

PLANNING AND LANDSCAPING THE MAIN ECOSYSTEMS IN CRAIOVA MUNICIPALITY

AMENAJAREA PRINCIPALELOR ECOSISTEME DIN MUNICIPIUL CRAIOVA

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Abstract: The importance of this study of landscape architecture results from the fact that it classifies the landscaped ecosystems on the territory of Craiova, describes the main parks and gardens within the city perimeter (both in terms of spatial characteristics and evolution over time) and emphasizes their complex importance (under ecological, sanitary, aesthetic, educational and spatial planning report). Emphasizing the need to protect and extend the areas belonging to landscaped ecosystems, this paper identifies and proposes several directions of action in this regard: proper maintenance of parks and gardens, both in terms of diversity and the richness of the current floristic fund, as well as in terms of the existing endowments; integral arrangement of Craiovița and Comițoiu parks as rest and relaxation spaces (in this sense, the transformation of Lake Craiovița into a real recreational area and for the practice of water sports is of special importance); the extension of the surfaces owned by the arranged ecosystems by transforming into squares or public gardens some vacant lands from the new neighbourhoods; improving the degree of arrangement of the parks and gardens of Craiova; restoration of street alignments damaged over time and their development by arranging arteries without such alignments; increasing the area owned by the species of trees and shrubs that are most indicated in the ecological conditions of Craiova, taking into account the current climatic trends and the possibilities of diminishing their effects; carrying out actions to raise awareness of the role that the population can play in protecting and enlarging the areas of landscaped ecosystems. In conclusion, we express our hope that this work will be a useful tool in the future management of the landscaped ecosystems in Craiova.

Key-words: *landscaped ecosystems, parks and gardens, ecological conditions, Craiova.*

Cuvinte cheie: *ecosisteme amenajate, parcuri și grădini, condiții ecologice, Craiova.*

I. INTRODUCTION

Craiova's gardens and parks have been the object of research, sometimes even the object of creation for famous specialists in landscape architecture, horticulture and urbanism.

Thus, in 1904, Edouard Redont, the specialist who made up the plans for Romanescu Park, who supervised its planning and landscaping works, published his famous work: «Ville de Craiova. Histoire descriptive des embellissements et

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création des promenades, parcs, squares, boulevards, avenues, jardins et voies publiques, plantés ou décorés par E. Redont» (n.t. «City of Craiova. Descriptive history of embellishments and creation of walks, parks, squares, boulevards, avenues, gardens and public roads, planted or decorated by E. Redont»).

During the interwar period, important scientific research concerning the subject of Craiova's parks and gardens appeared in "Arhivele Olteniei" scientific journal (n.t. "the Archives of Oltenia"). In this sense, we mention the works of Raul Călinescu - "Lunca oraşului Craiova" in no. 56/1923 (n.t. "Craiova's meadow"), Charles Laugier - "Igienă Craiovei" in no. 27/1926 (n.t. "Hygiene of Craiova") and Nicolae Gh. Dinculescu - "Grădini publice în Craiova" in no. 53/1931 (n.t. "Public gardens in Craiova"). For the same period, it is worth mentioning the works of D.E. Petrescu - "Un splendid colț din România Mare" (n.t. "A splendid corner of Greater Romania") and T. Rădulescu's "Parcuri și grădini" (n.t. "Parks and gardens"), the former published in 1932.

After the Second World War, Craiova's parks and gardens continued to be of major interest to specialists. In 1958, Marcus Rică published the work entitled "Parcuri și grădini din România" (nt. "Parks and Gardens in Romania") and in 1964, Ion Firu printed the work entitled "Craiova-ghid istoric" (n.t. "Craiova-a historical guide").

More recently, D. Cârțu and Mariana Cârțu published a series of studies and researches regarding Parcul Poporului ("the Park of the People" – former socialist name of Romanescu Park). The same subject is addressed by F. Firan in a paper entitled "Parcul Poporului din Craiova" (n.t. "The Park of the People in Craiova"). In 1982, Mircea Pospai refers to Craiova's gardens and parks in a book entitled "Memoria Băniei". In 1985, V. Diaconescu published the study entitled "Grădini botanice din România" (n.t. "Botanical Gardens in Romania"), in which several references to the Botanical Garden from Craiova are also found.

