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SUSTAINABLE URBAN PLAYGROUND RESTORATION THROUGH COMMUNITY CO-DESIGN AND EDIBLE PLANTINGS

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Abstract

Urban playgrounds are public spaces with a fundamental role in the growth and development of children, especially in today's times when younger generations are increasingly captivated by modern technologies. However, a worrying phenomenon of their degradation is observed, which affects their usability and sustainability. The presented case study analyzes the restoration of an urban playground through the use of natural materials, fruit trees, and a community co-design approach. The project has as final objectives the optimization of environmental performance and the stimulation of children's well-being through efficient, nature-based, urban design solutions. Based on field observations, the examination of international examples built on the same principles, and the formulation of design solutions, the aim is to highlight the importance of integrating built and vegetal elements that support biodiversity and can represent a catalyst for environmental education. The research illustrates how resilient landscapes are able to contribute to the transformation of urban playgrounds into sustainable environments. The study data add value to the broader debates about implementing participatory ecological design in urban spaces, creating more child-friendly cities, and developing strategic urban planning oriented on the long term.

Key words*: urban green infrastructure, playground restoration, edible landscapes.*

INTRODUCTION

Urban spaces intended for the public play a major role in social interactions and the level of comfort of the inhabitants of an urban center (Cojocariu et al., 2023; Istrate et al., 2025). In this context, playgrounds existing in most neighborhoods in a city become basic elements of the urban structure and involve carefully formulated and applied management measures. Within the urban fabric, these spaces represent indispensable elements that contribute to the physical, cognitive, and social formation of children; however, a significant percentage of them are in a state of progressive decline, both from a functional and identity perspective.

The possibility of benefiting from and constantly using a green space for various activities is repeatedly correlated with benefits for children, such as increased physical activity levels, better understanding and management of the emotional spectrum, and a considerable increase in overall health (Tillmann et al, 2018; McCormick, 2017).

The increasingly accelerated urbanization process and the alarming decrease in biodiversity in urban centers considerably diminish the opportunities that provide contact with the natural environment (Aronson et al, 2017; IPBES, 2019). Also, the amplification of the urban heat island phenomenon directly affects underage users of poorly shaded, or completely unshaded, play spaces, thus manifesting a further increase in the vulnerability of these spaces (Vanos, 2015; Bernardis, 2022). The current state of many playgrounds is largely due to the predominant presence of artificial surfaces and equipment, coupled with the lack of harmonious integration into the ecological structure of the environment, which also contributes to limiting the level of education offered, along with the decrease in initial performance. Therefore, the rehabilitation of these sites needs to be based on ecological interventions oriented towards resilience.

Current urban design strategies increasingly encourage the insertion of nature-based solutions (NBS) to enhance the resilience of the natural environment and increase human well-being. This typology of solutions provides ecosystem services such as microclimate regulation, responsible water management, and biodiversity protection (Raymond et al., 2017; Kabisch et al., 2017; Amisculesei et al., 2022).

At the same time, spending as much time as possible in nature enhances mental and psychological health (Bratman, 2019). In addition to this aspect, more and more recent research on the typology of these solutions demonstrates that an important direction is the integration of fruit species and community farming practices into urban planning, having a major role in strengthening social resilience and food literacy (Säumel et al., 2019; Artmann & Sartison, 2018). An additional benefit is that edible urban landscapes can facilitate community participation in their management, promoting inclusion and social interactions (Gradinariu, 2007; Zlati & Pașcu, 2021).

By applying the aforementioned principles and integrating natural materials and edible plants into play environments, these spaces become landscapes with diverse functionality that contribute to both ecological performance and environmental education. Therefore, the process of restoring urban playgrounds becomes simultaneously an environmental restoration intervention and a pedagogical act aligned with contemporary sustainability directions.

Currently, many studies address the concept of nature-based solutions and the possibilities of their application in urban planning (Negrea, 2011; Frantzeskaki, 2019; Bush & Doyon, 2019; Pașcu, 2021), yet there remains a significant gap in detailed implementation strategies specifically for children's play environments. This paper addresses this gap through a case study focused on the rehabilitation of an urban playground using natural materials, fruit species, and a community co-design approach.

The primary aim of this research is to demonstrate the untapped potential of playgrounds as drivers for environmental restoration and child well-being. To achieve this objective, the study pursues the following specific research objectives:

- to evaluate the effectiveness of nature-based solutions (NBS) in mitigating the urban heat island effect and improving microclimatic comfort within play spaces;
- to design and implement a functional model for an edible urban landscape that integrates fruit species to promote food literacy and biodiversity;
- to establish a set of replicable ecological design principles that transition playgrounds from artificial, high-maintenance structures to resilient, pedagogical natural environments.

