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THE IMPORTANCE OF GREEN SPACES AND SOIL QUALITY IN THE URBAN ECOSYSTEM – A PRELIMINARY CASE STUDY: CLUJ-NAPOCA MUNICIPALITY

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ABSTRACT. The rapid expansion of urban spaces in Romania's major cities has led to various problems such as land-use changes, new patterns of regional attractiveness, landscape fragmentation, environmental impacts, and the depletion of natural resources like natural land and local native soils. This has resulted in an important change in the dynamics, quality, and quantity of urban green spaces, ecosystems, and local native soils. The importance of green spaces and soil quality in the urban ecosystem is significant for various environmental, social, and economic reasons. To determine whether the urban ecosystem is green and friendly, we conducted a preliminary study to quantify the extent and quality of green spaces in Cluj-Napoca. We also compared this data with various European data. Additionally, we preliminary analysed the soil quality in Cluj-Napoca's two major urban parks to determine whether urbanization has a positive or negative impact on soil quality.

Key words: *Urban parks, soil quality, space consumption, Cluj-Napoca city.*

INTRODUCTION

Urbanization is the process of rapid population growth and infrastructure development in urban areas. This process presents a dual challenge: the need for urban expansion and the preservation of environmental quality. In large and emergent Romanian cities, it is of utmost importance to maintain green spaces and soil quality. These elements play a pivotal role in balancing urban development with environmental sustainability.

Green spaces, encompassing parks, gardens, and urban forests, serve as crucial components of the urban ecosystem. Beyond their aesthetic appeal, they contribute to the physical and mental well-being of urban dwellers, providing havens for recreation, relaxation, and community engagement. Furthermore, green spaces and native soil act as vital carbon sinks, mitigating the impacts of climate change by sequestering carbon dioxide and promoting biodiversity within urban landscapes.

Within the urban ecosystem, the native soil serves as the foundational substrate and its quality is a key determinant of the health and resilience of green spaces. The impacts of urbanization, including pollution, compaction, and altered nutrient cycles, pose challenges to soil health. Understanding and managing soil quality in urban areas are essential for fostering sustainable development, ensuring the longevity of green spaces, and safeguarding the overall urban ecosystem.

This preliminary case study focuses on the Cluj-Napoca Municipality, a major urban centre in Romania. As fast urbanization continues to shape the city's landscape, it becomes imperative to assess the state of green spaces and soil quality within its boundaries. Through this preliminary case study, we aim to explore the interplay between urban development and environmental quality, shedding light on the importance of preserving green spaces and maintaining soil quality as integral components of a resilient and sustainable urban ecosystem.

Population growth and urban space consumption

The reality of our days reveals a continuous expansion of cities, especially of metropolitan areas, towards regions that were not urbanized until recently. More confusion arises from the fact that until 30 years ago these bordering spaces were unbuildable or non-urbanizable – such as river meadows, steep

or slanting slopes, orchards, areas with associated forest vegetation, areas isolated from the *build-up areas ABC* - networks of water-sewage, electricity, and gas (Baciu et al, 2021).

An architectural and administrative uncertainty between urban and rural areas was gradually created, with the emergence of the metropolitan system. Local decision-makers and planning committees are tasked with the challenge of stopping uncontrolled urban development. Despite efforts to mitigate environmental harm (the consumption of agricultural land, soil and green spaces), the influence of real estate interests remains overpowering.

By introducing various agricultural lands into the inner city, which were previously owned by the people, it was anticipated that the economic output of the land would increase by 100 times. This phenomenon has made a lot of people rich over the last 20 years without creating any added value (Bienala Națională de Arhitectură, 2023; figure 1).

The expansion of the inner city can result in the poor functioning of the entire administration system of Cluj-Napoca Municipality (as shown in figure 1). In addition, it can cause blockages, and congestion, and put stress on the environment and human health. This phenomenon is known as urban stress which is subtle yet damaging.

