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PRELIMINARY ANALYSIS OF THE VISITING IMPACT ON THE NATURAL ENVIRONMENT OF ROMANESCU PARK

ANALIZA PRELIMINARĂ A IMPACTULUI ACTIVITĂȚII DE VIZITARE ASUPRA MEDIULUI NATURAL DIN PARCUL ROMANESCU

Ioan Eustatiu MARINESCU [1]

Abstract: Romanescu Park represents one of the main natural areas for leisure and urban comfort in Craiova. The study aims at analyzing the ecological footprint of the park through the calculation of the absolute values, by the ratio of ecological effective surface to the number of visitors on specific time intervals (daily, weekly, monthly). The paper is also focused on the identification of the main visiting corridors (pressure corridors) of the park area. The main findings of the research can contribute to the identification of the critical areas and to the rehabilitation, regeneration and improvement of degraded natural biotopes of the park. It can also become a useful tool for local authorities in order to increase the quality of natural biota and general recreational comfort of this urban green area.

Key-words: urban green, urban park, ecological footprint, Romanescu Park, Craiova
Cuvinte-cheie: *verde urban, parc urban, amprentă ecologică, Parcul Romanescu, Craiova*

I. INTRODUCTION

Nicolae Romanescu Park is one of the reference urban natural areas of Craiova city, which is typologically included in the category of permanent accessible parks, covering an area of more than 90 hectares. The accessibility futures are represented by its functional elements such as: transit pathways, natural biotopes, visiting infrastructure (benches, playgrounds, recycle bins, leisure areas). In this framework, the area of the park is one of the most visited green areas in Craiova and consequently one of the most exposed to human impact.

According to the General Town-planning of Craiova Municipality approved by HCL no. 23/2000 and confirmed by Local Regulation of Urbanization, Romanescu Park is included in the category of parks, sports complexes, leisure, tourism, protection alignments within the secondary functional area P1 - whose main functional features are related to leisure activities, sports, tourism, allowed complementary activities (cultural, public catering, trade), pedestrian pathways, urban services (G.U.P. - Craiova Town).

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Most studies related to the link between human and green spaces are concerned with the impact of urban green space on human health (Kondo et al., 2018), describing the benefits and outcomes of green areas for the human health. There must be mentioned studies like *Attitudes of citizens towards urban parks and green spaces for urban sustainability: The case of Gyeongsan City, Republic of Korea* (Lee&Kim, 2015), *Recreational visits to urban parks and factors affecting park visits: Evidence from geotagged social media data* (Zhang&Zhou, 2018), which compared the number of visits for different types of parks in Beijing using freely available geotagged check-in data from social media and not direct observation and measurements. There should also be mentioned papers like *Land Use Change in the Bucharest Metropolitan Area and its Impacts on the Quality of the Environment in Residential Developments* (Pătroescu et al., 2011). The paper analyses the possible direct and indirect consequences of land use change regarding the quality of the environment in the residential areas of Bucharest Metropolitan Area and especially the impact of built environment on urban green areas and parks. An accurate analysis of green areas of Craiova city is presented by the author (Marinescu, 2006) – *Dysfunctions of urban environment. Case study - Craiova municipality*. The paper deals with a detailed qualitative and quantitative analysis of the natural ecosystems present in the urban area of Craiova. There are mentioned numerous sets of measurements concerning the structure and functionality of green areas, but also some indicators, which enabled the author to calculate the ecological effectiveness of the green areas and stress factors of urban green.

II. DATA AND METHODS

2.1. General characteristics of the study area

Romanescu Park is situated in the south-eastern part of Craiova area, at the cross-road of Bd. Nicolae Romanescu and Caracal, with a total surface of more than 90.00 ha. The natural characteristics and location, made it one of the most visited parks and an important urban touristic attraction in Craiova.

2.2. Ecological footprint analysis

The ecological footprint is an indicator of human pressure on the biosphere. It is calculated as a ratio between the population and the bio-productive surface (soil and water) of the planet (Wackernagel et al., 1999).