MATERIALS AND METHODS

This research is based on a qualitative case study methodology, widely used in the field of landscape design for the analysis of complex interventions. In this case, the restoration of an urban playground is a process in which the effectiveness of solutions varies depending on the context of the site, local environmental conditions, and the needs of the beneficiaries in the area.

The site analyzed is located in the Alexandru cel Bun neighborhood of Iași city, one of the oldest and most populated residential neighborhoods in the urban structure. The development of these residential complexes, primarily a product of the communist era, is distinguished by multi-story apartment buildings organized around shared public spaces and circulation systems (Figure 1). Within these housing models, public areas are crucial in determining the daily quality of life and social dynamics within the communities.

The project was designed using Lumion and SketchUp software, and at the present time the project is in the implementation stage.



Figure 1. Site location and spatial analysis of the surrounding context

To achieve the research objectives, the study employs a mixed-methods approach.

Observational methods include systematic landscape audits and System for Observing Play and Recreation in Communities - SOPARC-based behavioral mapping to quantify user activity. Observations made at the site were used to document the existing conditions and highlight the challenges affecting the functionality of the site. This approach allows the documentation of the transformation process

from a degraded playground to a sustainable intervention.

The physical characteristics of the site were documented, such as the materials used, general location, accessibility to the site, shade conditions, and existing vegetation.

These observations were the basis for the identification of spatial deficiencies and landscape opportunities that can be implemented within the respective framework.

The study adopts a Collaborative Action Research (CAR) model, where the community is not merely a subject of study but a partner in the design process.

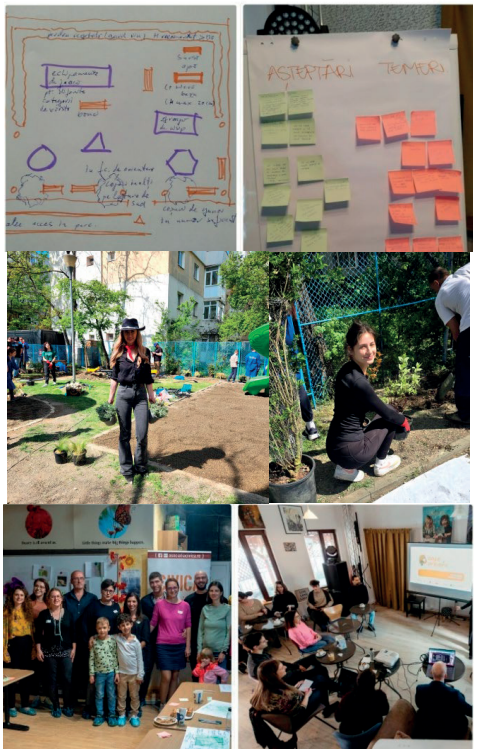

Figure 2. Community engagement activities

The community involvement is facilitated through co-design workshops and photovoice sessions, ensuring a participatory approach to edible landscape planning. Community was present from the first stage of the project by identifying community needs and local identity. Then, through collaborative workshops to select fruit species and the playground layout, involvement in organized community planting days, participants fostered a sense of ownership (Figure 2).

RESULTS AND DISCUSSIONS

In particular, playgrounds within residential neighborhoods are positioned as accessible recreational environments that encourage physical activity, social interaction, and community involvement (Carmona, 2021).

Given that the site is surrounded by apartment buildings on all sides, thereby registering a high degree of urban density, the playground is positioned as the only outdoor recreational element, accessible to children and families living in the immediate vicinity. There were a limited number of children's structures, benches, or areas with vegetation on the playground. The configuration of the space and the materials used, such as plastic or iron, denote outdated design approaches, which were based on standardized equipment and artificial surfaces, such as concrete or rubber tiles (Figure 3). This way of organizing the space establishes a rigidity in the design that considerably reduces children's opportunities for exploration and limits children's acquisition of new experiences or the formation of responsible attitudes.



Figure 3. Assessment of the existing playground conditions

It was observed that one of the factors with a strong emphasis on amplifying environmental discomfort is the presence of parking areas that

border the site on three sides. This immediate proximity to traffic introduces several negative environmental factors, such as increased air pollution, noise pollution, and visual intrusion into a space that in theory is considered safe for children. The dominance of parking facilities at the site boundary induces even more insecurity for users of the space, while simultaneously reducing its ecological quality and limiting opportunities for expanding green infrastructure.

The vegetation species found on the site are few in number and offer limited shade or ecological value. Their absence greatly reduces environmental comfort and the capacity of the space to support biodiversity. Consequently, the playground cannot provide protection against solar radiation, which significantly affects the use of the space, especially in the summer months, the period in which it is assumed to be most used (Figure 4).

