the air, and the sound protection that the presence of trees gives the environment [29,30].

4.2. Urban Green Spaces and Issues for the Disabled Population

Urban green spaces provide residents with opportunities to go outside, interact with nature, and participate with others in ways not possible in concrete buildings or other urban environments [25,31]. By gathering people in places, urban green spaces are strongly associated with social cohesiveness, which is an essential component of a sustainable city and is based on the principles of community development, collaboration, and social ties among individuals from various socioeconomic and ethnic backgrounds [12,25]. It can

also include sentiments of trust, belonging, acceptance, and connectivity, all of which are often associated with pleasant social encounters [25]. For the disabled population, it can be viewed as an opportunity to participate with others, where they can experience a sense of community and help counter the feeling of marginalization [12,31]. Moreover, urban green areas can enhance health and liveability through the coordination of a wide range of recreational, physical, and sporting events [32]. In urban green spaces, people with disabilities can show not only themselves but also everyone else their physical abilities, skill levels, or athletic spirits [33]. Such interaction has the potential to serve as a source of constructive encouragement for other disabled individuals as well as ordinary park users who attend the same sporting venues. It can greatly extend and make a substantial contribution to improving the attitude of the general public toward the capabilities of people with disabilities, especially their ability to participate in physical activities.

4.3. Urban Green Spaces and the Individual

Several aspects of health benefits have been associated with urban green spaces, including physical, physiological, cognitive, and mental health for people with disabilities [34,35]. Physical activity and exercise in natural settings can maximize the health benefits by providing more support for safety, providing aesthetic pleasure from use, and engaging more with society [26]. Regarding people with impairments, physical health improvement can occur in relation to muscular strength, mobility through a combination of gross and fine motor skills, and movement control based on proprioception and sensory perceptions [14,34]. Physical activity can also promote physiological health via cardiovascular function by improving the heart and circulatory system, which leads to lower cardiovascular mortality and risk of cardiovascular disease [36,37]. Another area where people with disabilities report improvement is in executive function, learning ability, and memory systems, which are related to cognitive health [14,34]. Mental and emotional health, including loneliness, isolation, and stress, has been significantly improved by becoming involved with physical activity as well as urban green spaces [34,35].

Strong evidence suggests that people engaging in urban green spaces, particularly those with disabilities, can reduce stress [35,38]. The stress response experienced by an individual is highly controlled by the function of the autonomic nervous system, whereas the sympathetic branch reacts to stress-related stimuli [39]. The parasympathetic branch reduces the stress response by releasing hormones that calm the mind and body and inhibit or slow down many high-energy physiological functions [39,40]. It is evident from some experimental studies that the parasympathetic system may be dominantly involved as part of the restorative effects of green space [41,42]. For example, a past study found that increased parasympathetic activity during the visual observation of urban green space for at least five minutes could help people recover from stress [39]. In a separate study, participants who spent time walking in the forest environment (for 12–15 min) exhibited an increase in parasympathetic modulation via heart rate and heart rate variability outcomes to alleviate cardiovascular stress, which in turn decreased negative psychological signs such as anxiety levels and mood states when compared to those who walked in the urban environment [43]. These findings strengthen and deepen the growing evidence base for the health benefits of urban green spaces for individuals.

An autonomic investigation recently reported that, by comparing viewing green and constructed landscapes, the parasympathetic function was induced while observing green images, whereas the sympathetic function found no differences between those two observations [44]. Additional research conducted within the same team discovered that visualizing green views before a stressor raised parasympathetic function in the recovery phase, as evaluated by vagus-mediated heart rate variability (the root mean square of the successive differences) [45]. In the second study, there was no evidence that sympathetic function changed during the recovery phase. Other studies have reported reduced sympathetic activity during or after exposure to green space, as indicated, for example, by decreased blood pressure, skin conductance, salivary cortisol, and muscle

tension [46–48]. According to certain studies, being in or following exposure to green spaces resulted in decreased blood pressure, skin conductance, and salivary cortisol, which was associated with a decline in sympathetic function [47,48]. Furthermore, when compared to hearing transportation and its surrounding noises after a stressful event such as finishing arithmetic assignments, paying attention to natural ambient sounds decreased levels of skin conductance, which is a biomarker of sympathetic responses. However, parasympathetic responses via heart rate variability did not increase [49].

5. Discussion

According to the discussion of urban planning strategies by UN-Habitat (2015), the three key features of building sustainable neighborhoods are a vibrant street life, walkability, and affordability [50], all of which are consistent with this article. For a better understanding of urban green spaces, this article interprets all the key features by focusing on the opportunities that can emerge for those who are part of the inclusive population.

