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Fostering community engagement through sustainable design: A study of child and elder-friendly amenities in botanical garden, Sarangpur, Chandigarh

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Abstract
Botanical gardens serve multifaceted roles in society, including environmental conservation, scientific research, education, and public engagement. Their historical evolution underscores their importance in preserving plant biodiversity and advocating for sustainable practices. A geographical exploration of botanical gardens reveals diverse landscapes and ecosystems that bridge the natural world with human society. Public perspectives highlight these gardens as educational hubs, recreational spaces, and cultural landmarks. The Botanical Garden in Sarangpur, Chandigarh, epitomizes these roles through its focus on research, conservation, education, and eco-tourism. This study examines the garden's meticulous organization, emphasizing functional areas, natural elements, and educational resources. Key facilities include the Administrative Block, Energy Park, Nursery-cum-Research Block, and various public amenities, all enhancing visitor experiences and promoting environmental awareness. A survey conducted at the garden provided insights into visitor demographics, motivations, and perceptions, revealing strong interest from younger adults and highlighting the garden's appeal for enjoyment, natural beauty appreciation, educational opportunities, and family bonding. Feedback suggests improvements in child-friendly and old age friendly areas, facilities, cleanliness, and educational initiatives. The garden's commitment to sustainability practices positively impacts visitor satisfaction and environmental conservation. Prioritizing these practices and addressing visitor feedback are essential for the garden's ongoing enhancements and strategic planning. In conclusion, the Botanical Garden in Sarangpur, Chandigarh, exemplifies the critical roles botanical gardens play in fostering environmental stewardship, education, and public engagement, making them invaluable assets for current and future generations.

Keywords: Botanical gardens, environmental conservation, scientific research, education, public engagement, biodiversity preservation, sustainable practices, eco-tourism, visitor experience, child friendly, old age friendly, community asset

1. Introduction
Botanical gardens serve as fascinating spaces that bridge the natural world with human society, offering a unique blend of ecological exploration and public engagement. This geographical exploration delves into the diverse landscapes and plant collections found within these gardens, while also delving into the perspectives of the public who visit and interact with these spaces. Botanical gardens are place where people go to spend time outdoors, learn about plants and gardening, see special exhibits or plant collections, hang out with friends, or simply relax and rejuvenate mentally. International Union for Conservation of Nature (IUCN) “A botanic garden is a garden containing scientifically ordered and maintained collections of plants, usually documented and labelled, and open to the public for the purposes of recreation, education and research”. Botanic Gardens Conservation International (BGCI) the definition which encompasses the spirit of a true botanic garden - “A botanic garden is an institution holding documented collections of living plants for the purposes of scientific research, conservation, display and education”. Just like museums and libraries, gardens are valuable educational resources for the community. They also offer beauty, tranquility, and enjoyment. To better serve their visitors, gardens conduct audience research, which is like studying the people who come to visit. Botanical studies of a local region not only are of a didactic value, but they are also the source of information for pupils