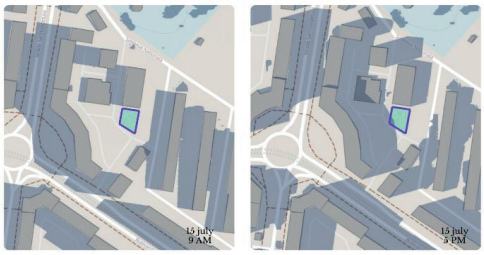

Figure 4. Sunlight and shadow analysis – July 15 (9:00 AM / 5:00 PM)

The analysis of the solar study shows that throughout the day the space is exposed to strong sunlight, and this, together with the predominance of impermeable surfaces, contributes to the excessive accumulation of heat during the summer period. Hard layers absorb and retain solar radiation, creating inadequate thermal conditions for users of the space (Unal et al., 2021; Zhang et al., 2024; https://www.wri.org).

Also, the existing organization of the site does not offer children opportunities for learning based on the environment. The lack of natural materials, direct interaction with various textures and vegetation elements, limits children to learn about seasonal changes, biodiversity, and enrich their sensory experience of textures. Previous research has highlighted the value of introducing natural materials into the design of a playground, describing the numerous benefits of implementing nature-based solutions within them (Vladimir & Cojocariu, 2024; Bernardis, 2024).

All the existing conditions analyzed in the site highlight the urgent need to implement a restoration strategy capable of generating an increase in both the level of environmental performance and the degree of use of the space from a social perspective.

In addition to sustainable design approaches, the project integrates participatory design strategies, focusing on community needs and potential users' proposals for the playground design.

The practice of participatory design is widely used in international urban planning with the aim of creating the most favorable conditions for users of public spaces and encouraging community participation in strategic planning decisions (Innes & Booher, 2010; Vladimir, 2025). Including children in the design process can also contribute to the development of a sense of belonging to both a physical space and a community with shared values and interests (Derr & Tarantini, 2016).

Following the analysis carried out, the study of specialized literature, and the consultation of the population, a concept for the restoration of the site was developed (Figure 5).

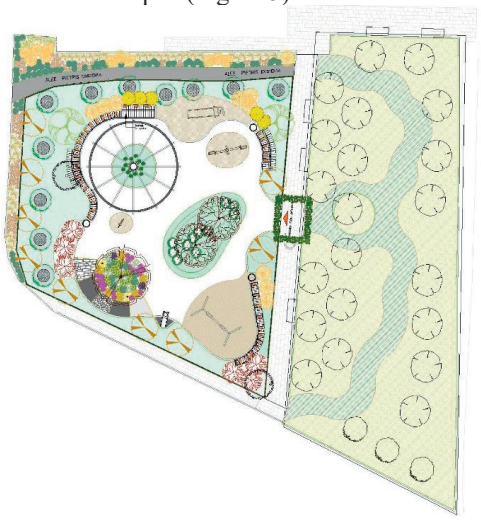

Figure 5. Proposed site redevelopment plan

The proposed design brings with it an improvement of the space from both an ecological and social point of view. It is recommended to introduce new trees to increase the shade area, replace impermeable materials,

and introduce natural materials both in the technical structure of the intended new equipment and as an independent use for free play. In order to expand the green area of the playground, the original site was expanded by incorporating the adjacent space located on the eastern side of the playground. This area was previously an undeveloped land area, used informally as a parking lot. Adding this area to the total area allows for the expansion of the vegetated area and the implementation of new interventions. A solution to the problem of surrounding the site with parking spaces was the introduction of a buffer zone of vegetation along the southwestern edge of the space (Figure 6). This green barrier will function as a protective space both visually, acoustically, and ecologically.



Figure 6. Proposed green barrier

On the northern side of the site, where there was previously an informal stone alley, the concrete and compacted surfaces were removed, and the soil was reconditioned to allow the creation of new vegetated areas (Figure 7).



Figure 7. Proposed new vegetated areas

The new modifications reorganize the space so that new distinct areas will appear, while connected to the utilitarian function of the space, which will encourage children to dynamic play, movement, and socialization.

