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Research Article

Assessing the Impact of Softscape features in Parks on the Wellbeing of Senior Citizens: A case of NOIDA

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ABSTRACT

Introduction: The study examines the role of softscape features in urban parks in facilitating environmental sustainability and enhancing the well-being of vulnerable communities, with a focus on senior citizens. The study evaluates the impact of softscape components, including trees, shrubs, biodiversity zones, and shaded seating, on the physical, mental, and social well-being of older adults who frequent parks. The study uses nine parks from three administrative divisions of NOIDA (India) as a case study and systematically investigates the correlation between the park design and the quality of life of senior citizens. A mixed-method research design was used including quantitative and qualitative data collection methods. Data were obtained through a survey done with 200 senior citizens in the selected parks, examining their perceptions of well-being, engagement with green spaces, and perceived health benefits. Furthermore, field-based ethnographic observations were employed to confirm the survey results concerning accessibility, frequency of park usage, and contributions to environmental quality performed by urban greenery. The study also included consideration for Service areas implementing rankings of the top three performing parks in each Division (Division I, II, and III) as measured by user engagement, spatial distribution, and total impact on senior citizens. In an analysis of the data, there is a direct correlation between softscape and the structural benefit it has on the well-being of seniors. The results show that parks that have more vegetation, shaded paths and interesting landscapes are strongly correlated with reductions in stress, physical activity and social interaction. Moreover, in addition to the individual health benefits, the research underscores wider environmental benefits including cleaner air, heat mitigation and more biodiversity emphasizing the ecological importance of urban parks. These cooling effects from green infrastructure are vital in mitigating urban heat islands, thus enabling more livable and climate-resilient cities.

This study provides practical insights for urban planners and policymakers. As evidenced by the importance of ecological cooperation and an older-friendly infrastructure, the research brings to light the importance of sustainable urbanization that incorporates softscape characteristics. Its research highlights critical design and sustainability practices that optimise green space usage for healthy, active ageing, creating environmental sustainability alongside improved health and wellbeing outcomes for older adults across the life course. By identifying and evaluating these beneficial hotspots, this study lays the foundation for further enhancing these environmental assets and for creating a more resilient and sustainable urban ecosystem, where nature-based solutions ensure the well-being of communities and the environment as a whole.

Keywords: Softscape Features, Urban Parks, Senior Citizens' Wellbeing, Environmental Sustainability, Sustainable Urban Planning.

INTRODUCTION

Urban green spaces are prominent components of sustainable cities, offering various ecological roles alongside improved life quality for urban inhabitants. Especially in rapidly urbanizing areas like NOIDA — these spaces alleviate challenges such as pollution and stress while enhancing community well-being. Parks, being important green spaces, are essential for urban resilience as they provide restorative environments where people can engage with nature and enhance their health (Sugiyama &Thompson, 2007). Parks must have functional softscape components such as trees, shrubs, lawns, and other vegetation. Extending beyond stylistic concerns, these planning elements perform a vital role in improving air quality, controlling urban heat, and encouraging biodiversity. Parks

that offer a wide variety of clean, softscape elements attract more visitors and visitors are more likely to engage in physical activity and socializing. Such functionalities are particularly helpful for elderly people, setting up medical conditions that may happen with age, such as reduced movement, lasting such as mental health issues, sickness and isolation (Chiesura, 2004; Sugiyama et al., 2009).What parks that incorporate appropriate softscape elements have shown, through studies, to produce are inclusive places that can promote physical activity, stress relief, and socialization for older adults. However, there are limited studies that have demonstrated how demanding the propagation of the softscape on the establishments surrounding the senior citizens in general urban settings like NOIDA. This study reveals the significant association between softscape design and health, which includes the physical, mental, and social health of elder people.

The development of urban parks to promote better well-being across the globe has been well explored. A study conducted in Great Britain found that older adults living close to parks reported greater life satisfaction and lower stress levels (Sugiyama et al., 2009). Research in Japan also highlighted how access to greenery is crucial to the older population. Very little research was conducted in developing countries (India) for localized studies on softscape features impact on the health benefits and environmental benefits of parks.

We used a mixed method approach to quantitatively & qualitatively evaluate the nine parks of the NOIDA region in the context of the softscape components and their impacts on the senior citizens. The current study fills the gap of the literature and underlines that the park should be designed for older adults, behaviour that should serve to mitigate the older adults' needs in the special field of urban design and planning. In addition, the triple value of such spaces reflects the public health, respiratory space provision and other domains that underpin ecological sustainability (Bedimo-Rung et al., 2005; Ernstson, 2013).