on the diversity of nature and a necessity for protection of the region they live in. Going outdoors, visiting nearby and farther surroundings can observe the principal properties, record and collect plants or analyse and describe plant communities and vegetation of the given region. The collection of all plants of a particular region or a period comprises the flora, while overall acquaintance with it is encompassed by various floristic studies. Besides, various analyses of plant communities and their habitats are used in botanical studies of the flora of our surroundings. The Botanical gardens specialised in local flora or present plants from around the world, within the limits of the local soil and climate unless the plants are placed in a greenhouse. The first US botanical garden was established by John Bartram in Philadelphia in 1728. Famous botanical gardens include the Royal Botanical Gardens in Kew, near London (1759), the Botanical Gardens of Berlin-Dahlem (1646), and the Botanical Gardens in Schonbrunn, Vienna (1753) (United States Botanic Garden, 2013) [7]. The valuation of the benefits provided by urban gardens and parks like botanical gardens are quite difficult to measure and quantify, but yet indispensable. According to Milton, (2002) [8], some of the many benefits of urban green spaces are; air and water purification, mitigation of the impact of environmental pollution, carbon sequestration, regulation of microclimate, habitat for urban wildlife, recreational, spiritual and therapeutic value as well as social integration. Hence, green space improves the environmental quality of life, urban tourism, active and passive recreations and many other urban ecological functions (Randall *et al*., 2003) [5]. Urbanization is having an enormous impact on the environment at local, regional and global scale (Turner *et al*. 1990) [6] the trend of studying different aspects of urban green spaces is gaining momentum among urban researchers. Thus, it becomes imperative to investigate users' perceptions of urban parks (Botanical gardens). The major botanical gardens of India are Lalbagh or the Mysore State Botanical Garden in Bangalore, Lloyd Botanic Garden in Darjeeling, National Botanical Garden in Lucknow, Botanical Garden of Forest Research Institute in Dehradun, Indian Botanical Garden in Calcutta, which is also the largest botanical garden of India. A geographical exploration of botanical gardens involves studying the physical attributes, layout, and environmental factors that contribute to their unique ecosystems. Geographical exploration also encompasses mapping out the different sections or zones within the botanical garden, such as themed gardens, collections of native or exotic plants, and conservation areas. On the other hand, public perspectives refer to the views, opinions, and experiences of the visitors who frequent botanical gardens. This involves understanding why people visit botanical gardens, what they hope to gain from their experience, and how they perceive the garden's value in terms of education, recreation, conservation, and aesthetic enjoyment. Public perspectives also encompass factors like accessibility, amenities, interpretive signage and engagement programs offered by the botanical garden to enhance visitor experience. Combining geographical exploration with public perspectives provides a holistic understanding of botanical gardens as both natural and cultural landscapes. It helps us appreciate the interplay between environmental factors, plant biodiversity, human interactions, and the societal significance of botanical gardens in promoting environmental awareness, conservation efforts, and public engagement with nature.

