Review on Agriculture and Rural Development 2023 vol. 12 (1-2) ISSN 2677-0792
DOI: 10.14232/rard.2023.1-2.60-66

THE RELATIONSHIPS OF THE EUROPEAN UNION PROJECTS IMPLEMENTED IN DEBRECEN IN THE PERIOD 2014-2020 AND THE BIOLOGICAL ACTIVITY VALUE

György Orosz[1]*, Botond Kőhalmi[2], Julianna Skutai[3]

[1,3]Hungarian University of Agriculture and Life Sciences
Intsitute for Wildlife Management and Nature Conservation
[2]Nature Conservation Engineer student (BSc) Hungarian University of Agriculture and Life Sciences

*corresponding author: orosz.gyorgy@uni-mate.hu

Abstract: In the study, the implemented European Union development projects of the city of Debrecen for the period 2014-2020 are evaluated based on their effects on the green infrastructure. Our aim is to reveal to what extent the development projects occupied green areas and, accordingly, what amount of green area compensation would be required. The tests were carried out by classifying and analysing the projects and calculating the biological activity value. The basic principle of the calculation of the biological activity value laid down in the law is that the areas included in the settlement plan are provided with values, so-called biological activity value multipliers, proportional to the hectare level according to their role in the urban fabric, their properties and surface coverage. The values obtained by multiplying the extent of the demarcated areas in hectares and their activity values give the total biological activity value of the chosen area. In our research, we divided the topic of biological activity values into two groups, the project-level calculation (information in the possession of implementing bodies), and the examination of the effects related to settlement planning, which are publicly available in development and planning documents. Based on these, the cumulative biological activity value of the 38 development projects evaluated in the landscape use section is 201.9475. This indicator means that the implemented developments caused a decrease in biological activity value for the city in total.

Keywords: EU development projects, biological activity value, reduction of green surface, green infrastructure

1. Introduction

The settlement environment is a frontier area both geographically and scientifically, and from the point of view of nature conservation, it is one of the most significant elements of social geography, the knowledge of which is essential for effective nature and landscape protection. From a domestic point of view, Debrecen is the settlement that, with its long-term goals, aims to be the economic, social and cultural motor and center region of the eastern part of the country and the Carpathian Basin as a counterweight to Budapest (https1). Based on this, the protection of the natural environment constitutes a significant and essential issue during the development activities of Debrecen. In terms of the legal basis, the Act on the Formation and Protection of the Built Environment lays down that the biological activity value of the administrative area of the settlements cannot decrease parallel to the designation of the area intended for new construction. According to the legal definition, biological activity is the effect of the vegetation covering a given area on settlement ecology and the health of society (https2). This is quantified with the help of biological activity values in a mandatory manner as defined in the government decree on the content of settlement plans, the order of their preparation and acceptance, and specific legal institutions for settlement planning (https3).

One of the most important elements of the environmental assessment and Natura 2000 impact assessment documentation completed for Debrecen in 2020 (https4) was the determination of biological activity values. According to the document, between 1990 and 2012, Debrecen experienced a decrease in biological activity value equivalent to the incorporation of 1,032 ha of agricultural land in terms of agricultural land. The city's 2020 cumulative biological activity value is 236,755 points. The biggest decrease in activity value was experienced in the area of the western industrial park and the airport, which is abundant in

functional green spaces, while the increase in activity value was due to the afforestation taking place in the eastern areas of the city. Between 2014 and 2020, 6,378 projects were implemented in Debrecen from European Union funds. In our current research, we examined these projects in order to find out what effect they have on the settlement's green infrastructure and, through this, on its biological activity value. The vegetation, or the conditioning effect of surfaces covered with vegetation on the environment through physical - physiological - biological processes is called biological activity. The intensity of biological activity is expressed by the biological activity value.

There is still relatively little literature on the use of biological activity values in the monitoring of surface cover changes and the quantification of the surface qualities of individual areas during studies from a landscape ecological perspective.

Balogh (2008) interprets the biological activity value as the only indicator used in practice in the control of landscape architecture planning, and in his case study he points out the problems of the method, for example the excessive settlement-centricity of the calculation in contrast to the regional approach, the different interpretation between the value calculation of the state foreseen in the plans and the current state, or to the necessity of the sometimes disadvantageous, disproportionate, and out-of-character compensation required by the depreciation. In its conclusion, it therefore advocates the creation of a unified and control-conscious legal framework.