Also, there have been studies on landscaped ecosystems in Craiova during recent years. Thus, in 1992, Adrian Năstase published the study "Grădini publice din Craiova" (n.t. "Public Gardens in Craiova") in "Anuarul Muzeului de Științele Naturii" ("Yearbook of Natural Sciences Museum") din Prahova and in 1995 he published a group of studies and communications entitled "Grădinile Palatului Mihail" (n.t. "Mihail Palace Gardens") under the auspices of the University of Craiova. In 1996, another group of authors (Adrian Năstase, Adriana Năstase, Ion Tiță, Constantin Păun, Ionel Turcin, Edmond Gabriel Olteanu and Cătălin Simeanu) published the work entitled "Istoria ilustrată a Craiovei. Arbori și grădini publice" (n.t. "The illustrated history of Craiova. Public trees and gardens") under direct coordination of Oltenia's Museum.

Finally, in 2018, marking the occasion of celebrating feast days of Craiova and other cultural events, all parks and gardens in Craiova were modernized as a result of the efforts of local authorities in order to generate a positive impact on the city's residents and visitors.

Study area

Residence of Dolj county and the "capital" of Oltenia province, Craiova is the 6th largest city in the country by population (about 293,567 in 2012). Craiova is located in the southern part of Romania, at 44°17'27" North latitude and 23°48'16" East longitude, in the morphological contact area between the Getic Piedmont (north) and the Romanian Plain (south), in the corridor of the Jiu Valley, located between the high Bălăcița Plain (west) and Oltețului Piedmont (east), between the confluences with the Amaradia (to the north) and the Preajba valley (to the south). The approximate area of Craiova is 150-160 square kilometers. The municipality territorially and administratively includes the localities of Făcăi, Popoveni, Mofleni, Rovine, Izvorul Rece and Șimnicul de Jos.

Since antiquity, the geographical location of the settlement has favoured permanent contacts with more remote regions. Due to its location, at the crossroads of old, important communication arteries between the north and south of the country (on the Jiu Valley and its tributaries) and between west and east (between the Iron Gates of the Danube and the Black Sea coast). Regarding other urban proximities, Craiova is located 200 km (by rail) away from Bucharest and is crossed by the European roads E70 and E94.

Located at the contact of large relief units (the Getic Plateau and the Romanian Plain), the territory on which the city of Craiova appeared is the actual result of the Jiu River. The entire development of the settlement took place on the terraces to its left. Viewed from the height of the right bank of the Jiu, the city appears as an amphitheater, located on the five Quaternary terraces, slightly sloping towards the Jiu meadow and called the Old Terrace, High Terrace, Upper Terrace, Lower Terrace and Lower Terrace.

Craiova is located on a well delimited corridor of relief forms with heights of 70-75m at the meadow level and 140-150m at the level of the high terrace. The municipality is bordered on the west by Bucovăț Hill (165m), Cârligei Hill (160m) and Drumul Mare Hill (150.5m), and on the east by Viilor Hill (209.5m), Mlecăneștilor Hill (203.5m) and Cârcea Hill (191.5m). To these natural forms of relief, certain forms of anthropic provenience have been added in time. These are related to providing the necessary residential space for a growing population, to rehabilitating the ponds in the area, arranging watercourses, water supply, sewerage and industrialization of the city.

For the realization of some constructions (industrial, residential or other nature), large areas of land were levelled and the resulting materials were deposited in other places, resulting in positive forms of relief. Thus, many ridges in the Jiu meadow were levelled in the 8th and 9th decades of the XXth century to expand agricultural land. The category of anthropic relief forms also includes household warehouses, flood defence dams, tailings dumps, road embankments. In the perimeter of the city there are two large domestic platforms, at Mofleni (14ha) and at Șimnicu de Sus (8ha). The tailings dumps (result of the ash from the burning of coal in Ișalnița thermal power plant), located upstream of Ișalnița on the two banks of the Jiu, have an area of 306 ha and heights exceeding 38 m.