2. Objectives of the study

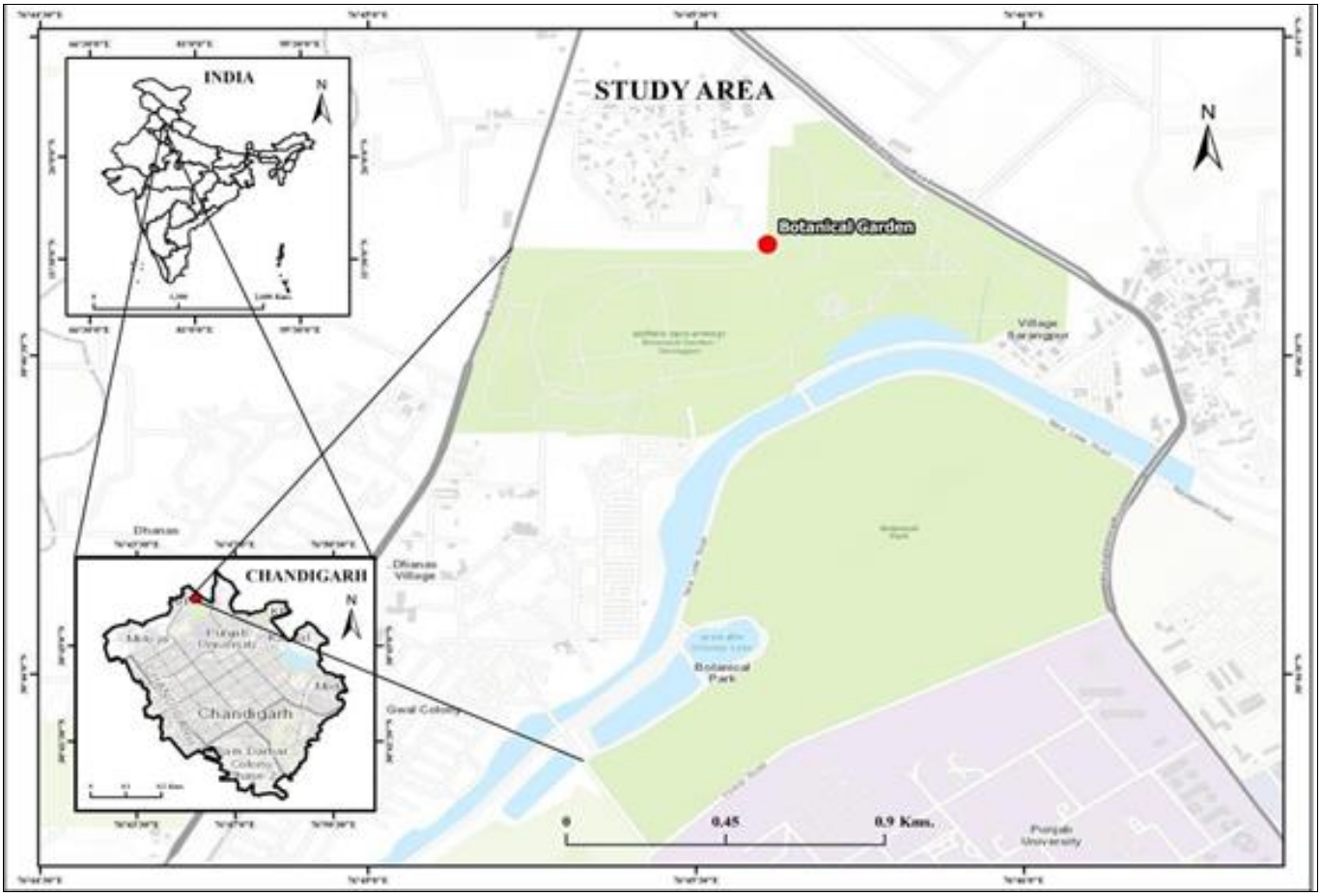
1. To identify and assess the features and amenities provided in botanical gardens especially that cater to the needs of both children and the elderly.
2. To explore the public perception about the Botanical Garden that contributes to increased visitor satisfaction and engagement while promoting sustainability through amenities and educational programmes.

3. Database and Methodology

The research methodology involves a mixed-methods approach. Firstly, secondary data will be collected through literature review, botanical records, and official documentation to examine the spatial organization, floral composition, and facilities of the botanical garden. Primary data will be gathered through schedule, interviews, and observations to assess features catering to different age groups and public perceptions. Interview schedule held to collect data of visitors to gauge their satisfaction levels and preferences regarding amenities. Interviews with botanical garden staff and selected visitors will provide insights into specific features for children and the elderly. Observations will complement these methods by capturing visitor behaviour and interactions. Data analysis will include quantitative techniques for interview schedule data and qualitative analysis for interviews and observations. Pie charts, Bar graphs constructed for data presentation.

4. Study Area

Chandigarh, the 'city beautiful' is situated in the foothills of Shivalik hills and is blessed with a climate that is suitable to accommodate the number of species of flora of different climatic regions. It is worthwhile setting up a Botanical Garden here with a purpose to conserve the flora of the region as well as those exotic and near extinct species. With this background Chandigarh Administration has established a Botanical Garden near village Sarangpur. This garden spreads over 176 acres of land and has been connected with the nature reserve known as Patiala-ki-Rao Forest through a causeway. H.E. Inaugurated the garden in January, 2007. This garden when fully developed would be one of the biggest in this region. The garden consists of 15 Botanical Sections. The primary aim of the setting up of the Botanical Garden is to promote research, education, ex-situ conservation of flora and to spread awareness about our floral heritage.



Source: Survey of India, 2011

Map 1: Location of study area

In addition, the garden would help promote eco-tourism in Chandigarh. The botanical garden is situated in village Sarangpur on Kurali-Chandigarh Road is about 6 Kms from Chandigarh bus stand and 80 Kms from Patiala. It spreads over an area of 176 acres. The place is identified in the study of the flora of the region.

