

## **SENSORY GARDENS AS THERAPEUTIC SPACES: DESIGN FOR RECOVERY AND CONTEMPLATION APPROACHES TO CREATING GARDENS FOR PEOPLE WITH SPECIAL NEEDS**

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**Abstract:** *This scientific article is devoted to the study of sensory gardens as therapeutic environments from the perspectives of architecture and landscape design. Within the framework of the research, the principles of forming rehabilitation environments for users with special needs—including individuals with autism spectrum disorders, dementia, and physical disabilities—are analyzed.*

*The relevance of the study is determined by the growing demand for inclusive and sensory-enriched outdoor spaces in modern rehabilitation facilities. The research employs comparative analysis, graphic-analytical methods, and the examination of international case studies to identify the functional zoning, ergonomic parameters, and compositional solutions of sensory gardens.*

*As a result, the key factors influencing users' psycho-emotional state are identified, along with the development of a parametric table outlining recommendations for pathway покрытия (surfacing), plant selection, and the placement of water features.*

*In conclusion, the article presents a conceptual model for the design of sensory gardens and provides practical recommendations for their implementation.*

### **INTRODUCTION**

Relevance. Over the past decade, the functional role of open spaces surrounding healthcare institutions and rehabilitation centers has been reconsidered on a global scale. Unlike traditional landscaping approaches, contemporary architectural practice increasingly calls for the creation of specialized therapeutic landscapes that contribute to human health recovery. In particular, environments designed for individuals with special needs—including people with physical disabilities, neuropsychological disorders, the elderly, and children—must be not only safe and comfortable but also rich in sensory stimuli. In this context, the concept of sensory gardens emerges as a relevant scientific and practical direction. Sensory gardens are specially designed environments that engage all human senses (sight, hearing, smell, touch, and taste), aiming to improve users' cognitive and psycho-emotional well-being.

Problem Statement. Although general principles of healing gardens have been developed in architectural theory, the issues of regulating sensory load and organizing space for contemplation remain insufficiently explored. In particular, individuals with autism spectrum disorders may face the risk of overstimulation, while elderly people

with dementia often experience difficulties with spatial orientation. Therefore, the creation of spatial models that balance stimulation and calming effects through architectural means requires a scientifically grounded approach.

**Research Aim.** The aim of this study is to develop architectural and compositional principles for designing sensory-therapeutic gardens for groups of users with special needs, and to propose a model for their practical implementation.

**Research Objectives:**

1. To analyze and classify the functional and spatial structure of sensory gardens;
2. To determine ergonomic and sensory parameters based on the needs of different user groups;
3. To develop a conceptual design model based on the proposed principles.

**Object of Research.** Open landscape spaces within the territories of rehabilitation institutions and specialized centers.

**Subject of Research.** Architectural and design elements that form the spatial organization of sensory gardens, including their composition and ergonomic characteristics.

**Scientific Novelty.** This study, for the first time, adapts the principle of the “Sensory Opportunity Spectrum” to national architectural practice, providing a parametric justification for the differentiation of spaces into stimulating and calming zones. In addition, ergonomic indicators of plant species and materials suitable for local climatic conditions are systematized.

**Practical Significance.** The results of the research can serve as a practical guide for architects and designers. The developed parametric tables and conceptual schemes are recommended for direct application in the preparation of design documentation for healthcare facilities, boarding schools, and hospice centers.

Zone Name	Level of Sensory Load (1-5)	Main User Group	Architectural Element (Example)	Plant Types
Active Play Zone	2	All users; focus on orientation	Clear signage, transition gates, and tactile maps	Low-maintenance greenery, structured hedges (Boxwood)
Fragrance Garden	5	Children with ASD, ADHD; youth	Musical play equipment, balancing beams, rubberized flooring	Resilient turf, non-toxic shrubs (Willow), flexible grasses
Waterside Area	4	Visually impaired; elderly users	Raised planter beds at waist height, seating alcoves	High-scent herbs (Lavender, Rosemary), Lilacs, Jasmine
Contemplation Garden	3	Users with anxiety or PTSD	Cascading water wall or "bubbling" stone fountains	Water lilies, Papyrus, weeping ornamental trees

Contemplation Garden	1	Elderly users; those needing sensory decompression	High-backed "enveloping" benches, secluded gazebos	Soft-textured plants (Lamb's Ear), Ferns, White Birch
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Figure 1 Functional–Sensory Gradation Parameters of Sensory-Therapeutic Gardens

## METHODS

During the research, comprehensive methods typical of architectural design and landscape architecture were applied.