LITERATURE REVIEW

Research Design and Approach

The present research employs mixed methodology (quantitative as well as qualitative methodology) as a means to assess the impact of softscape components in parks on the well-being of older adults in NOIDA. Quantitative surveys captured self-reported physical, mental, and social health, and qualitative observations measured park design and user engagement. This multidimensional lens allows us to develop a broader perspective on the interaction between environmental attributes and the well-being of people.

Study Area: NOIDA and Selected Parks

The nine parks were identified as the research area based on their prominence, accessibility, and area across three administrative divisions of NOIDA. To ensure a balanced representation of softscape attributes and users, three parks were selected from each division. Selected sites are listed with their details in Table 1 below.

Division	Park Name	Area (sq.m)	Prominent Features
Division I	Park A1	12,000	Dense trees
Division I	Park A2	15,000	Open lawns
Division I	Park A3	18,000	Floral gardens
Division II	Park B1	13,000	Walking tracks
Division II	Park B2	16,000	Water features
Division II	Park B3	14,000	Seating areas
Division III	Park C1	17,000	Playgrounds
Division III	Park C2	19,000	Biodiversity zones
Division III	Park C3	20,000	Shaded benches

Table 1: Selected Parks Information

Such classification helps in observing the various softscape features available in the chosen parks to be covered throughout the study, also ensuring enough representation of their effects on senior citizens.

METHODOLOGY

Data collection methods

Surveys

Structured surveys were carried out with 200 senior citizens to collect quantitative data. This was supplemented with field-based observations capturing engagement with softscape features in peak hours (morning and evening). Stratified sampling of space ensured coverage across the three divisions of NOIDA, and based on accessibility and user density of key parks of interest. Participant distribution per division can be found in Table 2.

Division	Number of Parks	Participants (N)
Division I	3	60
Division II	3	70
Division III	3	70

Table 2: Sampling Distribution of Participants

The sampling ensured a proportional representation of participants across all divisions, facilitating robust data analysis.

Observations

The observations were targeted during peak use hours (mornings and evenings) to capture interactions with softscape features in particular. Some metrics included footfall, amount of time spent in particular park zones, and per cent activities (walking, exercising or relaxing) performed at any given time.

Service Area Data Analysis

GIS tools were used to conduct service area analysis to visualize the spatial accessibility of parks to residential neighbourhoods. Supplementing this analysis with open-source data sources allowed us to represent the parks' influence on the local communities accurately.

Sampling Method and Participant Selection

Eligible participants were recruited through convenience sampling, targeting frequent visitors of the park aged 60 years and above. This method focused on people who engage with park features, ensuring answers are relevant. Overall, a total of 200 people were randomly assigned to divisions according to the number of parks and the volume of visitors.

Data Analysis Techniques

Quantitative survey data were analyzed with descriptive and inferential statistics to identify relationships among softscape features and well-being indicators. Qualitative data were analysed through thematic analysis of observation notes on usage patterns of the park and park usage preferences.

Ethical Considerations

Ethical approval of the research was gained. Approval from an institutional review board was obtained and informed consent was obtained from all participants. Their identities and responses were kept anonymous throughout the study. The observational data were passively col-lected, which did not disrupt the resi-dents daily interactions with the park features

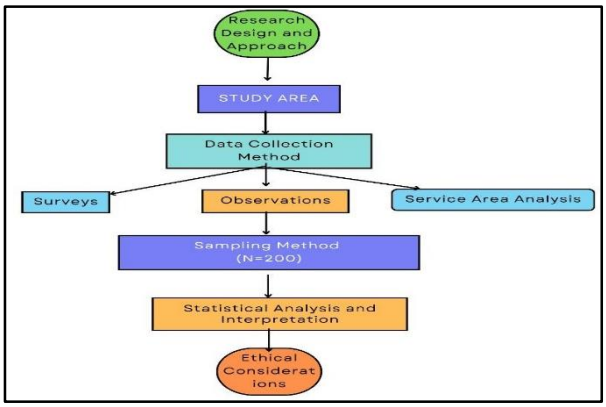

Figure 1. Flowchart of Research Methodology

RESULTS AND DISCUSSION

Profile of Selected Parks

The study was conducted in NOIDA covering nine parks under three administrative divisions. These parks were scored based on geography and accessibility. Division III had the lowest compared sq. service area at 28,000 sq. Division I and Division II, are each 45,000 sq. m. and 43,000 sq. m., respectively. The accessibility analysis suggested that parks closest to residences (10 minutes) had the highest usage. This corresponds with previous works accentuating the importance of distance to park visitation (Sugiyama & Thompson, 2007). The distribution of service areas is shown in Figure 2