5. Results and Discussion

5.1 Assessing the botanical garden: Child friendly design and suitability for older individuals

In a child-friendly botanical garden, kids embark on a journey of discovery amidst nature's wonders. Here, playful exploration merges seamlessly with learning about plants and ecosystems. With engaging play areas, interactive exhibits, and themed activities like treasure hunts, children delve into the world of botany in an exciting and educational manner. Simultaneously, botanical gardens offer a haven tailored for senior citizens' comfort and enjoyment. Smooth pathways, ample seating, shaded retreats, and informative signage ensure a relaxed and accessible experience. These gardens become more than just landscapes; they transform into immersive learning environments where every visitor, young or old, can connect with nature's beauty and wisdom. This present chapter sheds light on some factors of child friendly design and suitability for older individuals which are as follows:

5.1.1 Visitor's demographics: The Sarangpur Botanical Garden attracts a diverse and balanced demographic, with 52% females and 47% males. While young adults (19-30) lead in participation at 38%, other age groups are well-represented, including children, teenagers, adults, and seniors. This wide-ranging appeal underscores the garden's broad-based attractions.

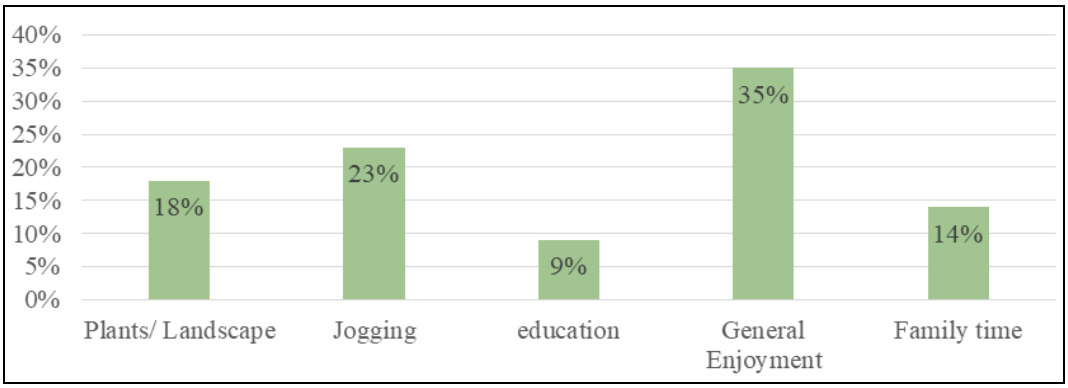
5.1.2 Visitor's preferences to visit botanical garden

The Sarangpur Botanical Garden caters to diverse visitor preferences, from the lush greenery and vibrant flowers to serene sunrise views and relaxing fishing areas. With 11% appreciating bonsai artistry and 3% enjoying the evening water fountain, the garden offers something for everyone. This variety ensures broad appeal, making it a versatile and engaging destination for all visitors.

Source: Primary Field Survey, 2024

Plate 1: Botanical Garden: Lawns

5.1.3 Visitor motivations and perception: The Botanical Garden attracts visitors for various reasons: 35% for its serene ambiance and natural beauty, 18% for diverse plant collections and scenic landscapes, and 9% for educational opportunities. Additionally, 14% value family bonding moments in its tranquil setting. Notably, no visitors identified as tourists, highlighting the garden's community-centric appeal. This diversity in motivations underscores the garden's ability to cater to a wide range of interests and experiences, enriching each visitor's time and reinforcing its local significance.



Source: Primary filed Survey, 2024

Fig 1: Botanical Garden: Visitors Motivation and Perception

5.1.4 Play area engaging for children
The survey revealed that 62% of visitors find the botanical garden very engaging, praising its safety and educational value for children, who often visit with parents or grandparents. However, 24% suggest adding play areas with swings, slides, and exercise machines to enhance children's engagement. While 14% remain neutral, no visitors found the garden unengaging for children. Overall, the garden is appreciated for its child-friendly environment, but there's a call for more recreational facilities to boost its appeal.