### 2.1 Comparative Analysis.

At the initial stage, sensory garden projects implemented in Europe, Australia, and CIS countries were analyzed. In particular, the Tobruk Park Sensory Garden (Australia), the proposed hospital sensory garden in Bangladesh, and sensory garden elements of the NIKI Detstva Center in Russia were comparatively studied. The analysis criteria included spatial zoning, width and surface of pathways, plant selection, and the presence of water features.

### 2.2 Graph-Analytical Method.

In order to visualize the functional structure of sensory gardens and identify the relationships between their elements, graph-analytical modeling was conducted. This method made it possible to analyze the spatial arrangement of elements and the trajectories of user movement within the garden.

### 2.3 Case Study.

A sensory-therapeutic garden project developed at the University Clinic in Cluj-Napoca, Romania was examined in depth as a case study. Within this case study, the results of post-occupancy evaluation were analyzed in order to understand users' perceptions and experiences of the space.

### 2.4 Projective Modeling.

Based on the obtained theoretical and empirical data, an original conceptual model was developed by the author. The model includes the following components: an entrance zone, an active sensory zone (for touch and smell), a passive contemplation zone (with water elements and green walls), and a special raised-bed area for therapeutic gardening. During the design process, ergonomic standards (pathway width, slope angles, railing height) and the level of sensory stimulation were taken into account.

Figure 2 Herecomparative Analysis of International Sensory Gardens

Project Name & Location	Year	Location Type	Area (m2)	Primary Sensory Focus	Pathway Width	Special Elements	Level of Inclusivity
Royal Tasmanian Botanical Gardens (AU)	2012	Public / Botanic	~1,200	Touch & Smell	1.8m – 2.4m	Raised herb beds, tactile sandstone walls	High

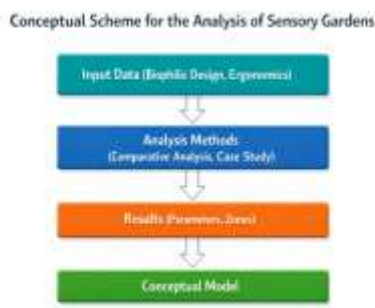


Figure 3. Conceptual Scheme for the Analysis of Sensory Gardenshere

Kalyani Sensory Garden (BD)	2018	Clinical School	/ ~450	Hearing & Touch <sup>1</sup>	1.2m – 1.5m	Bamboo wind chimes, textured sand pits	Medium
Sokolniki Sensory Garden (RU)	2014	Public Park	~800	Smell & Vision	2.0m – 3.0m	Fragrant flower displays, tactile paving	High
Psychiatric Hospital Garden (RO)	2021	Clinical	~300	Hearing & Sight	1.2m	Water fountains, "silent" seating pods	Medium

## RESULTS

As a result of the conducted analyses and modeling, the following key findings were obtained.

### 3.1 Typological Analysis of Sensory Gardens.

Based on the studied international experience, four main types of sensory gardens were identified:

Rehabilitation gardens (located within clinics and intended for targeted therapy);

Inclusive public sensory gardens (open to all citizens and designed considering the needs of people with dementia and autism);

Educational sensory gardens (located within special schools and boarding institutions);

Hospice and palliative care gardens (intended for contemplation and psychological comfort).

Each type differs in terms of its functional zoning, plant assortment, and equipment.

### 3.2 Gradation of Sensory Stimuli.

The analysis showed that the dosage of sensory stimulation is crucial for users with special needs. The spatial organization should follow a gradient from the most stimulating (B1) to the most calming (B13). Based on this gradient, a parametric table was developed (see Figure 1). The table presents the sensory impact levels of garden elements and the corresponding user groups.

### 3.3 Ergonomic and Planning Parameters.

For the main architectural elements of sensory gardens—pathways, rest areas, and planting zones—the following parameters were identified:

Pathway width: Main pathways should be at least 1800 mm wide (to allow two wheelchair users to pass each other), while secondary paths should not be less than 1200 mm.

Pathway surface: Smooth, non-slip materials (such as pressed concrete or rubber tiles) are recommended. Tactile pathways should have differentiated surface textures.

Seating areas: Benches should be placed every 15–20 meters, preferably under a canopy or pergola. The recommended bench height is 450–480 mm, and benches should include armrests.