The Jiu river meadow was completely dammed on the left bank and partially on the right (in the places of water capture from Breasta and Bucovăț and in the area of Podari industrial platform). The hydrographic network has undergone changes by carrying out hydrotechnical works (canals, ditches) to defend against the flooding of the localities themselves, of the industrial objectives, of the agricultural and forest lands. In order to capture surface runoff from the eastern slopes of the city, two main canals were built, one in the northwest (12.4 km long), another in the southeast (10.4 km long). Also, in order to ensure the necessary water of the industrial platforms and, partially, to cover the water consumption of the inhabitants, a concrete dam was built in Ișalnișa, on the Jiu river.

II. DATA AND METHODS

When writing this paper focused on the issue of planned landscaping ecosystems in Craiova, I was animated, from the beginning, by a sentimental motivation, which consists in the pleasure of writing about my hometown.

To this, a personal acknowledgement was added: that although several studies appeared in the past concerning the gardens and parks of Craiova, these works most often tackle the subject either in a completely general/fragmentary way or by focusing its scientific content on one ecosystem only. Also, the changes that have occurred during recent years regarding the floristic composition and the degree of landscaping in the case of some parks and gardens in Craiova are also not to be neglected.

Another argument that led me to carry out this study is the personal belief that landscaped ecosystems must be known, protected and expanded, in order to continue to exert their beneficial action on contemporary lifestyles, subject to the hectic pace of daily life.

The present study starts from various documentations and researches carried out previously and wants to select, synthesize and clarify the landscape elements specific to Craiova Metropolitan Area in order to formulate recommendations for its sustainable development. The data thus obtained are entered into a GIS database to improve the design and landscaping process.

The study method does not aim to resume analyses, but to synthesize existing elements and relate them to the concept of landscape, interpreting data to identify the distinctive competencies of the territory through both objective - quantitative and subjective - perceptual analysis.

The synthesis elements will be interpreted for the structuring of recommendations and development directions that have as main purpose the improvement of the landscape quality as an indicator of the quality of life.

III. RESULTS AND DISCUSSIONS

3.1 Defining and clarifying concepts

The term *ecosystem* (introduced in 1935 by A.G. Tansley) refers to an ensemble consisting of: biocenosis (all organisms related to a particular habitat) and biotope (the geographical environment that houses a biocenosis) and which

establishes certain relationships between organisms, such as and between these and abiotic factors (relief, climate, hydrographic network, soil).

In fact, the ecosystem is highlighted by the existence of food chains, through which the flow of substances and energy introduced by living organisms in the process of metabolism. The components of the ecosystem are fixed (plants) and/or mobile (animals), in the latter case they cannot have fixed limits.

It is worth noting that an ecosystem does not necessarily have to include all the components that exist within the given area. Moreover, in a territory there are usually a lot of ecosystems that overlap with each other. In addition, the notion of ecosystem can be used at different levels — from a plant with its environment to the entire biosphere.

In relation to those presented above, the landscaped ecosystem is defined as the ecosystem in which the preponderant role in establishing the surface, biological composition and destination is played by anthropogenic intervention. It can be stated that the landscaped ecosystem cannot exist in the absence of man. Sometimes, the notion of landscaped ecosystem is replaced by equivalent terms, such as: built ecosystem, revitalizing aesthetic space, green space or green area.

3.2 The importance and role of landscaped ecosystems

Landscaped ecosystems have a multifunctional role in improving the living environment, combating pollution, conserving water resources and combating soil erosion. They are an efficient filter that traps airborne particles and fixes harmful gases through certain metabolic processes. They also moderate microclimate and noise pollution. In the landscaped ecosystems, a much smaller amount of germs has been found than in the crowded urban centers without plantations, and their stenic, comforting effect is indisputable.

Landscaped ecosystems enrich the atmosphere with oxygen (O_2) and reduce the amount of carbon dioxide (CO_2) in the air. Scientific studies have established that 1 ha of pine produces in a year 30 t of oxygen, a deciduous forest about 16t/ha, and agricultural crops 3-10t/ha. It was also found that woody plants (trees and shrubs) can fix annually 2 kg of carbon (C) per sqm of leaf area in the tropics and 0.3kg/sqm in the temperate zone.