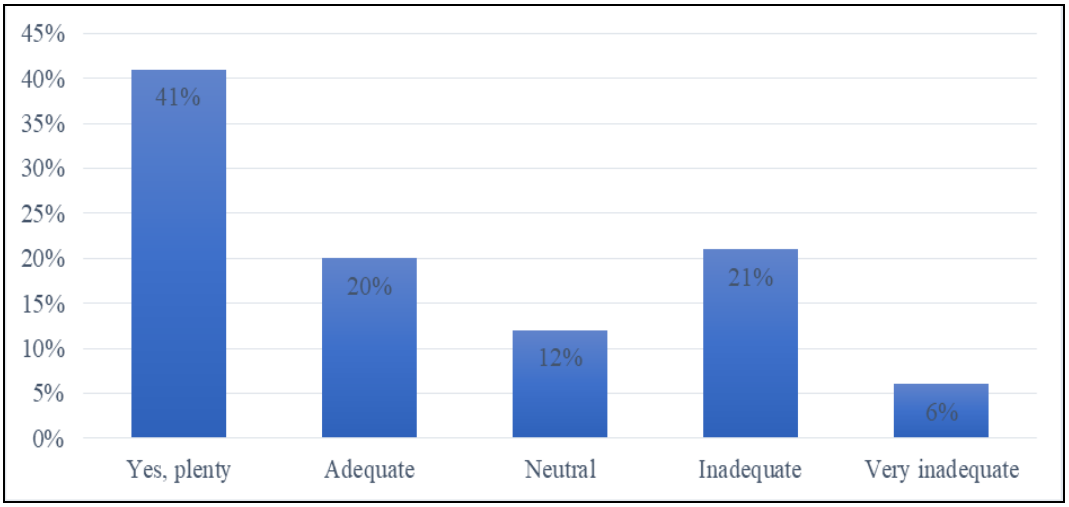
5.1.5 Pathways and facilities
The survey indicates that 44% of visitors find the botanical garden's pathways and facilities very accessible, with well-maintained paths allowing easy movement for children. However, 29% suggest improvements, citing damaged pathways and the need for more facilities like swings and exercise machines. While 18% remain neutral, 6% find the accessibility lacking, and 1% deem it completely inaccessible for children. Overall, enhancements in pathways and amenities are needed.

5.1.6 Play area engaging for children
Almost every visitor observed children playing in the botanical garden's open areas. While 78% noted a lack of educational activities, 22% mentioned beneficial physical activities like meditation, judo, and karate classes. To enhance child-friendliness, 95% of visitors recommended adding play areas, and 5% suggested increasing security. These improvements aim to make the garden safer and more engaging for children.

Seating and rest areas for older people
41% visitors said that the seating and rest areas are more than enough for older individuals. 20% visitors found that seating and rest areas are adequate for older individuals. 21% visitors said that seating and rest areas are inadequate for older peoples. There should be more chairs provide in the botanical for older individuals.