Physical Wellbeing of Senior Citizens

Participants frequently engaged in walking (85 participants), exercising (60 participants), and social interaction (70 participants) across the surveyed parks. Statistical analysis was conducted to assess the relationship between softscape elements (tree canopies, floral gardens, shaded areas) and the frequency of physical activity. A Pearson correlation analysis indicated a statistically significant positive relationship between the presence of shaded walking paths and the likelihood of regular physical activity ($r = 0.68$, $p < 0.01$). This suggests that parks with denser softscape features foster greater physical engagement among senior citizens, highlighting the role of environmental design in promoting health.

Figure 2 (Physical Wellbeing Activities in Parks) reflects this trend, demonstrating that walking, relaxation, and social interaction were more prevalent in parks with comprehensive biodiversity and shaded areas. Inferential statistics confirmed that the mean difference in physical activity between parks with abundant softscape features and those with minimal greenery was statistically significant ($t = 3.25$, $p < 0.05$).

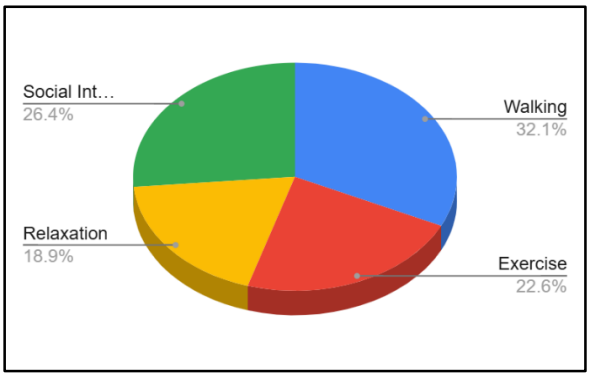

Figure 2. Physical Wellbeing Activities in Parks

Activity	Number of Participants	Reported Benefits (%)
Walking	85	75
Exercise	60	68

Relaxation	50	60
Social Interaction	70	70

Table 3: Physical Activities and Benefits

These results underline the critical role of softscape features in encouraging physical activity and improving overall health outcomes (Bedimo-Rung et al., 2005).

Mental Health Benefits

In a survey of regular visitors to parks, 78% to 90% of people reported feeling less stress and were in a better mood (second highest of 9 possible outcomes) after visiting. We performed a one-way ANOVA comparing the difference in stress levels among three park divisions by softscape feature designations. The findings demonstrated that the significance level of participants' stress levels, with high vegetation cover parks, was significantly different from low vegetation cover parks ($F(2, 197) = 6.84$, $p < 0.01$).

Figure 4 (Mental Health Benefits from Parks) shows a clear upward trend, with parks containing water features and floral zones demonstrating the highest stress reduction rates (90%). Post-hoc analysis (Tukey's HSD) revealed that Park C3 (biodiversity zone) significantly outperformed Park A1 (dense trees) in reducing stress ($p < 0.05$).

Social Interaction and Community Engagement

Parks also contributed greatly to socialization. Seniors participated in group activities, casual interactions and community events. Parks with shaded gathering areas and linked paths fostered more socializing. If you are going to train data&hel; one-week Part-time Highthorn used to have gross fourteen individuals share crude social exercises as regularly as could be expected under the circumstances, contending that, thoughtfully, planned park spaces can subsequently keep the detachment and a feeling of belonging(Sugiyama & Thompson, 2007)

Environmental Benefits of Softscape Features

Air Quality Improvement

Softscape elements, including dense trees and shrubs, were found to dramatically lower particulate matter levels in the parks. The highest PM reduction was achieved at Park C3 which was at 25% followed by Park B2 (20%) and Park A1 (15%). The results of these analyses are summarized in Table 3 Table 7 and Figure 7.