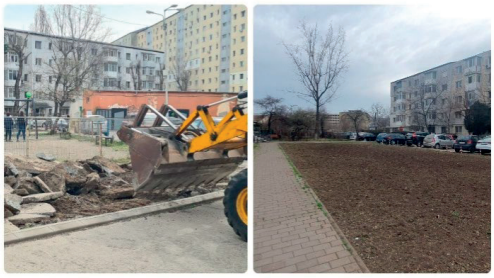

Figure 8. Soil rehabilitation measures

An important aspect of the planning was the inclusion of edible species. Previous research has concluded that their introduction into the landscape makes a significant contribution to improving knowledge about the environment, biodiversity, and responsibility. It also favors social inclusion and encourages the community to take part in management actions (Zlati et al, 2022). Such fruit species as *Corylus avellana*, *Crataegus monogyna,* and *Cornus mas*, proposed in the planning (Figure 9), can stimulate the population's interest in local food and the integration of species with potential, but little valued in their own consumption (Zlati et al, 2024).



Figure 9. Edible plant species in the landscape design

In addition to all the climatic benefits, this plant selection contributes to supporting pollinators, being also an organic way for children to learn about natural processes and about the creatures that can exist in the urban fauna. The integration of this plant typology is an approach also studied in the concept of peri-urban gardens that combine decorative and medicinal plant species

(Hangan et al., 2020) In the current project, this principle was applied by creating a small community garden with diverse plants selected for texture, shape, or scent. A visually attractive and ecologically functional composition was formed from species such as *Stachys lanata*, *Santolina chamaecyparissus*, *Rudbeckia hirta*, *Lavandula angustifolia,* and *Dianthus* spp.



Figure 10. Community garden section

The community garden element fits into larger strategies for reconfiguring degraded spaces. Similar methods have been used in other projects that aimed to revitalize public places by integrating a garden or areas that contribute to increasing the standard of living (Pașcu et al., 2019). In this case, similar principles are applied by incorporating landscape elements of plant infrastructure. The proposed intervention includes the use of the *Salix alba* species to create a natural fencing structure (Figure 11) and elements such as pergolas (Figure 12) or play structures.



Figure 11. Natural boundaries from *Salix* species

These structures fit into the general environment, not acting as rigid built boundaries.



Figure 12. Living plant structures

Regarding the materials used – wood is the main one, used for the equipment proposed on the site as well as for benches or other relaxation spaces (Figure 13).



Figure 13. Wood as the main design material

It was chosen for its ecological properties, its ability to harmonize with the natural setting, and the tactile sensory experiences it offers.

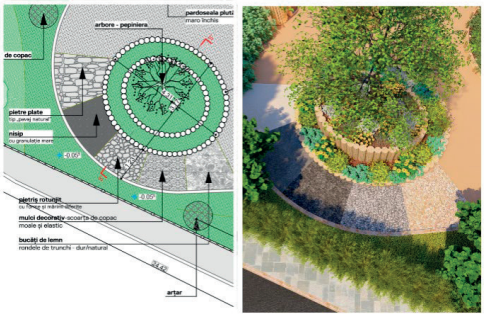

Figure 14. The sensory path

In addition to these wooden structures, it is proposed to arrange a small sensory trail designed to stimulate the tactile perception of children (Figure 14).
Materials such as – gravel of different sizes, sand, mulch will give children the opportunity to experience different textures, encouraging them to explore.
The first phase of the project began in the spring of 2025, through landscaping interventions that aimed to prepare the space and involve the community. These included planting tree species and installing furniture. The planting activities were organized by engaging several social actors, both community members and public figures, which aimed to develop a sense of shared responsibility for the future playground (Figure 15). Other initiatives and public workshops followed throughout the year, involving both adults and children from the community in the process of transforming the site into a playground that supports education and social interaction in the neighborhood.



Figure 15. Community engagement activities

It should be noted that the final implementation has not yet been completed. The second phase of the project, scheduled for 2026, will consist of the actual arrangement of the playground area, including equipment and related vegetation. Therefore, the study in question presents the initial steps of the project, the design and the conceptual solution.
Although the project and the redevelopment proposal have considerable potential, a number of limitations should be mentioned regarding the implementation process. Urban regeneration projects related to public space can often be delayed due to financing considerations, certain administrative procedures and regulations, or the lack of proper community involvement.

CONCLUSIONS

The study analyzed an urban playground, the rehabilitation of which was based on the integration of nature-based solutions and the community co-design approach.
The methods and actions proposed for implementation aimed to improve the challenges found on the site by introducing natural materials, appropriate vegetation, and edible species, transforming the space into an inviting one for users and offering multiple functions.
A significant component was the involvement of the community from the early consultation phases, thereby promoting a sense of belonging to the space and the responsibility assumed for its management.
The project presents opportunities to be replicated in other neighborhoods of the city, with a similar residential fabric and comparable challenges. In other neighborhoods, there are also aging, unkempt, and worn-out playground structures with limited green spaces and non-existent comfort.
Focusing restoration efforts on these spaces intended for children can significantly contribute to the development of more resilient and child-friendly cities.

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