Source: Primary Field Survey, 2024

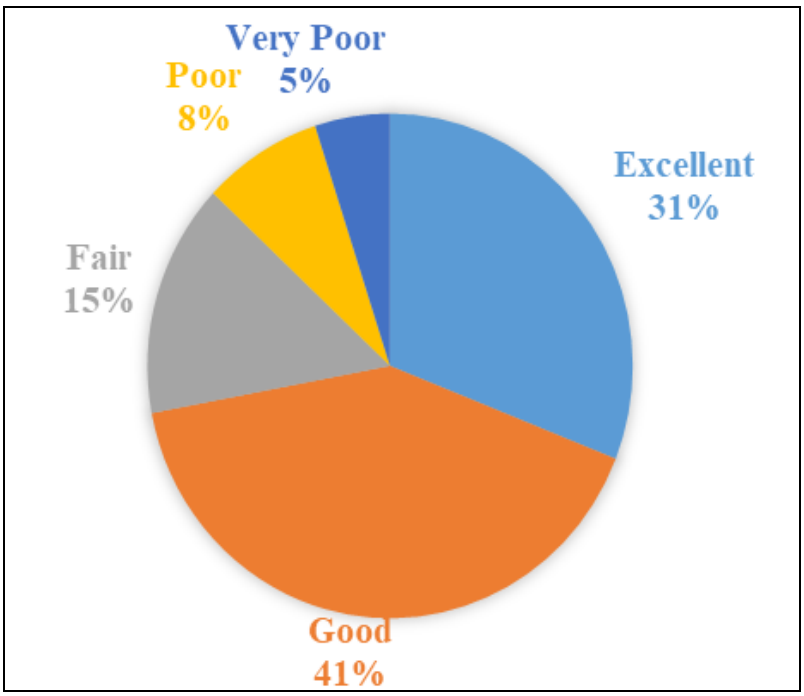
Plate 2: Resting Benches



Source: Primary filed Survey, 2024

Fig 2: Botanical Garden: Visitor's Perception for Seating and Rest Areas

5.1.7 Overall accessibility of Botanical Garden: Visitor feedback on seating in the garden varies, with 64% finding it comfortable while 36% call for more and better-placed rest areas, especially for older visitors. Hygiene concerns in washrooms, highlighted by a 72-year-old, impact their experience.



Source: Primary filed Survey, 2024

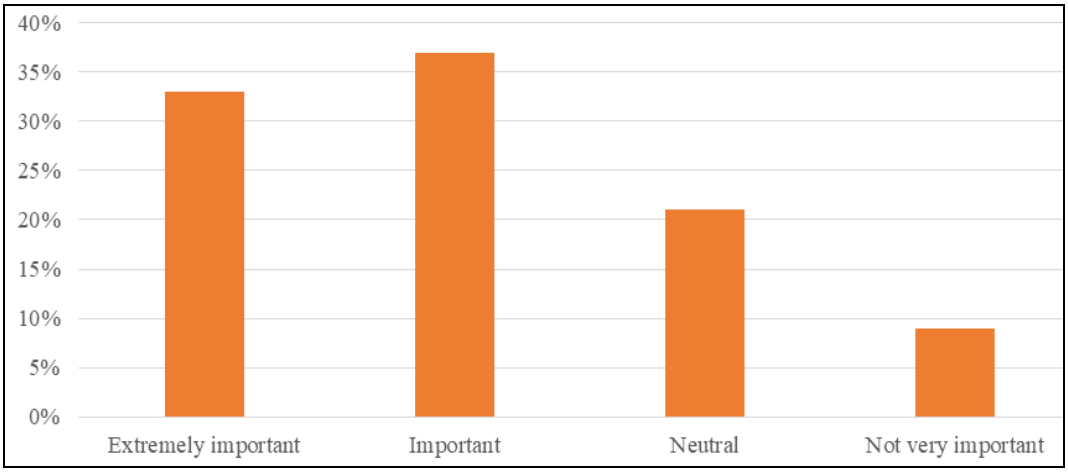
Fig 3: Botanical Garden: Visitor's perception for Overall Accessibility

However, all visitors agree that older individuals can access all areas. Gardening activities for seniors are lacking. This highlights the need for improved amenities and activities tailored to the needs of older visitors.

5.1.8 Suggestions to improve botanical garden for better care for both child and older individual: The significant portion of visitors, around 40%, expressing satisfaction with the botanical garden's current state underscores its quality and appeal. However, the suggestions from other visitors highlight the importance of inclusivity and functionality. More seating near pathways for children and seniors acknowledges diverse visitor needs and promotes comfort during exploration. The inclusion of play areas for children not only adds a fun element but also encourages family visits and engagement with nature from a young age. Providing exercise machines aligns with wellness trends and promotes active lifestyles within the garden's serene environment. Addressing security concerns, especially for children, is crucial for fostering a safe and enjoyable experience for all visitors. These diverse suggestions emphasize the importance of balancing existing strengths, such as high satisfaction levels, with targeted enhancements to cater to different age groups, promote health and wellness, and ensure a safe and welcoming atmosphere for everyone in the botanical garden.