In his study, Nagy (2008) also bases his study on the legal background of the biological activity values, who sheds light on the shortcomings of the legal environment determining the way to maintain the biological activity value of Budapest, the generalized definition of land use, and the undeveloped set of conditions for biological activity. In his work, he mentions that the structural plan and thus the realistic measurement of the activity value cause problems because the plan is rough in many respects, it does not take into account the smaller green areas, it is compressed into the land use intended for construction, which makes it possible to transform these areas without amending the regulatory plan.

Jámbor and Szilágyi (2006) dealt in detail with the use of biological activity values, which were already linked to investment scales. The study was prepared following a bill according to which investments created on biologically active surfaces that were not originally intended for installation can only be implemented if the builder undertakes to compensate for 1.1 times the value of the activity value associated with the original surface quality. Jámbor mentions that in many cases the OTÉK does not give the opportunity to further refine the value of the area (e.g. arable land), since the determination of the value is only tied to the branches of cultivation. He considers it necessary to visit the site to identify the exact surface cover. In addition to the basic zoning classification, in the case of inspection of plots of land, special importance is attached to the inclusion of correction values that take into account the unique ecological properties of the area.

For the environmental assessment of a concrete investment plan in Budapest, the biological activity values, due to their index nature, were used by Szilágyi et al. (2012) also found it perfectly applicable. In his study - similar to our research, instead of a zonal approach - he evaluated the route of the Külsőkeleti körút in a 40 m wide strip according to the land uses defined in the ÖTM decree, regardless of the function of the given areas in the settlement planning document. The advantage of the method is that a minimum surface coverage ratio was determined against the planning documents. Alternative routes were also designated, the potential environmental impact of which was determined specifically on the basis of biological activity values, thus making individual ideas easily comparable.

Gábor et al. (2007) examined changes in the biological activity of Budapest and its region between 1990 and 2005. The study evaluated the biological activity of the area, assessed on the basis of the vegetation index, in the form of its increase or decrease, thus establishing the trends

of the entire urban area. In order to identify land use, infrared band-based NDVI indicators obtained from satellite data, different from the traditional ones, but more suitable for more precise definition of territorial functions, were used. The method is based on the difference in the different activity indicators of the map pixels and thus creates a more accurate picture of the actual land use compared to the methodology of biological activity values defined and applied by law in settlement planning documents.

Bárcziné (2011) also mentions biological activity values in her investigation, who sees the function of greenways in settlements as, among other things, a potential arena for the implementation of the prescribed biological activity value compensation.

A similar view can be found in Túri et al. (2023) in his landscape ecology work covering land use changes in the vicinity of Debrecen, where the biological activity value appears tangentially. In the case of Vámospércs, in 2020, the municipality allowed the change of cultivation branch on hundreds of parcels. The settlement sees the importance of this in increasing the activity value through the expected afforestation and fulfilling its compensation obligations.