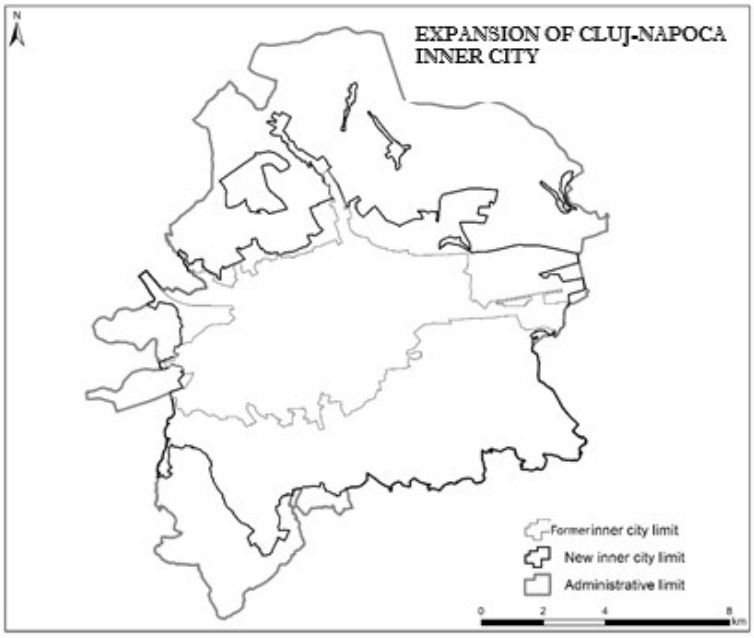

Fig. 1. *Expansion of Cluj-Napoca inner city between 2000 and 2023*

The presence of this reality can be observed in major cities and metropolitan regions, which experience both temporary and permanent population and labour force dynamics. The current evolution of the big cities, presenting a permanent attraction and thus, an overpopulation process, ultimately justifies the expansion of the inner city and the consumption of the natural space (Raffestin, 2012). According to all urban planning theories, we need a functional city with shorter distances and efficient land use, rather than a sprawling city that consumes space and creates suburbs (Gehl, 2012).

The explosive growth of the population in the first metropolitan ring is the most significant feature of the definitive change in agricultural clusters (Baciu et al, 2018, 2021). The population of the area has increased due to immigration from various parts of the country, making it a diverse and heterogeneous community. Florești is a good example of this, with its population growing from 7,470 inhabitants in 2002 to 46,535 inhabitants, a staggering increase of over 523% (as shown in table 1 and figure 2). The commune is currently the most densely populated rural settlement in Romania, and it is extensively studied from a socio-economic perspective.

Table 1. *The evolution of population between 2002 and 2022 within the communes in the vicinity of Cluj-Napoca*

Nr. Crt.	Communes	Inh. 2002	Inh. 2011	Inh. 2022
1	**Apahida**	8785	10685	15391
2	**Baciu**	8139	10317	12983
3	**Chinteni**	2786	3065	3717
4	**Feleacu**	3810	3923	4409
5	**Floresti**	7470	22813	46535
6	**Gilău**	7861	8300	9112

The period from 2002 to 2020 was characterized by a significant change in land usage in the first ring of the Cluj-Napoca metropolitan area. This change was conduct to an increase in non-agricultural land surface in most of these administrative units. The rise in non-agricultural land surface