5.2 Sustainability and satisfaction: Exploring the botanical garden experience

5.2.1 Sustainability and ecofriendly practices: The survey reveals a strong emphasis on sustainability among botanical garden visitors, with 32% considering it extremely important and 37% rating it very high. While 21% remain neutral, indicating room for education, 9% of younger visitors show less prioritization. This underscores the demand for sustainable practices. Targeted efforts, like educational programs, are crucial to bridge understanding and promote eco-friendly initiatives across all demographics, ensuring the garden meets both environmental and visitor needs effectively.



***Source*:** Primary Field Survey, 2024

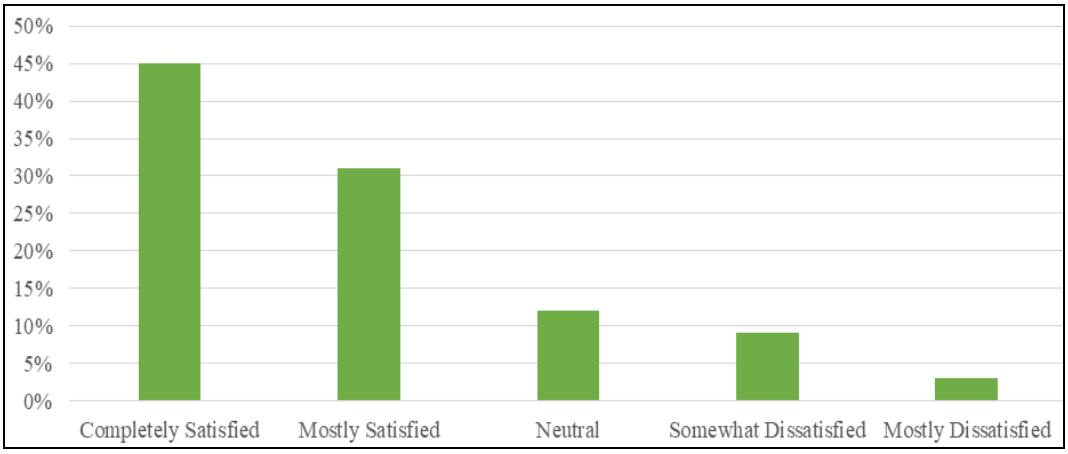
Fig 4: Botanical garden: Visitors perception sustainability and ecofriendly practices

5.2.2 Suggestions from visitors to improve sustainability practices: Visitor priorities in the botanical garden vary, with 26% emphasizing waste management, 18% suggesting cleaning water bodies, and 17% advocating for biodegradable materials. Additionally, 11% highlight renewable energy sources, while 27% offer diverse suggestions from cleanliness measures to adding plantations and street lights. Implementing these ideas can enhance the garden's eco-friendliness and visitor comfort, fostering a sustainable and enjoyable environment. This reflects a collective effort towards creating a more sustainable and visitor-friendly botanical garden experience.

5.2.3 Interactive elements: It's clear that visitor opinions on interactive elements in the botanical garden vary widely. While 62% feel the current level is sufficient, they emphasize the need for better maintenance. The 17% advocating for more features like water points, dustbins, and additional plantations highlight a desire for practical additions. Conversely, the 21% who feel there are already too many features suggest a preference for maintaining the garden's current state. Balancing these perspectives could involve improving maintenance while selectively adding practical elements that enhance visitor experience without overwhelming the garden's natural beauty. Flexibility in adapting to diverse visitor preferences can help ensure a positive experience for all.