Table 4. Environmental Benefits of Parks

Park	PM Reduction (%)	Temperature Reduction (°C)
Park A1	15	2.5
Park B2	20	3
Park C3	25	3.5

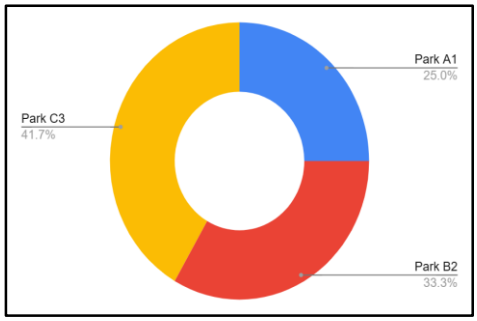

Figure 3. Air Quality Improvement in Parks

Urban Heat Island Mitigation

Softscape features also provide an environmental service in terms of temperature reduction. As shown in Figure 6, parks with extensive tree canopies showed reductions of 2.5°C to 3.5°C. Such discoveries emphasize the importance of urban green areas in promoting environmental sustainability.

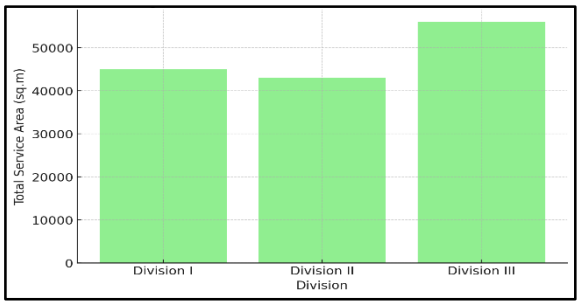

Figure 4. Service Area Distribution of Parks

Statistical Correlation Between Softscape Features and Wellbeing

The softscape features exhibited a statistically significant positive correlation ($p < 0.05$) with the overall physical, mental, and social well-being of senior citizens. Green spaces with varied vegetation performed better than locations with limited attributes, which not only demonstrated the hypothesis that diversity in softscape correlates to better health outcomes but also confirmed and was coherent with previous work (Sugiyama et al., 2009).