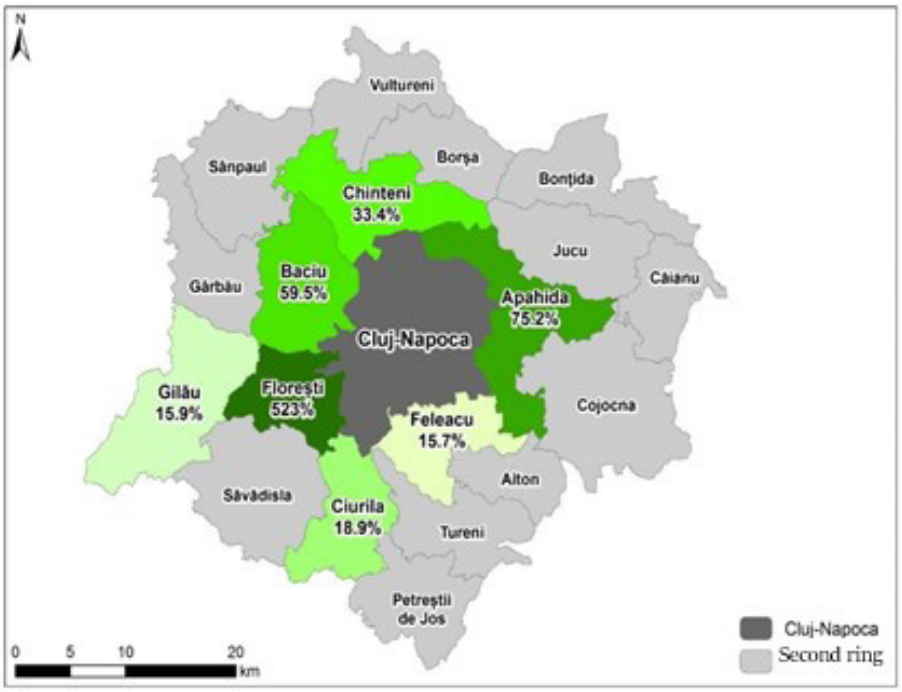

Fig. 2. *Population evolution (per percent) in the first ring of metropolitan area Cluj from 2002 to 2022 (adapted from Baciu et al., 2021)*

was a consequence of the pressure from real estate investors on local decision-makers to release land in built-up areas. The most affected communes were Florești, which experienced a 70% increase in urbanization, Chinteni, which saw a boom in residential real estate investment starting in 2011-2012, and Feleacu, which recorded a 20% increase due to new infrastructure projects and the real estate trend near the commune center. The local policymakers have a friendly approach towards real estate investors. The new General Urban Plan of Chinteni commune, which is yet to be approved, proposes a generous surface area of 3685 Ha for the built-up area. If approved, this would be the most significant urban growth in the metropolitan communes since 1990. Between 2002 and 2020, the non-agricultural land growth was 16.7% (Baciu et al., 2021; table 2, and figure 3).

Table 2. *The evolution of agricultural and non-agricultural land between 2002 and 2022*

Nr. Crt.	Communes	S. total (Ha)	Agric. 2002 (Ha)	Agric. 2022 (Ha)	Non Agric. 2002 (Ha)	Non Agric. 2022 (Ha)	Difference 2002-2020 Non-agriculture (Ha)	Difference 2002-2022 Non-agriculture (%)
1	**Apahida**	**10602**	9102	**9396**	1250	**1206**	**-44**	**-3.5**
2	**Baciu**	**8751**	5890	**5559**	2724	**2827**	**103**	**3.8**
3	**Chinteni**	**9651**	7455	**7242**	2064	**2409**	**345**	**16.7**
4	**Feleacu**	**6196**	4094	**3724**	2059	**2472**	**413**	**20.1**
5	**Florești**	**6074**	4397	**4129**	1141	**1945**	**804**	**70.5**
6	**Gilău**	**11682**	3898	**3740**	7756	**7840**	**84**	**1.1**