2. Materials and methods

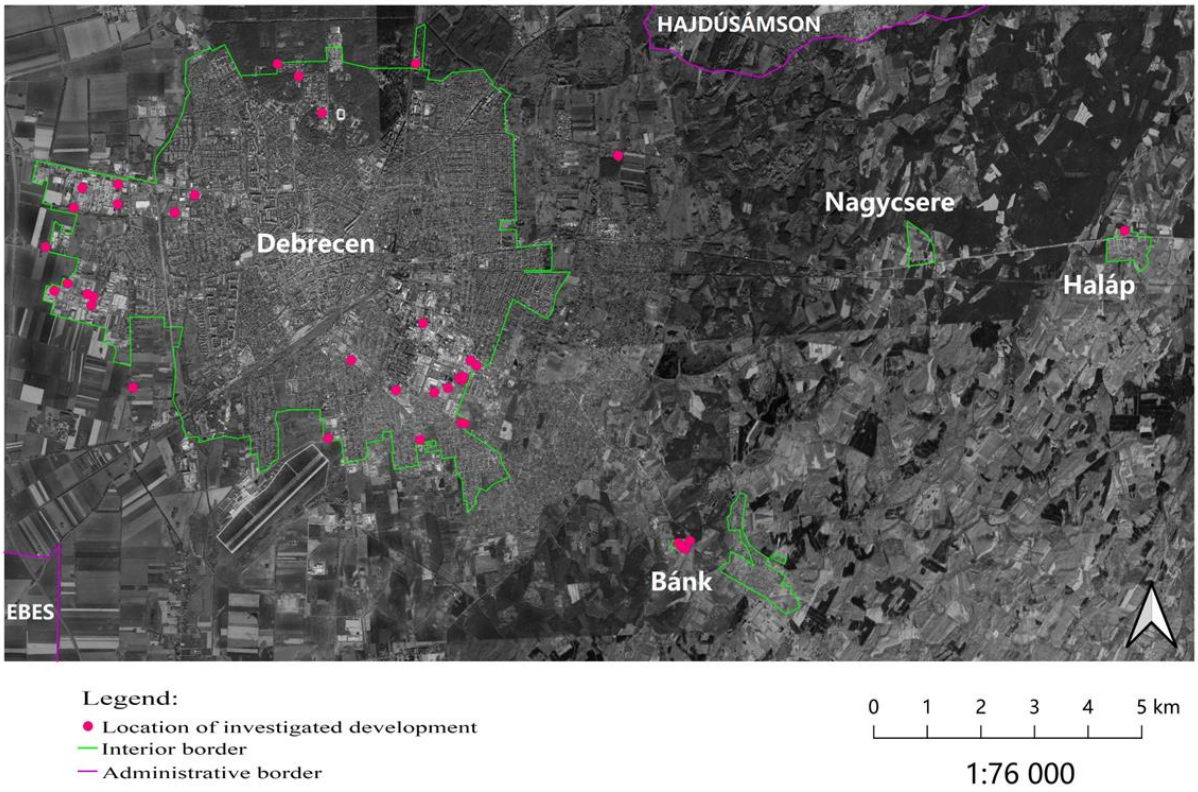
The development projects under investigation, implemented between 2014 and 2020, were collected from the official portal of Térképtér (https5). We also paid attention to the fact that there were projects that belonged to the previous cycle, but their implementation was linked to the examined period. In the first part of the investigation of the development projects, we showed the trends underlying the changes in the surface cover in a detailed breakdown, while in the further part of the investigations we specifically limited ourselves to the occupation of land and the transformation of the landscape. In the course of the research, the queried projects were first divided into groups of aspects and characteristics, the involvement of the natural environment, the legal form of the supported person, and the place of implementation were examined basically according to the number of projects and the amount of support (Orosz et al., 2022).

In the second, central stage of the analysis, we further evaluated the projects that are directly involved with the natural environment, that utilize it, and are based on its resources, including those that were implemented in outlying areas and non-inhabited inland areas. Due to the demonstrability and map illustration of the land occupation, several aspects were applied, so from the point of view of landscape use, a total of 38 projects with a demonstrable land occupation, which can be precisely demarcated on site, green fields, and a grant amount of over HUF fifty million form the basis of the statement (see: *Figure 1*).

First of all, we examined whether the implementation of the given investment involved a change in the cultivation branch. If the implementation was accompanied by a change in the field of cultivation, we examined the field of cultivation before and after the change. If there was no change in the field of cultivation, then what the field of cultivation was like at the time of implementation, and most importantly, what the real function of the area was before implementation. This helped us when typing the exact area reservation. At the same time, the area of Debrecen was divided into use-based landscape categories, which are necessary for the map illustration of the projects. They were demarcated on the basis of their surface coverage, with the combined evaluation of MePAR (Agricultural Parcel Identification System) and Google Earth overlays. The exact area reservation was demonstrated through project descriptions and map measurements. The topic of biological activity values can be divided into two groups, the project-level calculation (information from the possession of implementing bodies), and the examination of the impacts related to settlement planning, which are publicly available in development and planning documents. Accessing the former information is extremely difficult due to the low willingness to answer and the sensitivity of the research topic.

The latter do not follow the organic development of the settlement in terms of improvements and minor changes, but are aligned with the ideas of strategic planning. In the classical sense, the data here cannot be used in the study to evaluate the natural function of the consumed areas.