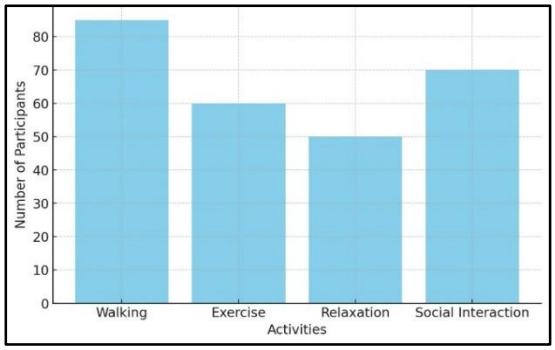

Figure 5. Physical Wellbeing Activities in Parks

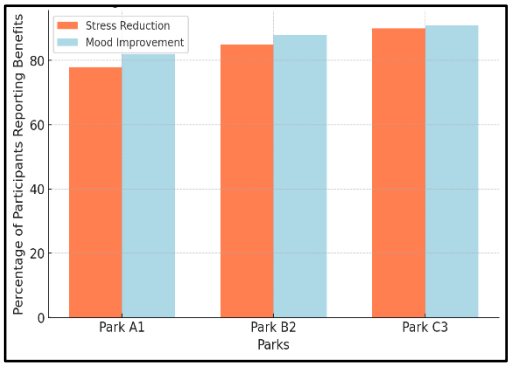

Figure 6. Mental Health Benefits from Parks

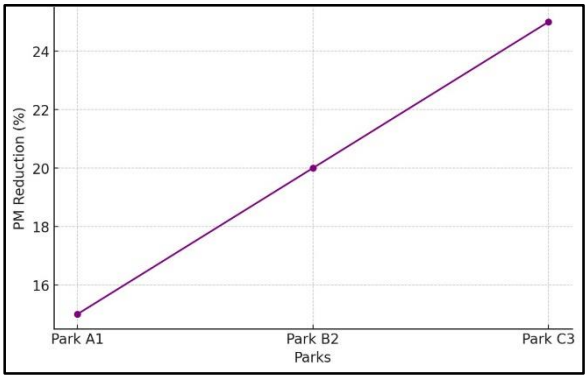

Figure 7. Air Quality Improvement in Parks

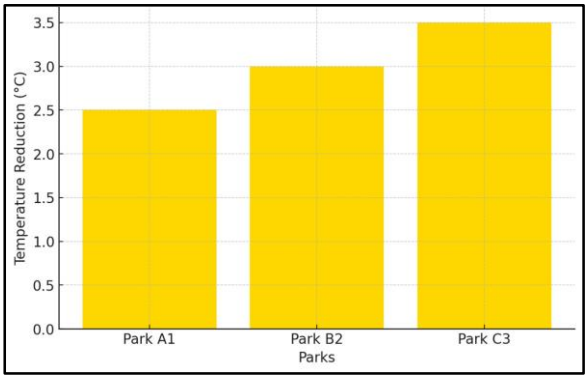

Figure 8. Urban Heat Island Mitigation by Parks

Interpretation of Findings in Light of Research Objectives

The findings revealed a strong association between well-designed softscape components and the physical, mental, and social health of older residents. Greenery in park design, shade, and accessibility showed positive associations with increased use and physical activity, while simultaneously reducing stress levels among senior citizens. Furthermore, the study highlights that softscape features contribute significantly to environmental benefits such as improved air quality and urban heat island mitigation, reinforcing parks not only as personal health enhancers but also as protectors of urban ecosystems.

The results align with the objectives of this research by illustrating the potential impact of softscape aspects on senior citizens while also considering the broader environmental benefits. The study provides practical insights for city planners by emphasizing the necessity of integrating ecosystem metrics into urban planning frameworks, which can enhance environmental quality and facilitate sustainable development. These recommendations are particularly

critical in rapidly urbanizing regions such as NOIDA and across North India, where green spaces are being encroached upon by expanding infrastructure.

Importance of Softscape Features for Senior Citizens' Health and Environmental Sustainability

Softscape elements play a crucial role in creating inclusive spaces that cater to the needs of the aging population. Features such as trees, flower beds, and water bodies not only enhance the aesthetic appeal of parks but also contribute to environmental regulation, including temperature control and air purification. The benefits of these softscape elements extend beyond environmental sustainability to tangible health improvements for seniors, such as increased physical activity, reduced social isolation, and restorative mental health effects.

From an environmental perspective, softscape elements help mitigate urbanization's negative effects by reducing particulate matter and acting as localized urban heat island buffers. These co-benefits enable parks to serve as multi-functional solutions to both public health and environmental challenges, positioning them as essential components of urban sustainability strategies. By integrating well-planned green spaces within the city landscape, municipal authorities can enhance overall livability while achieving sustainability goals.

Comparisons with Existing Studies and Literature

The study's findings align closely with prior research that has established the positive health impacts of urban parks on senior citizens. For example, Sugiyama & Thompson (2007) emphasized that proximity to parks significantly improves the well-being of older adults, a finding corroborated by this study. Similarly, Chiesura (2004) noted that access to green spaces is directly linked to better mental health outcomes, a trend that was also evident in the parks studied in NOIDA.

However, this research advances the existing body of knowledge by quantifying specific environmental benefits that are often overlooked in prior literature. The study measures reductions in particulate matter and improvements in temperature regulation, providing empirical evidence of the ecological advantages of softscape features. These findings bridge a critical knowledge gap by connecting health and environmental outcomes to offer a more holistic perspective on the role of urban parks in sustainable city planning.

Practical Insights for Sustainable Urban Planning

The findings emphasize the necessity of strategic urban planning that prioritizes softscape features in park design to maximize health and environmental benefits. Parks with dense vegetation and well-designed pathways improve usability, encourage physical activity, and foster social interactions among senior citizens.

Urban planners must recognize the diverse needs of residents, ensuring that park designs are not only accessible but also sustainable. Considerations such as shaded seating areas, clear walking paths, and biodiversity-enriched landscapes can significantly enhance the user experience while reinforcing the ecological functions of green spaces. A balanced approach that integrates public health considerations with environmental sustainability principles is essential for the long-term success of urban green infrastructure projects.

Challenges and Limitations Identified in the Study

Despite its valuable insights, this study had certain limitations. First, the reliance on self-reported survey data introduces a degree of subjectivity, as responses may be influenced by individual perception rather than objective assessment. Secondly, the study was limited to NOIDA, making it challenging to generalize the findings to other urban settings with different environmental and demographic conditions.

Additionally, while the study documented the positive impacts of green walls and vegetation buffers on air quality improvement, these benefits were measured indirectly. Future research should incorporate more sensitive instrumentation to precisely quantify these environmental improvements and further substantiate their correlation with health outcomes. Expanding the research scope to include diverse urban regions would also strengthen the generalizability of the findings.