Currently, there is an increasing pollution, in terms of magnitude and intensity, of air, water, land, vegetation, with various pollutants from industry, transport, household consumption. Vegetation retains air pollutants on leaves and branches, partially neutralizing the effects of harmful gases (sulfur oxides, nitrogen, carbon, gaseous hydrocarbons). Spruce and pine trees can retain 30-50t/ha annually of dust and impurities, and beech trees 68t/ha. After each rain the impurities of the leaves are washed and introduced into the soil and the filtration capacity returns to the initial level.

By purifying the atmosphere, ultraviolet radiation penetrates more easily, leading to the destruction of pathogens, so that in the masses of woody plants was found a very small amount of germs per liter of air (0.7) comparable to that found above the oceans. Trees and shrubs ensure good conservation of water resources

and the flow of clearer and less fluctuating water on rivers, by reducing the speed of raindrops, increasing water infiltration, reducing surface and depth runoff.

Landscaped ecosystems improve microclimatic conditions. Under their influence the temperatures are influenced by a distance of up to 1 km (in winter the air temperature is higher by 1-2°C, and in summer it is lower during the day by 5-6°C). In the warm season, the leaves ensure an increase in air humidity by 7-14%, through evapotranspiration. One hectare of forest massif can evaporate from the soil up to 3 thousand liters of water/ha/year.

The wind speed is reduced by trees and shrubs over a distance of up to 20-30 times their height. It also prevents snow from spreading, which maintains a higher humidity on the ground. Due to the differences in air temperature between the landscaped ecosystems and the populated center, breezes are formed with low speeds (1-2m/s) that continuously refresh the city with oxygenated air. That is why landscaped ecosystems are called "city lungs".

Vegetation reduces noise pollution by intercepting noise. Noise attenuation in tree masses reaches 5-15 phones/100m.

Landscaped ecosystems also have an artistic importance. They introduce their picturesque variety into the monotonous geometry of buildings and streets, create wonderful spatial, plastic, light and colorful effects, paintings that move a little at the slightest breeze.

3.3. Classification of landscaped ecosystems in Craiova

The surface occupied by the ecosystems arranged on the territory of Craiova municipality amounts to 680 ha. As compared to the total population (320,000 inhabitants), each inhabitant of the city has 21.25 sq m, the minimum international norms providing for each inhabitant of large cities, a surface of public space of 9.5 sq m (4.5 sq m for squares and gardens, 4 sq m for sports field and 1 sq m spaces for children).

Compared to the total area of the municipality (160 sq m), the area owned by landscaped ecosystems represents 10.88%, which means very little, if we take into account that specialists in landscape architecture say that the green area of the city should have at least 3/4 from the urban territory.

The landscaped ecosystems in the area of Craiova are different in terms of size, floristic composition, degree of arrangement, destination and location. Because of this, we can distinguish several types of landscaped ecosystems existing in the city area, namely parks, gardens (public, institutional and individual), squares, landscaped ecosystems with specialized profile (botanical garden, zoo, rosaries etc.), ecosystems arranged within the traffic arteries (street alignments) and isolated arboreal groves.

Generally, a park is a landscaped ecosystem with an area of over 20 ha. It often has a varied relief or has the existence of a lake, which increases its attractiveness. It is composed of plantations of trees and shrubs (60% of the territory), lawns (40-50%), flowers (5-10%). The alleys represent about 10%. Its functions are leisure and outdoor walks, sports or cultural activities (shows,

reading, etc.). Romanescu (Fig. 1), Hanul Doctorului, Craiovița and Cornițoiu parks can be visited on the territory of Craiova.

The forest-park is located outside the city and it is the largest ecosystem, resulting in the arrangement for rest and recreation of the forest massifs located near the city. It also has a role of protection against wind. The forest-park is a forest that gradually passes into the park, a process that must take place with minimal interventions on the natural environment. The network of country roads and walking alleys must have a maximum of 4% of the surface. Facilities can include visitor shelters, sports fields, water facilities, etc. This type of landscaped ecosystem is represented by the "Lunca Jiului" Park (also known as Tineretului Park).

The public garden has an area of 3-20 ha. It has the role of rest and daily recreation of the inhabitants within the area. It includes large areas planted with trees and shrubs, which moderate the urban climate. Mihai Bravu, Băniei (St. Dumitru Park), Central (Holy Trinity), Unirii (English Park), Madona Dudu, National Theater (or National Theater Park), 1 Mai (1 May Park) gardens belong to this type. The Chrysanthemums Park and the "Ștefan Velovan" High School Park also set into this category (due to the small surface, under 20 ha).