Figure 1: Georeferenced developments in Debrecen satellite image



Source: Author's own editing, Google Earth

Following the values is made difficult by the fact that in many cases (and this is especially true for areas intended for development but not yet utilized) in the settlement's structural plans, the function intended for the area is not based on the current surface cover and utilization practice. Based on this, the implementation only served the theoretical quality of the area and did not "cause" a change in the biological activity value with its creation. As a result of the developments, an effective change only occurred when the relevant part of the city was designated as a "general economic" area. Since the method can be used to determine the territorial quality change that occurs during planning activities and the accompanying biological compensation, the actual transformation in the project-scale study is not appropriate and needs a new interpretation. The basic principle of the calculation of the value of biological activity indicated in the law is that the parts of the settlement defined in the settlement plan are provided with value numbers, so-called biological activity value multipliers, proportional to the hectare level according to their role in the urban fabric, their properties and surface coverage. The values obtained by multiplying the extent of the demarcated areas in hectares and their activity values give the total biological activity value of the selected area. In order to be able to utilize the basic principle and essence of the biological activity value calculation in the research, the function of the occupied areas was applied individually to the actual surface cover before the realization, which was made possible by a chronological, retrospective satellite study. The evaluation of biological activity is thus different from the function-based approach, which homogeneously evaluates city sections, also displayed in the Natura 2000 impact assessment documentation. The individual territorial qualities therefore differ from those published in the development and settlement plans in the research, they are based on surface coverage narrowed

down to the project level, in accordance with the guidelines of the government decree (https3). By standardizing the biological activity values and projecting the measured areas per hectare, we obtained what index the given area had according to its function before implementation, and what it turned into after the conversion. By subtracting the two values, you can get the data of how much compensation area should be provided after the implementation of the development.

3. Results

The project-level examination of the change in the value of biological activity can only be interpreted within the framework of this research. The majority of the examined projects were classified as internal areas, and within them were especially implemented in industrial areas, and the related legal regulation is related to the designation of the areas intended for construction, the change of the demarcated settlement structure, i.e. the planning works. As a first step, the extent of the developments was projected per hectare and provided with multipliers as specified in the government decree. Based on these, the cumulative biological activity value of the 38 developments evaluated in the landscape use section is 201.9475. This indicator means that the implemented developments caused a decrease in the value of biological activity for the city. It follows from the method that there is no close correlation between the eradicated or created surfaces with different biological activity and their exact extents. A small area, e.g. In a forest area of 0.7 hectares, the value multiplier of which is 9, the decrease in the value of biological activity can be higher than in an area covered by single-level vegetation of more than 1 hectare, calculated with the associated value of 5. Within certain limits, the size of the area designated for compensation is also independent of the biological activity value created. Although in most cases the projects turned the demarcated area into a surface occupied by a building with a score of 0, in five cases surfaces with a biological activity value were also created as a secondary measure. All of these caused a total increase of 38.1579 points in the case of the investigated developments in the settlement. It can be said that these values did not represent an actual increase in any case, they only moderated the depreciation of the transformed surface, which is the most essential in the case of the development of sports areas.

Table 1: Development of territory occupation and biological activity according to the converted activity categories

Function of affected area	Transformed surface [m^2]	Distribution [%]		BAV decrease [point]	Increase in BAV due to the cover created in the area [point]
Single level vegetation	128.468	38,17	35,01	64,2340	1,5957
Shrub- thicket	93.820	27,87	25,57	56,2920	-
Forest	74.516	22,14	20,31	67,0644	36,5640
Arable land	39.801	11,82	10,85	12,7363	-
Σ Area characterized by vegetation	**336.605**	*100*	91,74	200,3267	38,1597
Unpaved road	6.800		1,85	0,6800	-
General economic area	23.519		6,41	0,9408	-
Σ Area with significant anthropogenic influence	30.319		8,26	1,6208	-
Σ	**366.924**		100	**201,9475**	38,1597
		Difference in value to be compensated			**163,7878**

Source: Author's own editing

These projects were leisure and recreational developments in the Bánk district. If we subtract the point value of the transformed surfaces and the created surface values from each other, we get that in the area of Debrecen, as a result of the narrowed-down developments based on the criteria system of the examined period, a decrease in biological activity value of 163.7878 points actually took place (*Table 1*).