5.2.4 Current services provided in garden: Visitor opinions on botanical garden services vary. While 36% find them good and 14% rate them excellent, 26% consider them average, suggesting improvements in washroom cleanliness and more water coolers. However, 12% deem services poor, and 11% very poor. Suggestions for improvement include daily washroom cleaning, increased water coolers, and quality enhancements like water purification. Addressing these concerns can elevate visitor satisfaction and ensure a more enjoyable experience within the garden.

5.2.5 Visitor's satisfaction: The survey results from the Botanical Garden reveal a range of satisfaction levels among visitors. A significant portion, 45%, expressed complete satisfaction with the services provided, indicating a positive experience overall. Additionally, 31% of visitors were mostly satisfied, reflecting a generally favorable perception of the garden's offerings.



Source: Primary Field Survey, 2024

Fig 5: Botanical Garden: Visitor's Satisfaction

A notable 12% of visitors remained neutral, suggesting they neither leaned towards satisfaction nor dissatisfaction. On the flip side, 9% of visitors were somewhat dissatisfied, indicating areas where improvements could be made. Finally, 3% of visitors were mostly dissatisfied, highlighting specific aspects that may need attention to enhance overall visitor experience. These results underscore the importance of continuously evaluating and improving services to meet the diverse expectations of visitors and maintain a high level of satisfaction in the Botanical Garden.

5.2.6 Visitor suggestions for Botanical Garden: Visitor suggestions for the botanical garden span various aspects, including hydration with 18% advocating for more drinking water points. Aesthetic enhancements, like new flower varieties (4%) and increased green plants (12%), aim to beautify the environment. Extended timings (6%) accommodate diverse schedules, while improved washroom cleanliness (23%) prioritizes visitor comfort. Suggestions for a cafeteria (10%) and additional amenities (17%) cater to convenience and recreation, including play areas, water fountains, and safety measures. Implementing these diverse ideas can enrich the botanical garden experience, meeting a broad spectrum of visitor preferences and needs effectively.

6. Conclusion

Botanical gardens hold a multifaceted role in society, encompassing environmental conservation, scientific research, education, and public engagement. Their evolution from medieval origins to contemporary establishments underscores their enduring importance in preserving plant biodiversity and advocating for sustainable practices. The geographical exploration of botanical gardens unveils diverse landscapes, plant collections, and environmental factors, fostering unique ecosystems that bridge the natural world with human society. Public perspectives shed light on the varied motivations and expectations of visitors, highlighting botanical gardens as educational hubs, recreational spaces, and cultural landmarks. By conducting audience research and understanding user perceptions, botanical gardens can enhance visitor experiences, promote sustainability, and contribute positively to societal well-being. The Botanical Garden in Sarangpur, Chandigarh, is meticulously organized to blend functional areas, natural elements, and educational resources, enhancing visitor experiences, promoting environmental awareness, and facilitating research and conservation efforts. The survey conducted at the garden provided insights into visitor demographics, motivations, perceptions, engagement of children, facilities, accessibility, and educational programs. Key findings from the survey include the garden's appeal to a diverse audience, with strong interest from younger adults. Visitors primarily seek enjoyment, natural beauty appreciation, educational opportunities, and family bonding. Suggestions for enhancements include more child-friendly areas, improved facilities, cleanliness, and expanded educational initiatives. Visitor opinions on sustainability practices, interactive elements, and current services varied but generally indicated positive satisfaction levels. Enhancements in amenities, cleanliness, accessibility, and recreational offerings are suggested to improve the overall visitor experience. The survey emphasizes the garden's appeal to a diverse audience and the importance of sustainability and visitor satisfaction. Prioritizing sustainability practices contributes to a positive visitor experience and environmental conservation. Visitor feedback provides valuable insights for ongoing enhancements and strategic planning, ensuring the gardens continued success as a cherished community asset. In conclusion, botanical gardens like the one in Sarangpur, Chandigarh, play vital roles in promoting environmental stewardship, education, research, and public engagement. Their diverse facilities, educational programs, and sustainable practices contribute to a vibrant and enriching experience for visitors, making them invaluable assets for current and future generations.

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