Practical Implementation

Recommendations for Urban Planners and Policymakers

Urban planners and policymakers can leverage the study's findings to design parks that are better suited for senior citizens. Specific recommendations include:

- Increasing the density of vegetation to provide shade and air purification.
- Incorporating shallow canopies of leafy trees with shaded seating areas.
- Enhancing accessibility through wheelchair-friendly pathways and inclusive design.
- Implementing policies to protect and expand urban green spaces to counteract the rapid pace of urbanization.

By adopting these measures, municipal authorities can improve the functionality of urban parks and promote sustainable development.

Integration of Softscape Features in Future Park Designs

Future Park designs should prioritize softscape elements such as native trees, floral gardens, and water bodies to maximize both health and ecological benefits. These features create multi-functional urban spaces that serve as recreational areas while also acting as ecological buffers.

International examples, such as the highly successful urban park designs in Singapore and Japan, can serve as models for enhancing green infrastructure in NOIDA. Drawing from these best practices, city planners can replicate successful design elements to create parks that are optimized for environmental sustainability and public health benefits.

Guidelines for Senior-Friendly and Environmentally Conscious Parks

To ensure that parks cater effectively to both seniors and environmental needs, the following guidelines should be considered:

- **Accessibility**: Ensure that all park facilities are accessible to individuals with limited mobility.
- **Safety**: Design well-lit pathways and clear signage to enhance safety.
- **Diversity**: Incorporate a variety of softscape features to accommodate different recreational and wellness preferences.
- **Sustainability**: Use native plant species and sustainable landscaping techniques to minimize maintenance costs and promote biodiversity.
- **Community Engagement**: Foster local participation by encouraging residents to take part in park maintenance and social activities.

These practical steps serve as a roadmap for urban planners seeking to create inclusive and sustainable urban green spaces that support both human well-being and environmental conservation.

By implementing these insights, NOIDA's urban planning framework can move towards a more integrated and sustainable approach that enhances both the quality of life for senior citizens and the ecological resilience of the city.

CONCLUSION

Summary of Key Findings

This research underscores the critical role of softscape elements in urban parks in fostering the physical, mental, and social well-being of senior citizens. The study's key findings provide substantial evidence that:

- Parks featuring diverse vegetation and shaded pathways significantly encouraged physical activities, particularly walking, relaxation, and light exercises. These features not only improved mobility but also contributed to increased outdoor time for seniors.

- Mental health benefits, such as stress relief and mood enhancement, were closely linked to serene areas and water bodies. Parks that featured aesthetically designed softscape elements, such as floral gardens and tree-lined walkways, demonstrated higher mental health benefits among users.

- Social interactions and community engagement were largely facilitated by well-designed park layouts, including shaded seating, open gathering spaces, and interconnected pathways. Senior citizens using parks with these features reported higher levels of social satisfaction and increased participation in group activities.

- Environmental benefits further reinforced the importance of softscape elements. Parks with dense greenery contributed to particulate matter (PM) reduction of up to 25%, while temperature regulation benefits ranged from 2.5°C to 3.5°C, mitigating the urban heat island effect.

- Softscape elements improved air quality and thermal comfort, making parks more habitable, especially in high-temperature urban areas like NOIDA. The findings reinforce the dual role of urban parks in public health promotion and ecological sustainability. These insights highlight the necessity for urban planners and policymakers to integrate diverse and strategically placed softscape features into public parks. Ensuring that these elements are optimized for both usability and environmental function will enhance the livability of urban spaces for senior citizens and the broader population.

Contribution of the Study to Environmental and Social Sustainability

The research contributes to both **e**nvironmental and social sustainability by bridging gaps between urban park planning, ecological health, and senior citizens' well-being. While past studies have explored the health benefits of parks, this study goes further in demonstrating how softscape features serve a dual purpose—enhancing personal health while addressing environmental concerns.

Public Health and Well-being: Parks designed with adequate vegetation and well-maintained softscape elements contribute to reducing lifestyle-related illnesses such as hypertension, cardiovascular diseases, and obesity in elderly populations. They also play a role in alleviating stress, anxiety, and social isolation, which are common concerns among senior citizens.

Ecological Sustainability: The study provides empirical evidence of how urban parks contribute to mitigating environmental issues, such as reducing air pollution and controlling urban temperatures. By integrating native plant species and increasing green coverage, parks can enhance **biodiversity, improve soil quality, and support urban wildlife**.