The ecological footprint enabled us to analyze the human pressure on natural biotopes of Romanescu Park by the calculation of the Absolute Ecological footprint ***Abs Ef*** values. These were obtained by the ratio of the most vulnerable ecological surface to the number of visitors on specific time intervals: daily, weekly, monthly.

Estimation of the number of visitors was made by using a measurement form extended for one month (September, 2019), with two specific time interval during week time (10.00-12.00; 16.00-18.00) and weekend time (11.00-13.00; 13.00-18.00).

Visitors counting was made by direct measurements to the access points (Fig. 1), subsequently the number of visitors who entered the park area through the

selected main entrances (1, 2, 3 and 4) in a two hour time intervals. Time intervals were established according to the most preferred hours of visiting, both in week and weekend time and subsequently the highest number of visitors.

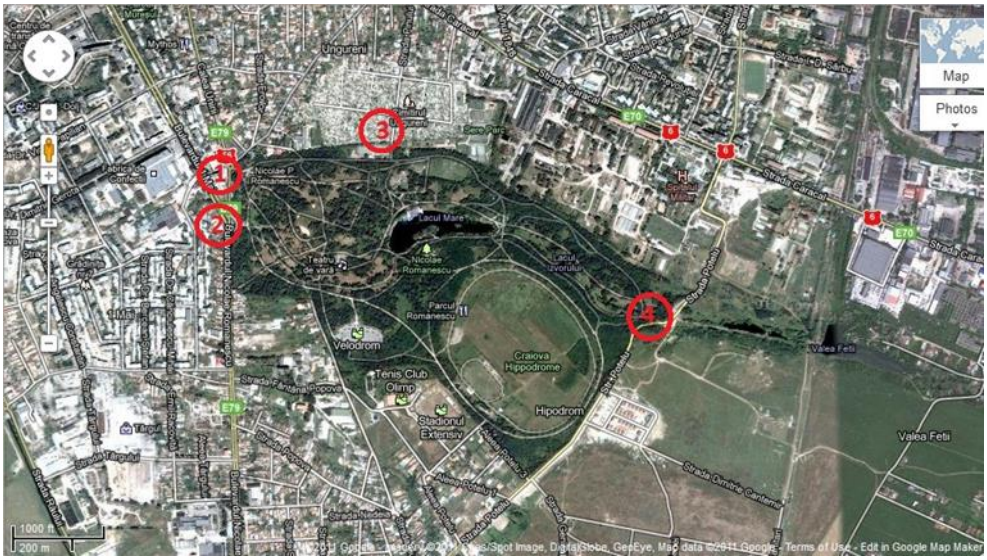

Fig. 1 - Main access points of Romanescu Park - 1 - Main entrance - Unirii Street, Bd. Nicolae Romanescu; 2 - Secondary entrance - Bd Nicolae Romanescu; 3 - Secondary entrance - Pinului Street, Ungureni Cemetery; 4 - Secondary entrance - Caracal Street - Potelu Street
(Source*:* http://maps.google.com/*)*

Visitors counting was performed by using a *counting form* which was used to make the centralization of measurements, with specific indication of the week and weekend time and time intervals (Table no. 1). It summed up to 4 hours/daily during week time and up to 5 hours/daily during weekend time. The analyzed intervals would appear enough representative for understanding the real dimension of visits, based on spot observation and taking into account that most visits are occurring in the intervals above mentioned.

The calculation of the ecological footprint was done by using the ecological effective surface (EES) of Romanescu Park (Marinescu, 2006). The data indicates the structural typology of biotopes and their ecological effectiveness (Table no. 2).

The ecological effectiveness of different biotopes that compose Romanescu Park area was calculated using the BSF (Biotopes Surface Factor). It classifies all composing surfaces on a scale ranging from 0 to 1 class of efficiency.