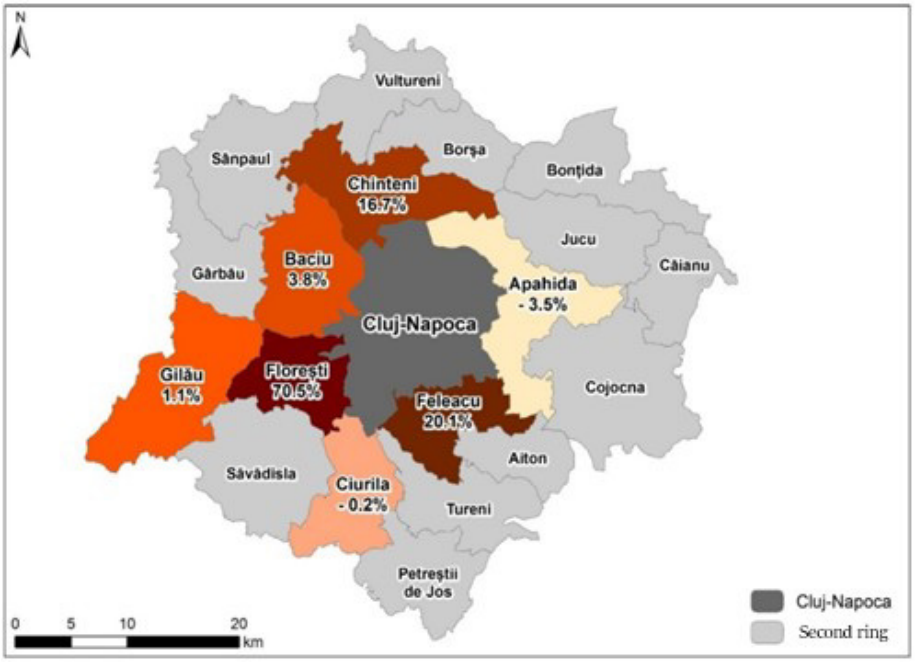

Fig. 3. *The evolution of non-agricultural land (per percent) in the first ring of the Cluj metropolitan area from 2002 to 2022 (adapted from Baciu et al., 2021)*

The importance, distribution and quality of urban parks

Urban parks and ecosystems play a crucial role in mitigating climate change and reducing the heat island effect. The haphazard construction of cities, along with industrial gas and car emissions, is causing urban heat islands and often, fog within the urban spaces. Studies conducted in urban areas have revealed that green spaces play an important role in their capacity to sequester carbon dioxide. In fact, in cities like Mexico City, green areas can sequester up to 1.4% of carbon dioxide emissions, while in Vancouver, this figure goes up to 1.7%. This is more than what human activities produce (Tan Yok et al., 2020). One positive aspect of urban air is its ability to ventilate, reducing the urban heat island effect. While it is widely accepted that improving green spaces leads to ecological and social benefits, their fragmentation or disappearance remains an ongoing concern (Florență, 2022). Cities benefit from a variety of green spaces, including natural spaces like cemeteries, grassy roundabouts, and even parking lots. These spaces can easily contribute to improving statistical data in many studies.

Urban development in the Cluj-Napoca Municipality has brought about significant transformations in both native urban soil and green spaces, marking a complex interplay between human infrastructure and the natural environment. Urban parks are the largest green spaces that can be associated with nature. According to Iliescu's theory (2003), a park must occupy an area of more than 20 hectares to be considered an urban park. Also, the weight of the component elements must be distributed as follows: - planted and grassed areas 66-77%; alleys 10-12%; parts of water 5-10%; sports fields 5-8%; constructions 3-4% (Florincescu, 1999; Iliescu, 2003). In reality, urban planning and landscape aesthetics greatly combine these percentages. For example, the Central Park of the Cluj-Napoca municipality totals 13.6 Ha (*Parcul Central Cluj - Obiective Turistice, Cluj.com, 2019*), with 8.9 Ha of green spaces (planted and grassed spaces), which means 65%. The central body of water (Lake Chios) represents 1.1 Ha (i.e. 8%). Instead, the alleys cover 2.9 Ha, and together with the gutters occupy around 3 Ha. Thus, pedestrian paths consume 21% of the park's surface, because they are also dedicated to green mobility (bicycles). Constructions occupy 0.2 Ha - 1.4%, children's playground and sports activities areas take up to 0.07 Ha - 0.5% (according to *Spații verzi; Cluj-Napoca, 2023*), being far from the standards set out by Florincescu (1999) and Iliescu (2003).

To summarize, Central Park is mostly covered by trees and grass, followed by alleys, water, sports areas, hedges, and constructions, as shown in figure 4. It is worth noting that particular attention is given to pedestrians,

which is a common trend throughout the city center. In several locations, alleys are used as a means of accessing parking or as a pathway for cyclists and pedestrians (Machado-León, 2020).