Plant selection: Non-allergenic plants that are safe for touch (without thorns) and have strong aromas (such as mint, lavender, and rosemary) are prioritized.

### 3.4 Project Model.

Based on the conducted research, a conceptual model of a sensory-therapeutic garden was developed. The model includes three main sectors:

#### Active sector:

This area includes water play elements, raised flower beds, and wall panels with different textures. The sector is designed to stimulate motor activity and active interaction.

#### Transition sector:

A shaded pathway surrounded by strongly aromatic plants. This sector facilitates gradual calming and concentration, allowing users to transition from active engagement to a more relaxed state.

Passive (contemplative) sector:

A space consisting of soft lawns, shaded benches, and areas where the gentle sound of flowing water can be heard. This sector is intended for psychological relaxation and meditative reflection.

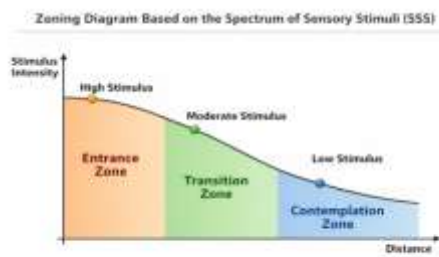


Figure 4 Based on the Spectrum of Sensory

## DISCUSSION

The obtained results confirm the necessity of an interdisciplinary approach in the design of sensory gardens. The analyzed case studies, particularly the experience of Australia, demonstrate the importance of involving users (patients, doctors, and nurses) in the design process.

For instance, during the design of the garden in Ulverstone, artificial lighting fixtures were abandoned based on consultations with patients suffering from dementia, as they complicated spatial orientation. This example demonstrates that design decisions should be based not only on theoretical assumptions but also on empirical evidence.

The results of the study are also consistent with Kellert's principles of biophilic design. Biophilia—the innate human affinity for nature—finds direct expression in sensory gardens. The proposed project in Bangladesh is based precisely on this principle, aiming to integrate the hospital building itself with the surrounding natural environment.

However, our research shows that a purely biophilic approach is not sufficient. For individuals with special needs (particularly children with autism), the cognitive load of the environment plays a crucial role. Excessive diversity of colors and sounds may lead to hyperstimulation. Therefore, the gradient-based zoning proposed in this study provides a way to address this problem through architectural means.

Post-occupancy evaluations conducted in Romania indicate that the most frequently used parts of sensory gardens are the areas around seating spaces and water features. This observation further confirms the importance of emphasizing passive and contemplative zones in the proposed conceptual model.

Limitations of the study. This research is based primarily on theoretical analysis and the study of existing projects. In order to verify the practical effectiveness of the proposed model, experimental implementation in a real environment and long-term monitoring are required. Furthermore, the research highlights the need to develop a catalog of plant species and materials suitable for local climatic conditions, particularly in the context of Uzbekistan.



Figure 5 here Contemplation Zone in a Sensory Garden (Conceptual Visualization CONCLUSION

Sensory gardens should be considered in modern architecture and landscape design not only as decorative spaces but also as functional therapeutic environments. Such spaces, designed for individuals with special needs, contribute to improving their quality of life, accelerating rehabilitation processes, and facilitating social integration.

#### Conclusions

In designing sensory-therapeutic gardens, the main criterion should be the gradation of sensory stimuli, where the spatial organization gradually develops from active (stimulating) zones to passive (calming) zones.

The ergonomics of architectural elements (pathways, benches, railings) must ensure accessibility for all user groups, especially wheelchair users. This requires harmonization between international standards and local regulatory documents.

The selection of plants and materials should consider allergenic potential, tactile characteristics, and maintenance requirements.

#### Practical Recommendations

Before starting the design process, the needs of the target user group (for example, children with autism or elderly people with dementia) should be carefully studied.

The use of water elements (such as fountains and waterfalls) within the garden area should be considered an essential component, as water is one of the most powerful sources of psychological comfort and relaxation.

Regular maintenance and renewal of sensory gardens (for example, replacing seasonal flowers) is an important condition for maintaining their therapeutic effectiveness.

### Future Research Directions

In future studies, it would be advisable to conduct clinical research aimed at quantitatively measuring the impact of sensory gardens on users' health, including indicators such as heart rate and stress hormone levels.

In addition, the development of sensory garden prototypes using virtual reality (VR) technologies and their testing during the design process represents a promising direction for further research.

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