In the study, we selected the most vulnerable biotopes and calculated the absolute footprint value *(Abs Ef)* by dividing the ecological effective value to the daily measured number of visitors according to the formula:

Table no.1. Visitors counting form in the interval 01.09.2019-30.09.2019

Survey interval - 01.09.2019-30.09.2019								
Time intervals	**M**	**T**	**W**	**T**	**F**	**Time intervals**	**S**	**S**
1 st week - direct measurements - no. visitors/day								
10-12	-	-	-	-	-	**11-13**		967
16-18	-	-	-	-	-	**15-18**		1542
2 nd week - direct measurements - no. visitors/day								
10-12	306	325	356	339	362	**11-13**	690	903
16-18	360	336	332	376	602	**15-18**	901	942
3 rd week - direct measurements - no. visitors/day								
10-12	188	304	311	354	342	**11-13**	922	1233
16-18	301	276	314	247	355	**15-18**	1206	1590
4 th week - direct measurements - no. visitors/day								
10-12	248	180	310	305	314	**11-13**	1230	1221
16-18	233	321	344	360	365	**15-18**	1610	1550
5 th week - direct measurements - no. visitors/day								
10-12	188	156	219	312	337	**11-13**	666	669
16-18	212	216	182	352	390	**15-18**	908	990
6 th week - direct measurements - no. visitors/day								
10-12	211	-	-	-	-	**11-13**	-	-
16-18	247	-	-	-	-	**15-18**	-	-

Table no. 2. Ecological effectiveness of surfaces (BSF)

Romanescu Park - ecological effectiveness of surfaces (BSF)						
Total surface (sqm)	**Built surface (sqm)**	**TOP %**	**Biotope surface**			
			Asphalt + concrete (Sqm)	**Meadows (sqm)**	**Aquatic surface (sqm)**	**Forest (sqm)**
900.000	**72.000**	**8**	**108.000**	**214.000**	**196.000**	**310.000**
			Ecological Effectiveness			
			X 0.0	**X 0.5**	**X 0.6**	**X 1.0**
			0	**107.000**	**117.600**	**310.000**

(Source: Marinescu, 2006)

Aef = EES/Vn*d (1), where

Abs Ef = Absolute ecological footprint
EES = ecological effectiveness surface
Vn = visitors' number
d = day

The results were compared to the reference values suggested by the international standards for green surface (Arnberger, 2012) and (Maryanti et al., 2017). The application of urban green space standards varied in many cities. According to the World Health Organization (WHO), every city is recommended to provide a minimum of 9 square meters of urban green space for each person, provided that it should be accessible, safe and functional. WHO also suggests that an ideal amount of urban green space can be generously provided as much as 50 square meters per person.

2.3. Pressure corridors identification

The analysis of pressure corridors was made through direct observations. There were designated 10 key-points for visitors counting activity in a specific period of time for one hour. The results would be centralized and discussed in close relation with the identification of **convergence spots**. The final outcome of this research is the map of human-pressure corridors of Romanescu Park.

III. RESULTS AND DISCUSSIONS

3.1 Absolute ecological footprint *Abs Ef*

The surface of vulnerable biotopes - meadows (0.3 - ecological effectiveness) was related to the reference values suggested by WHO for as much as 50 square meters/person. The results were also compared to the most livable city in Europe - Wien, with values that exceed 120 square meters of urban green space/person. Wien is the European capital that provides extensive green space for its population. Recently, in 2016 Mercer's Quality of Living Survey has voted Wien as the most livable city in the world. Each 1.7 million of its populations has been provided with 120 square meters of urban green space.

Recorded values (Table no. 1, Figs.1, 2) indicate higher use loads and crowding adversely affecting the physical conditions of natural biotopes inside the park during weekend time.