Institutional gardens are represented by ecosystems arranged within health institutions, churches, cultural institutions, educational, research or financial units, or near factories or other economic units.

The ecosystems arranged next to sanitary and curative institutions contribute to the restoration of the health, to the recovery of the work capacity of the patients. They consist of land for rest, walking and exercise. Plantations have a role in protecting against drafts, delimiting areas with different degrees of sunshine and isolating the enclosure from outside noise. This type is represented on the territory of Craiova by the gardens of the Pediatric Clinical Hospital, the County Hospital no. 1, the Hospital no. 2 Filantropia, the Hospital no. 3 and the Medicinal Garden (from Calea Unirii no. 110).

Ecosystems arranged near churches, cultural institutions, as well as those inside educational and research institutions perform functions of functional compartmentalization of land, sound insulation, protection from wind, dust, sunstroke, etc.

The gardens around the churches, generally small in size, are common in the city. In addition to the public garden at St. Dumitru Church (Băniei Garden), there are those located in the courtyard of the Holy Trinity Church (included in the Central Garden) and Madonna Dudu (located near the garden of the same name), to which is added the one at The Metropolitan Church of Oltenia and other smaller ones at the churches of St. George Nou, Mântuleasa, St. Archangels, Bășica, St. George the Old, Ioan Hera, Harsu, St. Elijah, St. Nicholas-Dorobăntia (str. Bucovăț), St. Nicolae-Ungureni (Caracal Street), St. Spiridon.

Inside the cultural institution (Art Museum) is the Garden of Mihail Palace. Green areas with small areas are located inside the radio studio "Oltenia" Craiova (Bd. Știrbei-Vodă), the Library "Oltenia" and the County Library "Aman".



Fig. 1. Selective photos taken in Romanescu Park, Craiova



Fig. 2. Selective photos taken in the Botanical Garden, Craiova



Fig. 3. Secular oak on Câmpia Islaz Street, Craiova

Among the educational institutions that have gardens located inside them are the "Frații Buzești" High School, the "Carol I" College, the "St. Velovan" High School, the Faculty of Mechanics, the Agronomic Institute, to which are added green areas of lesser importance to University, at the high schools "Nicolae Titulescu", "Economic", "CFR", "Elena Cuza", at the Art High School "Marin Sorescu", at the Energy School Group, as well as at the schools no.1 "Obedeanu" (str. Brestei), no. 2 "Traian" (str. Principatele Unite), no.5 "Petrache Trișcu" (str. T.Vladimirescu), no. 10 "Tudor Vladimirescu" (Bd. Carol I), no. 12 "Decebal" (str. N. Titulescu), no. 22, no. 24 (Brazda lui Novac neighbourhood).

Among the research institutions, the Hygiene Laboratory (str. Brestei) has a small garden. Other institutions that have small green areas are the branches of the banks "Țiriac" (str. I. Jianu) and "BNR" (Calea Unirii), Unitatea de Pompieri (str. CDFortunescu), Notariatul Public (str. I. Jianu), "Parc" Hotel, "Jiul" Hotel, Craiova Train Station.

The ecosystems arranged next to the industrial enterprises have the role of attenuating the noise, reducing the air pollution with dust, dust, gas, smoke, rest and recreation of the workers in their free time, etc. They have these economic units such as "Daewoo", "I.U.G." "Electropower", "M.A.T" .etc.

Ecosystems with a specialized profile have a scientific, cultural-educational, walking and resting role. They include the Botanical Garden – Fig. 2 (large collection established for the purpose of knowing and studying the flora of the Globe), rose gardens (rosaries, in St. Dumitru's Garden, Mihai Bravu Garden, Botanical Garden, where roses are the predominant species), the zoo Romanescu and the green areas in the cemeteries (with a sober character and a role in delimiting the alleys and plots): Sineasca Ungureni, L. Catargiu, Catholic, Jewish, Nisipuri-Dorobanți and Popova.