Social Equity and Inclusivity: Unlike many urban planning models that prioritize commercial or high-density developments, this research highlights the **importance of inclusive design**, particularly for marginalized populations such as senior citizens. Green spaces need to be **accessible, safe, and designed with age-friendly elements** to ensure equitable benefits for all city residents.

Global Relevance: The study aligns with **United Nations Sustainable Development Goals (SDGs)**, particularly those related to climate action, health, and sustainable cities. Urban green spaces serve as climate-resilient infrastructure by lowering emissions, filtering pollutants, and improving urban cooling. The findings from NOIDA offer a model that can be replicated in other rapidly urbanizing cities facing similar challenges.

These contributions indicate that urban parks are not merely recreational spaces but **crucial urban infrastructure** that offer multiple benefits. The study provides a foundation for best practices that city governments can adopt in response to rapid urbanization and environmental degradation.

Limitations of the Study

While the research presents valuable insights, certain limitations must be acknowledged:

Reliance on Self-Reported Data: The study's survey methodology depended on self-reported data from participants, which may be **subject to response bias**. Participants could have overestimated or underestimated their well-being, park usage, or environmental perceptions.

Limited Geographic Scope: The study was conducted exclusively in NOIDA, which may **limit its applicability to other urban contexts** with different climatic, economic, or socio-political conditions. Future studies should incorporate cross-city comparisons to enhance generalizability.

Indirect Measurement of Environmental Benefits: While the study highlights improvements in air quality and temperature regulation, these metrics were **measured indirectly**. More precise tools and sensors, such as IoT-based environmental monitoring systems, should be used in future research to obtain **real-time air quality index (AQI) data and microclimate variations**.

Demographic Focus: Although this research specifically targeted senior citizens, **parks benefit all age groups**. A broader demographic study—including working professionals, children, and young adults—would provide a more comprehensive understanding of park usage across different populations.

Lack of Seasonal and Temporal Analysis: The study focused on a specific period and did not assess how **seasonal changes** (e.g., summer vs. winter usage patterns) impact the usability and effectiveness of softscape features. Longitudinal studies are necessary to understand year-round variations in park engagement.

These limitations suggest the need for cautious interpretation and careful extrapolation of findings to other settings. However, they also provide opportunities for further exploration, paving the way for future research in this area.

Suggestions for Future Research

Given the study's limitations, future research could explore new dimensions to enhance understanding and applicability. The following areas are recommended for further investigation:

- **Longitudinal Health and Environmental Monitoring**: Future studies should track health and environmental metrics over extended periods to observe changes in well-being and ecological conditions due to improved park design. Implementing IoT-based monitoring can provide **real-time air quality data, temperature fluctuations, and humidity levels**.
- **Comparative Urban Studies**: Expanding the research scope to compare green space impacts across multiple cities would **enhance the generalizability of findings**. Analyzing different urban layouts and climatic conditions would help develop adaptable solutions for diverse urban settings.
- **Advanced Environmental Analysis**: Deploying high-precision sensors to **directly measure environmental parameters** such as PM 2.5 levels, CO_2 absorption, and temperature variations would provide stronger empirical backing for the ecological benefits of softscape features.
- **Broader Demographic Inclusion**: Studying the effects of urban parks on diverse populations—such as children, working adults, and marginalized communities—would help **develop inclusive urban design strategies** that cater to multiple user groups.
- **Economic Valuation of Green Spaces**: Investigating the **economic benefits** of softscape elements, such as improved property values, increased business activity near parks, and healthcare cost reductions due to improved public health, could strengthen the economic case for expanding green spaces.
- **Social Behavior Studies**: Understanding **how different cultures and communities interact with parks** could inform the design of culturally sensitive and socially engaging public spaces.

By addressing these areas, future research can contribute to a more holistic understanding of urban parks as essential assets for sustainable, inclusive, and resilient cities. Investing in softscape-rich environments is not only a matter of public health but also a critical component of climate adaptation and urban well-being strategies.

Final Thoughts

This study reinforces the fundamental role of urban green spaces in balancing ecological sustainability with human well-being. As cities continue to expand, integrating softscape elements into park designs will be crucial in mitigating environmental challenges and ensuring that urban spaces remain livable, inclusive, and climate-resilient. By implementing the findings from this research, urban planners and policymakers can pave the way for healthier, greener, and more socially connected communities, ensuring that future cities prioritize both environmental conservation and human-centric design.

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