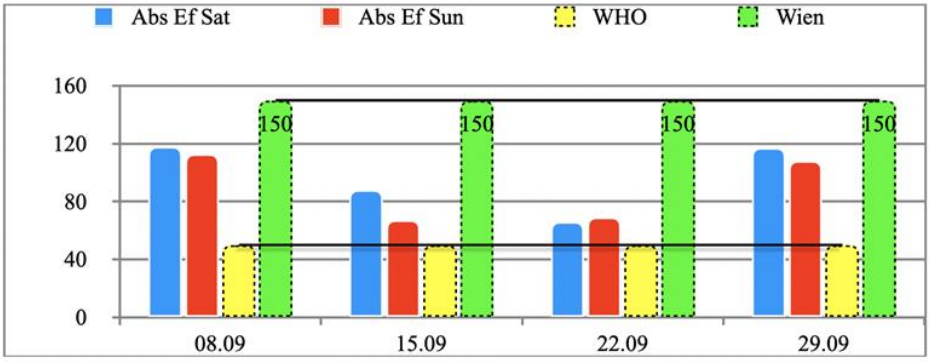

Fig. 1 Values of *Abs Ef* (Sat. 11.00-13.00) as compared with WHO recommendations and Wien

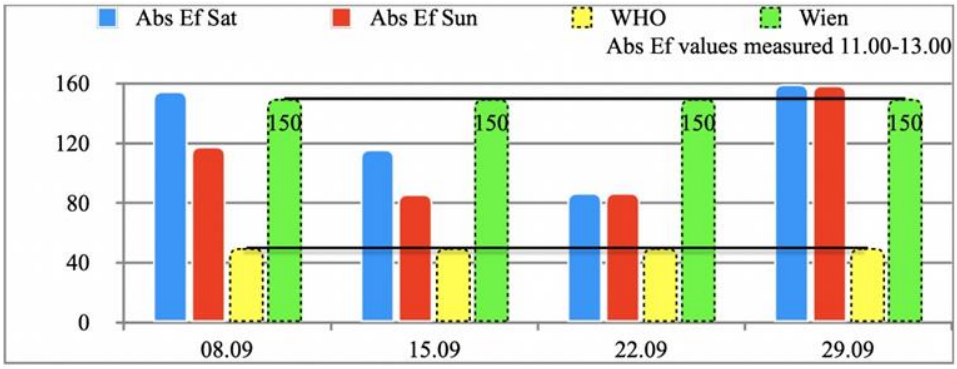

Fig. 2 Values of *Abs Ef* (Sun. 15.00-18.00) as compared with WHO recommendations and Wien

Moreover, high values of ***Abs Ef*** indicate a higher pressure on natural biotopes present in the perimeter of Romanescu Park, which may lead also to crowding, subsequently to recreational conflicts and degraded environments developed through the heavy use. Park visitors may no longer be able to find their desired recreational quality and will sometimes try to avoid such undesired conditions by applying coping behaviors such as displacement to other green spaces or even decide to stay at home or indoors.

The data also indicate higher levels of ***Abs Ef*** on Sundays, up to 58-60, more over the WHO recommendations, but far too low in comparison with Wien. The values can be generated by factors like weather conditions, time of the week and presence of cultural events.

For a better understanding of human pressure on the natural environment of Romanescu Park, we calculated the *Abs Ef* weekly and compared the results to the international recommendations mentioned above (Figs. 3, 4). At week scale, the results clearly indicate values far too low in comparison with international and European standards, which lead us to the conclusion that many vulnerable biotopes would be affected by visiting activities - meadows biotope - especially by the numerous pathways trespasses of visitors.

Visiting activities also contribute to the aggression of wild animal species such is the squirrel (*Sciurius vulgaris fuscoates*) and wild birds.

3.2 Identification of human-pressure corridors

Urban green spaces face increasing pressure from expanding populations, limited resources and growing impacts of climate change. Natural biotopes and living animals are a central component that can be affected particularly when the minimum time for regeneration and vegetal renewal is exceeded through human pressure.