The ecosystems arranged within the traffic arteries have the function of architectural ornamentation of the streets, protection (against insolation, wind, noise and pollution with car traffic products), partition of pedestrian paths and areas of road traffic buildings, interior segmentation of streets (separation of directions, separation of different types of vehicles). In Craiova there are alignments of trees, alignments with continuous hedge and mixed alignments with hedge and trees. These alignments are generally arranged on both sides of the street and sometimes only on one side.

The alignments of some streets such as Constantin Brâncuși, Mihai Viteazul (both with secular linden trees), Știrbei Vodă (secular poplars), General Dragalina, Frații Golești (both with secular acacias) stand out due to the size and number of specimens, as well as the landscape effect, Caracal, Ion Antonescu, Calea București, Carol I, Doljului, Oituz, etc.

The square is an ecosystem with an area of up to 3 ha. Its functions are to rest on a short duration of passers-by, to facilitate the movement of pedestrians from one street to another, etc. Includes alleys, lawns, floral decorations, plantations of trees and shrubs, artesian wells, etc. The squares are frequent in Craiova: in the Valea Vlăcii area, in front of the University, the "Carada" square

on the homonymous street, the "Sf. Dumitru" square, the square of the "Bigul Nou" complex in Craiovița Nouă, etc. It also falls into the category of squares (due to its small size) and the gardens of some churches such as "St. Archangels", "Hagi Enusi", "St. George" Nou, etc.

The individual gardens, usually with small areas (40-600 sq m) and fenced, have functions of rest and gardening. They include small and usually small plants. Sometimes they have special specimens such as the case of the gardens located on 10 Constantin Brâncuși street (a centuries-old oak), Păltiniș street at numbers 7, 13, 19, 22, N. Bălcescu street no. 46 (a specimen of the Jewish tree), Câmpia Islaz no. 40 (secular oak – Fig. 3), str. Caracal at no. 11, 15, etc. Isolated arboreal groves are found in front of large public buildings, such as the building of the Craiova Court of Appeal (str. N. Titulescu).

Of the 680 ha representing landscaped ecosystems, the parks amount to 180.5 ha, the park forests 57.5 ha, the public gardens 19.2 ha, the squares 22.8 ha, the street plantations 47.3 ha and the green spaces in the neighborhoods 452.6 Ha.

The parks, a place of historical importance, which have preserved their natural beauty, and through subsequent arrangements have gained more charm and harmony, deserve the attention of contemporary mayors, its beneficial role on the city's inhabitants can not be neglected.

IV. CONCLUSIONS

The importance of this study of landscape architecture results from the fact that it classifies the landscaped ecosystems on the territory of Craiova, describes the main parks and gardens within the city perimeter (both in terms of spatial characteristics and evolution over time) and emphasizes their complex importance (under ecological, sanitary, aesthetic, educational and spatial planning report). This paper presents from an overall perspective and, at the same time, in a broad and detailed approach, the characteristics related to the floristic composition and the existing endowments in these arranged ecosystems.

The importance of the study also derives from the presentation of the changes in recent years in these parks and gardens, which are, moreover, integrated in the architectural-municipal ensemble of Craiova, and, more broadly, in the general physical-geographical framework of Craiova area.

Emphasizing the need to protect and extend the areas belonging to landscaped ecosystems, this paper identifies and proposes the following directions of action in this regard:

1. Proper maintenance of parks and gardens, both in terms of diversity and the richness of the current floristic fund, as well as in terms of the existing endowments;
2. Integral arrangement of Craiovița and Cornițoiu parks as rest and relaxation spaces. In this sense, the transformation of Lake Craiovița into a real recreational area and for the practice of water sports is of special importance;

3. The extension of the surfaces owned by the arranged ecosystems by the transformation into squares or public gardens of some vacant lands from the new neighborhoods;

4. Improving the degree of arrangement of the parks and gardens of Craiova;

5. Restoration of street alignments damaged over time and the development of the flower by arranging the arteries without such alignments;

6. Increasing the area owned by the species of trees and shrubs that are most indicated in the ecological conditions of the Craiova area, taking into account the current climatic trends and the possibilities of diminishing their effects;

7. Carrying out actions to raise awareness of the role that the population can play in protecting and increasing the areas of landscaped ecosystems;

In conclusion, we express our hope that this work will be a useful tool in knowing the landscaped ecosystems on the territory of Craiova.

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