Urban greenways for people with disabilities can encourage a vibrant street life by creating more accessibility, safety, and dynamic usage of the streets as a sustainable urban planning strategy. Greenways help urbanization achieve more uniformity by connecting open public spaces and city parks into an urban texture [51]. Trees have a significant impact on urban greenways since they offer shading to cool down the streets for a comfortable environment and improve the aesthetic quality of the streetscape. Integrated greenways with urban pedestrians, paths, routes, and infrastructure can make neighborhoods much greener, friendlier, and more visually appealing [52]. Urban greenways that are not only well-designed but also well-maintained are associated with an active lifestyle that takes place outside, which promotes healthy urbanism [53]. All of which together make street cities more visually inviting and engaging for people with disabilities, which leads to sustainable cities.

In contrast to the general population, walkability is one of the most complex and challenging aspects when it comes to people with disabilities, and it is even harder for those who have more than one impairment [54]. Unfortunately, the main unaddressed issue is environmental mobility barriers to walking, particularly for wheelchair users [55,56]. Urban parks are built environments that have been intentionally created to support and promote healthy lifestyles and wellness while providing everyone with accessibility, safety, and aesthetically pleasing qualities [57–59]. Additionally, urban parks offer an alternative green space for rehabilitation and the management of illnesses by providing opportunities for physical and recreational activities [34]. To accommodate a wide range of activities and users, urban parks are equipped with a variety of features (e.g., multi-purposed areas, meeting or gathering areas, greenery or tree areas, exercise equipment, covered seating or resting benches after activities, refreshment shops, pet deposit areas, restrooms, and parking lots) [60–62]. By visiting urban parks, people with disabilities benefit from biopsychosocial health as much as the general population [34]. Walking or being mobilized with wheelchairs in the park is thus a great way to improve physical abilities and subjective health, as well as minimize potential incidents or accidents as a result of walking in unsafe environments [54].

As free services accommodate diverse groups of users, accessing urban green spaces and using the facilities therein contributes to considerable cost savings for people with disabilities [63,64]. Living costs can be substantially reduced as individuals take advantage of freely accessible recreational opportunities instead of relying on expensive alternatives. Engaging in physical activities within the city's green spaces negates the need for expensive gym subscriptions or sports venues [64]. Consequently, individuals require less medical attention and incur fewer expenses related to treatment and medication. Reduced healthcare expenses benefit individuals and the greater healthcare system, contributing to overall economic efficiency and sustainability. This financial relief allows individuals to allocate their resources more efficiently, addressing other pressing needs. An affordable and accommodating city supports sustainability by ensuring that all members of society can

actively participate in and benefit from available resources at no cost [50]. As cities attempt to become more sustainable, the incorporation of free services, amenities, and resources in urban green spaces for people with disabilities is a critical method for accomplishing these goals.

Finally, urban green spaces provide numerous benefits on multiple scales as a means of social cohesion for individuals. This view is aligned with the Healthy City Guidelines from the WHO [65], which define a healthy city as “one that continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential.” Thus, urban green spaces are important across many dimensions, including management, facilities, and design [34]. Improving urban green spaces could result in a population-wide enhancement in holistic health, which would be highly advantageous to individuals with disabilities in terms of their equality in society and opportunities, as well as their sustainable quality of life [66].

6. Recommendations

This article reviews the significance of urban green spaces and emphasizes their positive impacts on disabled individuals. However, this article is still only one piece of the equation in promoting holistic health and well-being so that cities can truly become sustainable. Collaborations from many sectors, as well as numerous additional research studies, are required to move our proposed perspective forward, as suggested in the following subsections.

6.1. *A Design Standard and the Use of Sustainability*

Several accessibility design guidelines, such as universal design and inclusive design, have long been proposed for the building and construction industries. However, a lack of implementation and enforcement, as well as misinterpretation and misunderstanding of the use [67,68], result in urban green spaces that are inaccessible or hazardous to people with disabilities. Planning and administration of urban green spaces should seriously prioritize the establishment and enforcement of comprehensive accessibility guidelines, as well as sustainability, to ensure that urban green spaces are accessible and safely usable by people of all abilities. There is a need for collaboration among urban authorities, professionals, research institutes, and other key stakeholders to develop and rebuild national regulations, standards, and guidelines for sustainable design and construction that are tailored to the requirements of people with disabilities [69]. This essential step needs to be carried out as soon as possible in order to take advantage of the potential benefits it may bring to the economy, society, and technology [6,8]. With that, design standards that contain appropriate criteria catering to the expressive needs of people with disabilities can provide important guidelines for the refurbishment of existing local parks and move towards the goal of achieving high-quality urban green spaces as well as a sustainable city.

6.2. *Increase Public Perception and Awareness*

Cities, communities, and their citizens should collaborate on a regular basis to create awareness campaigns involving people with disabilities, such as by organizing public hearings, community seminars, or other educational events suitable for the program's needs. This can lead to the general public's perception of disabled individuals as valuable members of society. It can also empower people with disabilities by demonstrating the value of their voices. Meanwhile, it is imperative that professionals in the fields of engineering, urban planning, and architecture pay closer attention to accessibility requirements and sustainable best practices. This will help ensure that urban green spaces are designed, constructed, and maintained with accessibility and sustainability in mind from the outset.