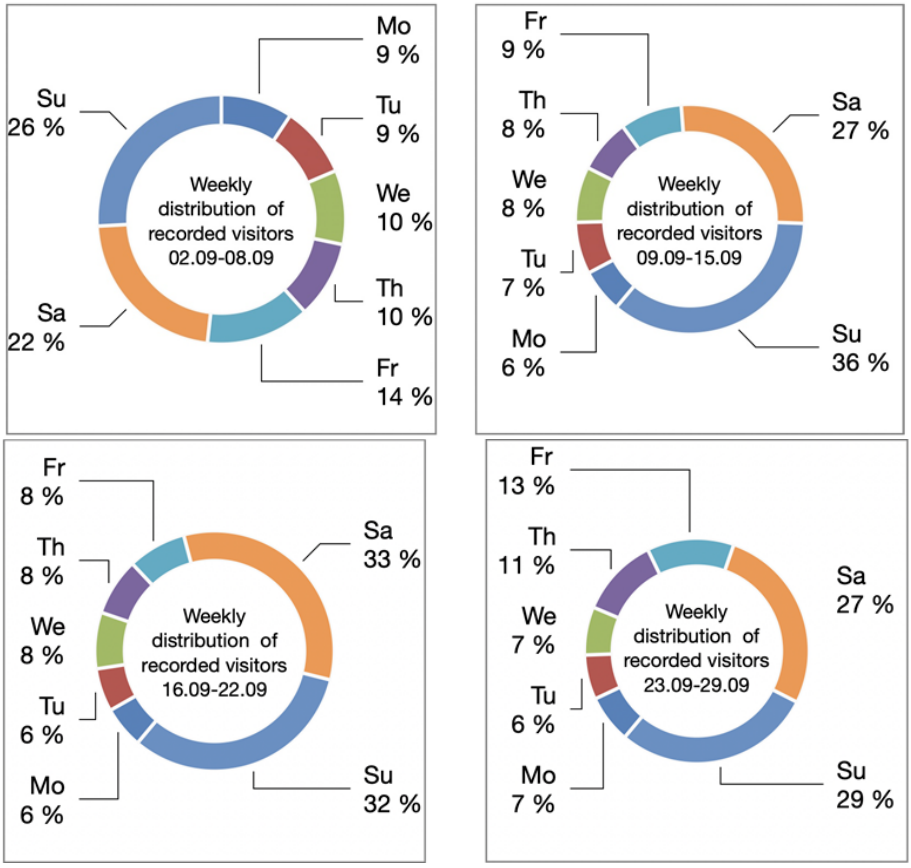

Fig. 3. General distribution of visitors during survey period

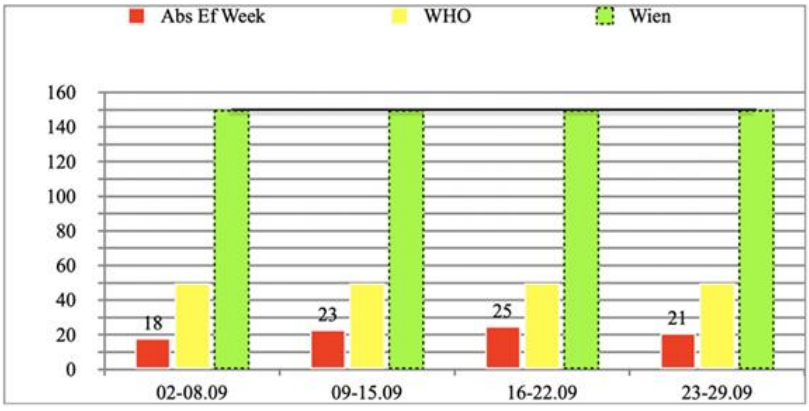

Fig. 4 Weekly calculated values of *Abs Ef* (01.09-30.09.2019) as compared to WHO recommendations and Wien

Pre-established counting points enabled us to make a preliminary estimation of the number of visitors who transited selected pathways. The preliminary analysis was made during Sunday the 15th of September, in the time interval between 12:00 and 1:00 pm. The results indicate 4 main categories of pathways as revealed in the map below (Fig. 5).