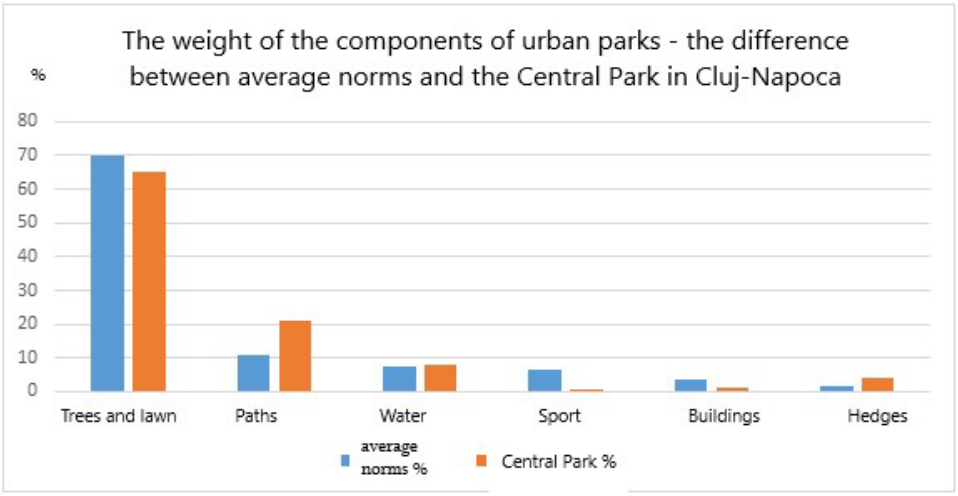

Fig. 4. *The weight of the component elements of urban parks (comparison between average norms and Central Park in Cluj-Napoca)*

The distribution of urban parks around the city is uneven, which poses a problem in ensuring equitable access to public green spaces for residents (see figure 5). Urban parks often feature outdated landscape designs that have been in place for more than 40 years. However, some newly developed or renovated residential areas, such as those located on the eastern side of Cluj-Napoca city, boast modern urban parks (Gheorgheni – Iulius Mall or Pădurea Clujenilor Park).

It is important to note that not all urban parks in Cluj, such as the Botanical Garden, Tetarom Park, or Parcul Sportiv, have the same accessibility or open park character as Central Park. Therefore, the Central Park model cannot be generalized to all urban parks in the city. Cluj has a total of 16 urban parks, while Timișoara has 23, Iași has 12, and Bucharest has 59. Cluj-Napoca Municipality, with 114 hectares, has the highest ratio between total population and parks surface among the larger cities in Romania, with 3.57 square meters per inhabitant. This is compared to Timișoara's 2.58 square meters per inhabitant, Iasi's 2.26 square meters per inhabitant, and similar to Bucharest's 3.68 square meters per inhabitant, which has urban parks covering 776 hectares (Baza de date urbane – Citadini, 2021).

Fig. 5. *The uneven distribution of urban parks in Cluj-Napoca (Source: Google Earth, 2023)*

From a different perspective, the situation of green spaces can be seen as a much broader and more generous category. Green spaces are not just limited to parks and gardens, but also encompass all natural urban elements, regardless of their size or location. This expanded acceptation recognizes the inherent value of various features that contribute to urban biodiversity, environmental sustainability, and overall human well-being. These spaces are divided into two categories:

1. Green spaces within localities, including parks, gardens, squares, green strips, street alignments of trees, plantations around public facilities, landscaping in the premises of institutions, zoos, botanical gardens, plantations related to cemeteries, flower plantation bases, arboriculture, and other plantations (Florență 2022; Iliescu, 2003).

2. The green spaces outside the localities serve as recreational areas and can include forest parks, recreational forests, plantations along the transportation routes, and protective plantations. Some other green spaces such as tree nurseries and research institutions' green areas can also be found outside the localities. In Romania, the global indices for inner-city green spaces range between 9-26 sqm/inh (Iliescu, 2003; table 3).