6.3. Further Research Directions

There is currently a shortage of research and practice for people with disabilities in several fields (both qualitative and quantitative methods), including design, health and well-being, and sustainability in relation to the context of urbanization and development.

All public spaces should provide clear, effective, and appropriate information and resources for people with disabilities to minimize confusion, frustration, or impeding their ability to fully engage the benefits of the places. Inclusiveness and accessibility for amenities, facilities, and services in public green spaces are then urgent needs. These aspects should be incorporated into programs aimed at altering existing spaces or planning to construct new areas. Since there are more types of illnesses and impairments than handicap or wheelchair users, there should be design research that examines each type of disability or limitation specifically. In Thailand, for example, people with disabilities are classified into eight categories: visual, hearing, physical or mobility, intellectual, learning, autistic, emotional or behavioral, and multiple disabilities [70], each of which necessitates a unique design approach. Furthermore, a deeper component, such as temporary or permanent conditions and mild, moderate, or severe classifications, should also be considered [10,71]. Regarding urban design and research, one of the most significant issues that discourages people with disabilities from reaching urban green spaces as destinations is the limited number of public transit choices. Insufficient accessible support for elevators, escalators, ramps, and public signage (e.g., symbols, wayfinding, and directory signs) makes it difficult to navigate them safely and effectively. It is worth mentioning that when using public transportation systems by themselves, people with disabilities tend to spend more time traveling than general users [72]. The locations of seating areas and accessible restrooms should be considered when planning. Urban pathways, pedestrians, and trails that are poorly built, uneven, or lack accessible elements such as handrails or tactile strips are advised to undergo additional research in regard to planning, materials, and management. Furthermore, conducting case studies and reviewing best practices from places or cities that have effectively integrated urban green areas for people with disabilities is encouraged. Identifying successful programs, analyzing their consequences, and extracting lessons that can guide prospective development and planning efforts for a sustainable city are also recommended.

Since the COVID-19 epidemic, not only disabled people but people all around the world have adapted and modified their ways of living, working, and socializing by embracing more well-being and hygiene. Some earlier studies and research on urban green spaces in health-related areas, including both objective and subjective measurements, may need to be reexamined to confirm this current situation. Also, the matter of whether park designs for people with disabilities should be isolated from those for the general public, which involves social factors of social judgment, cultural thought, and biological sex differences (especially female), is currently being disputed in the fields of urbanization and mental health. Prospective studies may need to consider these aspects within their investigations.

Sustainability studies with nature-based interventions, such as therapeutic landscapes, sensory gardens, horticulture therapy, and ecotherapy, to promote healing or rehabilitation among the disabled in cities are recommended. It would also be interesting to explore the role of assistive technologies in supporting the experience and usability of urban green spaces. For instance, by providing accessible charging stations (via green energy) for powered electronic wheelchairs, assistive devices, or smart navigation tools, people who rely on them can independently spend more time enjoying green spaces. Moreover, regular maintenance is required for urban green spaces and community parks to remain of high quality, safe, and non-harmful to their users. Inadequate maintenance procedures, on the other hand, might result in injuries or serious health problems for people with disabilities. Investigating strategies for long-term maintenance as well as how to preserve well-maintained green spaces are critical components of creating a sustainable city.

6.4. Strategy Plans to Improve Accessibility and Use of Green Space for People with Disabilities

All local stakeholders should be encouraged to improve accessibility and use of green space for people with disabilities to create more livable communities for all, especially in areas of deprivation or where there is unequal access, as an important part of the wider plan to reduce health inequalities. Improvements must be carefully planned, and purposeful consultation with all parties in the communities must occur at all stages in order to provide equitable, sustainable benefits and to ensure health inequalities are not intensified. It is essential that the accessibility and use of green space for people with disabilities are also reflected in local planning strategies, especially the local plan, which sets out the strategic priorities for the development of an area. This will support the case for specific planning standards to be implemented to address needs or help defend planning decisions based on the foundation of health and well-being. Developing strategies for accessibility and use of green space for people with disabilities will also support the protection and enhancement of green infrastructure for all.

7. Conclusions

Urban green spaces offer a significant opportunity to create the possibility that the overall health and well-being of a diverse spectrum of people, including people with disabilities, can be increased and guaranteed, while also being intertwined with environmental sustainability development to address the world's current and future challenges. Regarding building sustainable neighborhoods, urban green spaces assist in enhancing city features such as urban greenways, walking-activity environments, and free access to amenities and facilities, all of which contribute to the creation of a vibrant street life, a livable environment, and an affordable city, as well as promoting the quality of life of people with disabilities. These illustrate that the presence of inclusive green spaces has tremendous potential to foster a multitude of positive long-term effects, encompassing both the improvement in holistic health and the advancement of urban sustainability. When the value of sustainability benefits is recognized and the needs for their establishment and preservation are prioritized, urban green spaces for people with disabilities can therefore play a pivotal role in shaping the characteristics of a city and strengthen a path toward a more inclusive, healthier, and sustainable future.

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