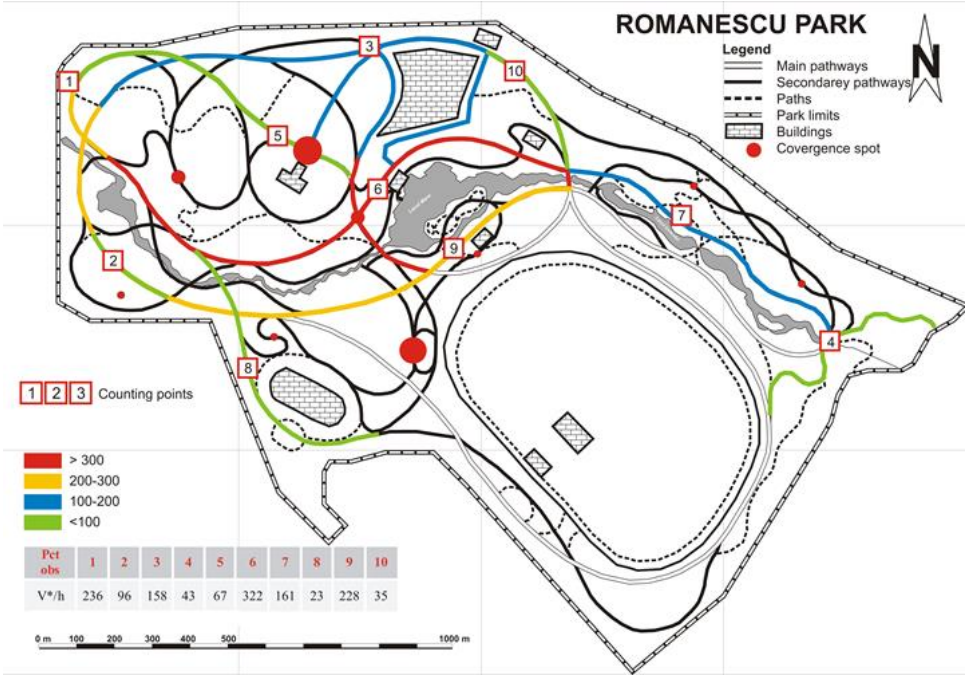

Fig. 5 Map of human-pressure corridors within Romanescu Park

Pressure corridors can contribute to the scratchy distribution of human impact along unidirectional axes, creating long discontinuities and structural displacements within the area of the park. Outdoor visiting activities can indirectly contribute to the decrease of biodiversity and general quality of the park.

The results indicate the highest values at point 1, 6, 9 (Fig. 6), specifically the main entrance 1, and the bistro area around the lake at point 6. The big number of visitors is determined by the easy access to the biotopes around the lake and the presence of two important pathways that encircle the lake area.

Pressure corridors generated two main convergence spots in the central area of the park. Their presence generates great values of the ecological footprint specifically in the area of vulnerable ecosystems and biotopes with negative impact on medium and long time scale.