Green spaces and their native soils are essential components of the Cluj-Napoca Municipality, both within and outside of the urban ecosystem. Within the urban ecosystem, they play a crucial role in ensuring environmental resilience, supporting biodiversity, regulating microclimates, and providing recreational and social spaces. Beyond the urban ecosystem, they are important for connecting to surrounding areas, improving water quality, preserving cultural and historical significance, and mitigating the impact on the local climate.

Table 3. *Norms of green spaces (according to Iliescu, 2003)*

Norms for green spaces/inh in rural and urban areas		
Type of area	Number of inhabitants	Index green spaces/inh (sqm/inh)
Rural areas	5,000 - 10,000	5 -7
	10,000 -20,000	8 - 10
Urban areas	Under 20,000	9 - 13
	20,000 - 50,000	12 - 16
	50,000 - 100,000	14 -20
	Over 100,000	17 - 26

Currently, these norms fall short of the green space norms set by the European Union, which suggest a minimum of 30 sqm/inh. Furthermore, these norms are well below the UN's standards for large cities, which recommend a minimum of 45 sqm/inh (according to *UN-Habitat - Module 6, 2020*). In reality, many major European cities fail to meet minimum space requirements per inhabitant. For example, Stockholm has 41.6 sqm/inh, Prague has 35.7 sqm/inh, Dublin has 32.9 sqm/inh, London has 19.2 sqm/inh, Paris has 14.6 sqm/inh, Sofia has 14.4 sqm/inh, Lisbon has 9.6 sqm/inh, and Bucharest has 7.1 sqm/inh (*The European Commission, ec.europa.eu, 2021*).

In national statistics, there is a term called "public recreation space" which refers to the number of square meters of public outdoor recreation space per capita. These figures differ from European statistics. As of 2021, Bucharest has 21.35 sqm/inh, Cluj-Napoca has 25.39 sqm/inh, Timișoara has 15.74 sqm/inh, and Iași has 18.64 sqm/inh (*INS TEMPO Online, 2022*; *Baza de date urbane - Citadini, 2021*). It's important to note that when calculating certain indicators, such as population, the results can differ depending on whether you're looking at the stable population or the resident population.

In 2021, Cluj-Napoca Municipality had a stable population of 320,547 inhabitants, but the resident population was only 286,598. This means that the indicator calculated for the resident population of Cluj-Napoca is expected to significantly improve, reaching 28.4 square meters per person. If we take into account the continuous growth of the inner city and the addition of green spaces, such as the southeast area of the municipality shown in figure 1, this figure could be further improved to 30 square meters per person.

Cluj-Napoca is also known for its commitment to green initiatives. The city is part of the one hundred climate-neutral cities initiative in Europe, which aims to achieve climate neutrality by 2030. In line with this goal, the city administration has pledged to plant 100,000 mature trees by 2030, with 20,000 of them planted along the new bank of Someșul Mic River. Additionally, two hectares of green meadow space will be allocated to this initiative. These efforts are part of the city's plan to become one of the one hundred pioneering cities in the world that aim to reduce greenhouse gas emissions generated by local government management to zero (European Commission's Directorate-General for Research and Innovation in 2022).

The analysis of some soil quality indicators in urban parks

Analysing soil quality indicators in urban parks is crucial for assessing the impact of urbanization on the environment. Urbanization can introduce various stressors to soil, such as pollution, compaction, and altered nutrient cycles. To assess the quality of soil in two of Cluj-Napoca's main parks - Central Park (CP) and Sports Park (SP) - we conducted soil analysis, focusing on bulk density, soil organic carbon, and texture. We collected five samples from each park (1-5 from CP and 6-10 from SP) and recorded the values in table 4. The samples were taken from 10 different locations within the parks, including grassy areas and areas with flowering plants, at a depth of 0-20 cm.

To measure the soil bulk density, we used a metal ring with a known volume. We first dried the soil samples for 24 hours at 105°C, then weighed them to obtain their total dry mass. We then calculated the bulk density by dividing the dry mass by the volume. In CP, the mean value of this parameter was 1.13 g/cm^3, while in SP it was 1.04 g/cm^3.