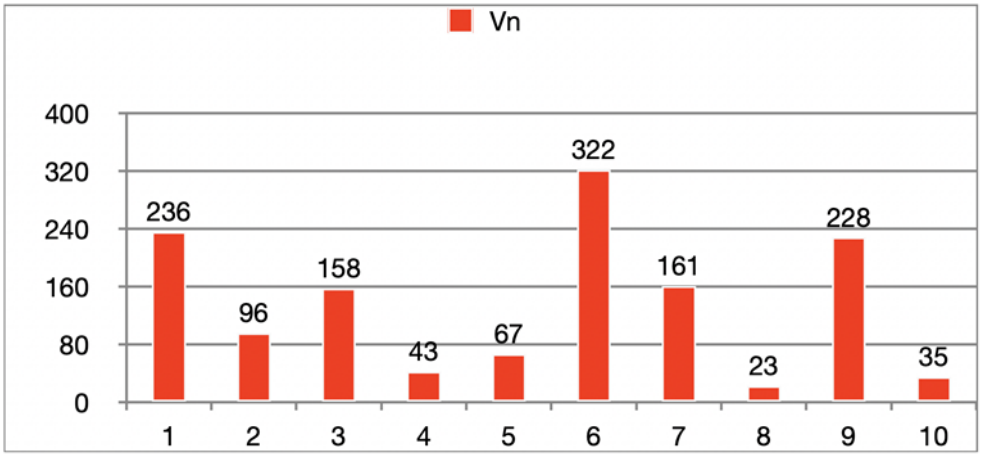

Fig. 6 Recorded number of visitors at pre-established counting points

IV. CONCLUSIONS

Ecological footprint **(Ef)** can become an important index for the analysis and monitoring of the human pressure on vulnerable ecological systems of urban green areas. It enables us to rate the human-pressure taking into account the surface of available biotopes and the number of visitors in a specific time unit.

The present paper represents a preliminary approach of ecological footprint analysis in the area of Romanescu Park. Our research was focused mainly on the calculation of ***Abs Ef*** for the most vulnerable ecological part of the park, included in the *3rd category* of ecological effectiveness. Further studies of the ecological footprint should extend the counting time intervals for a more precise identification of the number of visitors, staying duration and visiting itinerary. We propose the calculation of ***Rel Ef***, which would consider the surface of all categories of biotopes present within the area of the park in relation with the visitors` total number.

Further surveys should be extended to a 12 months ʾobservation period, the minimum period for the vegetal restoration of the ecological systems within the park area. The main findings of the research contributed to the identification of the *critical areas* and can contribute to the rehabilitation, regeneration and improvement of degraded natural biotopes of the park. The results of the study can become a useful tool for local authorities both to increase the quality of natural biota and to develop general recreational comfort of this urban green area.

REFERENCES

ARNBERGER A. (2012), *Urban Densification and Recreational Quality of Public Urban Green Spaces—A Viennese Case Study*, Sustainability, 4(4), 703-720, https://doi.org/10.3390/su4040703

KONDO M.C., C FLUEHR J.M., MCKEON T.P., BRANAS C.C. (2018), *Urban Green Space and Its Impact on Human Health*, Int. J. Environ. Res. Public Health, 15(3), 445, https://doi.org/10.3390/ijerph15030445

MARINESCU I. (2006), *Dysfunctions of urban environment. Case study - Craiova municipality*, Universitaria Publishing House, Craiova.

MARYANTI M.R., KHADIJAH H., MUHAMMAD UZAIR A., MEGAT MOHD GHAZALI M.A.R. (2017), *The urban green space provision using the standards approach: issues and challenges of its implementation in Malaysia*, Sustainable Development and Planning, VIII, 369-379, DOI 10.2495/SDP160311

WACKERNAGEL M., MONFREDA C., ERB K.H., HABERL H., SCHULZ N.B. (2004), *Ecological footprint time series of Austria, the Philippines, and South Korea for 1961–1999: comparing the conventional approach to an* '*actual land area* '*approach*, Land use policy, 21 (3), 261-269.

PĂTROESCU MARIA, VÂNĂU G., NIȚĂ R., IOJA C. (2011), *Land use changes in the Bucharest Metropolitan Area and its impacts on the quality of the environment of residential developments*, Forum Geografie. Studii și cercetări de geografie și protecția mediului, Volume 10, Issue 1/June 2011, 177-186.

ZHANG S., ZHOU W. (2018), *Recreational visits to urban parks and factors affecting park visits: Evidence from geotagged social media data*, Landscape and urban planning, vol. 180, 27-25, https://doi.org/10.1016/j.landurbplan.2018.08.004

LEE Y.C., KIM K.H. (2015), *Attitudes of Citizens towards Urban Parks and Green Spaces for Urban Sustainability: The Case of Gyeongsan City, Republic of Korea*, Sustainability 2015, *7*(7), 8240-8254, https://doi.org/10.3390/su7078240

*** Planul Urbanistic General. Municipiul Craiova / G.U.P. - Craiova Town, disponibil on line https://www.primariacraiova.ro/pozearticole/userfiles/files/01/6867.pdf

*** http://maps.google.com/

*** https://primariacraiova.ro/pozearticole/userfiles/files/Binder1(187).pdf