According to the USDA (1987), for optimal plant growth, the soil bulk density should not exceed 1.20 g/cm3. None of the soil samples analysed had a bulk density greater than this limit. Thus, the density of soil in Sports Park ranges from 1.07 to 1.20 g/cm^3, while it ranges between 0.92 to 1.21 g/cm^3 in Central Park. We have compared the results we obtained with the standard

for soils in the Cluj area, which was established in an experimental polygon of the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca (USAMV) located in the eastern part of the city (Hoban, 2008).

According to Hoban's (2008) analysis, the average density of the soil samples in the experimental area ranged between 1.14 and 1.25 g/cm3. This indicates that the soils in the central urban parks are not compacted and have favourable physical-hydraulic properties, which makes them suitable for supporting urban floral elements.

Soil organic carbon (SOC) is an important factor that can influence other soil properties and is considered one of the most important soil quality indicators (Wiesmeier et al. 2019; Zhao et al. 2014; Kumar and Hundal, 2016).

Urban green spaces and parks with vegetation have a higher probability of accumulating soil organic carbon (SOC) compared to non-vegetated soils (Cambou et al. 2012; Bae and Ryu, 2020). Some studies suggest that the type of vegetation and tree species can impact SOC due to differences in litter decomposition and root production (Takahashi et al. 2008; Lu et al. 2021).

Table 4. *The values of soil parameters in urban parks*

Samples	Texture	Bulk density (g/cm^3)	SOC (g/cm^2)	Clay (%)
1	**Sandy clay**	1.19	0.43	30.63
2	**Clayey sand**	1.19	0.28	29.03
3	**Sandy clay**	1.07	0.25	31.59
4	**Sandy clay**	1.12	0.26	39.59
5	**Sandy clay**	1.08	0.38	32.55
6	**Clayey sand**	1.20	0.33	20.40
7	**Clayey sand**	1.05	0.14	14.01
8	**Clayey sand**	1.16	0.35	20.40
9	**Clayey sand with gravel**	0.91	0.30	16.24
10	**Clayey sand**	0.92	0.47	19.76

*Gray – soil samples from CP and white- soil samples from SP

We analysed soil organic carbon using the Loss on Ignition method. Soil samples collected from SP have values ranging from 0.14 to 0.47 g/cm^2.

The low values can be explained by continuous urbanization, which induces soil degradation, and soil sealing, and depletes the soil's organic carbon pools (as suggested by Raciti et al. 2012; Wei et al. 2014; Lu et al. 2020). Another critical factor influencing the SOC content is the warm temperature (Davidson and Janssens, 2006) which accelerates the microbially-mediated mineralization rate (Liu et al., 2019) and soil respiration rates (Shi et al., 2020). It is well known that the rapid urbanization process induces a dramatic change in atmosphere structure near the surface (Estoque et al., 2017) and in thermal properties of urban land (Portela et al., 2020; Yu et al., 2020).

CONCLUSIONS

Fast urbanization poses several challenges, often associated with the modernization of socioeconomic life and the regional appeal of large Romanian cities. While local decision-makers strive to control limits on urban growth that do not disrupt the daily routines of residents, architects, and real estate firms seek to accelerate the rate of urban growth beyond city limits and into the metropolitan area. This is also happening in Cluj-Napoca, where many urban issues are arising due to the consumption of natural space and agricultural land. The main cause is urbanization, characterized by increased human activity, infrastructure development, and fast changes in land use, which can have significant consequences for soil health and the quality of green spaces. For instance, new residential areas are built on peripheral and agricultural land and native soils and there exists a permanent conflict between expanding urban fabric and preserving green space and fertile soil.

Within this context, we preliminary evaluated soil quality in two major urban parks in Cluj-Napoca City (Central Park and Sports Park). An analysis of soil samples has revealed a correlation between analysed indicators of soil quality and the process of urbanization. The decrease in soil organic carbon and an increase in soil density are real outcomes of the adverse impact of urbanization on local environmental factors.

This study will continue with the analysis of soil quality in other green spaces located within urban and periurban spaces of the city to assess the pressure of urbanization on these environmental components. By systematically assessing these soil quality indicators, we can gain valuable insights into the impact of urbanization on urban park soils and implement targeted strategies for sustainable soil management and environmental planning in urban and periurban areas of Cluj-Napoca City.

REFERENCES

Baciu N., Roșian G., Muntean O.L., Măcicășan V., Arghiuș V., Mihăiescu R., 2018, The current problems of urban development in Cluj Metropolitan Area. *Studia Universitatis Babeș-Bolyai, Ambientum*, **2**, pp. 5-13, DOI:10.24193/subbambientum.2018.2.01.

Baciu N., Roșian, G., Muntean O.L., Măcicășan V., Arghiuș V., Stanescu C., 2021, The Evolution of Rural Clusters within Cluj Metropolitan Area. *Studia Universitatis Babeș-Bolyai, Ambientum*, **2**, pp. 5-15, DOI: 10.24193/subbambientum.2020.2.01

Baza de date urbane – Citadini, 2021, https://citadini.ro/baza-de-date-urbane/, accessed on 26.09.2023.

Bienala Națională de Arhitectură, 2023, https://www.uar-bna.ro/, accessed 12.01.2024

European Commission, Directorate-General for Research and Innovation, EU missions – 100 climate-neutral and smart cities, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2777/191876, accessed on 27.09.2023.

Florență V., 2022, Cartarea funcțională a spațiilor verzi din ecosistemul urban Bălți. Journal of Botany, XIV, **1** (24), pp. 71-79.

Florincescu A., 1999, Arhitectura peisajului, Ed. Divya, Cluj-Napoca, 200 p., ISBN/ COD: 973-96789-8-X.

Gehl J., 2012, Orașe pentru oameni, Igloomedia, București, 269 p.

Google Earth, accessed on 29.10.2023.

Hoban A., 2008, Aspecte privind indicii hidro-fizici – densitatea aparentă a solului în solarul experimental din Someșeni, Cluj-Napoca. Agricultura - Știință și Practică, **65** (1-2), pp. 49-52, DOI: https://doi.org/10.15835/arspa.v65i1-2.2788.

Iliescu A.-F., 2003, Arhitectură peisageră, Ed. Ceres, Bucureşti, 300 p.

INSSE TEMPO Online, 2022, http://statistici.insse.ro:8077/tempo-online/, accessed on 25.09.2023.

JRC Publications Repository, 2023, https://ec.europa.eu/jrc/en/publication/enhancing-resilience-urban-ecosystems-through-green-infrastructure-enroute, accessed on 6.07.2023.

Kumar K., Hundal L. S., 2016, Soil in the City: Sustainably Improving Urban Soils. Journal of Environmental Quality, **45** (1), pp. 2-8, DOI: 10.2134/jeq2015.11.0589

Machado-León J.L., Girón-Valderrama G del C., Goodchild A., 2020, Bringing alleys to light: An urban freight infrastructure viewpoint. Elsevier, **105**, pp. 1-13, DOI.org/10.1016/j.cities.2020.102847.

Parcul Central Cluj - Obiective Turistice, 2019, https://cluj.com/locatii/parcul-central-cluj/ Mai 2019, accessed on 30.10.2023.

Raffestin C., Butler S., 2012, Space, Territory and Territoriality. Environment and Planning, **30,** (1), pp.121-141, DOI: 10.1068/d21311.

Spații verzi - Cluj-Napoca, 2023, https://primariaclujnapoca.ro/spatii-verzi/, accessed on 30.10.2023.

Tan Yok P., Zhang J., Masoudi M., Alemu J.B, Edwards P.J., Grêt-Regamey A., Richards D.R., Saunders J., Song X.P., Wong L. W., 2020, A conceptual framework to untangle the concept of urban ecosystem services. Landscape and Urban Planning, **200**, pp. 2-11, DOI: 10.1016/j.landurbplan.2020.103837.

UN-Habitat, 2020, Module 6, Public space, Nairobi.