Due to what is described in the methods, this value means the real decrease, which was not accurately shown in the development and settlement plans (due to the different application of the biological activity value method in research and development practice). The score obtained as a result of the subtraction indicates the difference in value that must be compensated in the city area as a result of the developments. The method does not provide guidelines as to where and with what method or with what type of surface covering it is necessary to achieve this. Since there is no close correlation between the accumulated values and the size of the area they characterize, it is not clear from the results how large an area this compensatory activity should take place. In each case, this depends on the quality of the surface to be created, which needs to be evaluated as specified in the government decree. Since there is no database, register or other information available on the possible compensations, this difference can only be compared with the increase in the value of other biological activities in the city. However, when assessing this, we cannot rely on the data displayed in the planning plans, since they evaluated individual neighborhoods and blocks of urban fabric in a homogenized manner, different from this research. In all cases, the values obtained during the research depend on the accuracy of the measurement and since the government decree allows for correction calculations, they can give an even more accurate picture of the biological activity of the investigated area. In addition to the quality of the surface cover of the area, the correction coefficients for differentiation also allow us to diversify the environmental elements to be evaluated in an area with basically homogeneous utilization, which gives a significantly more accurate picture of the real value. These values, proportionate to the extent of each element, must also be applied per hectare. Since the retrospective accuracy of surface cover data is not possible in all cases due to the limited resolution of satellite images, the correction calculation would most certainly only be most effective during a site visit (even before the developments are implemented). However, due to the opportunities they provide, the correction coefficients were used simultaneously with the general coefficients during the evaluation of the projects, so the value statement of the biological activity differs from the methods used in the sorting works, and it is specifically used to support the loss of value of the biological activity at the project level, and to determine the exact value differences. Projecting the total biological activity value of Debrecen onto the area of the settlement, we get a value of 5.1335 per hectare, while comparing the 33.6605 ha of the examined developments and the converted surface worth 201.9475 points, we also get a value of approximately 6 points per hectare. Based on this, it can be stated that the investigated developments affected an area with an average value of almost 1 point higher than the quotient of Debrecen's activity value per hectare. This can be explained by the previous conclusion that the developments were primarily realized in areas that were still degraded and covered with green areas without an agricultural function, but with an industrial function in the hinterland. This characteristic of the projects means that their implementation cannot cause a quantified decrease in activity value in the settlement's planning documents.

4. Discussion

Our research is not only used to monitor activity depreciation, but also an applicability study, in which we researched how the methods used in settlement planning can be applied or adapted to the project level by examining their green space transforming effects. Based on the above, it turned out that the method can not only be applied successfully, although in a different

interpretation, examining an area in greater detail, but keeping the practical principles, it also provides a good basis for quantifying the transformed area use in terms of environmental value.

References

Balogh Á. (2008): A biológiai aktivitás értékének számítása a településtervezésben. Előszó a kontrolltudatos tervezéshez. Falu Város Régió, Területfejlesztési és területrendezési szakmai folyóirat 2008/1 ISSN: 1218-2613 https://adoc.pub/1-terletfejlesztesi-es-terletrendezesi-szakmai-folyoirat.html

Bárcziné Kapovits J. (2011): Zöldutak lehetséges szerepe a táj- és településtervezésben. A zöldút fogalom tervezéstörténeti áttekintése alapján Tájépítészeti és Kertművészeti Folyóirat 21-24. (2011) https://adt.arcanum.com/hu/view/KerteszetiEgyetem_4Dfolyoirat_2011/?query=biol%C3%B3giai+aktivit%C3%A1s%C3%A9rt%C3%A9k&pg=207&layout=s

Gábor P., Jombach S., Ongjerth R. (2007): A biológiai aktivitás változása Budapesten és a Budapesti Agglomerációban 1990 - 2005 között, Tájépítészeti és Kertművészeti Folyóirat 5-8. (2007) https://tajk.szie.hu/sites/default/files/4D%205%20A%20biol%C3%B3giai%20aktivit%C3%A1s%20v%C3%A1ltoz%C3%A1sa%20Budapesten%20%C3%A9s%20a%20Budapesti%20Agglomer%C3%A1ci%C3%B3ban%201990%20-%202005%20k%C3%B6z%C3%B6tt%20.pdf

Jámbor I., Szilágyi K.M. (2006): Zöld mezős beruházás kontra biológiaiaktivitás érték. Egy törvény módosítási javaslat anatómiája, in 4D Tájépítészeti és Kertművészeti Folyóirat, 2006. 1. szám https://tajk.szie.hu/sites/default/files/4D_szamok/2006/4d_1_zoldmezos_beruhazas_kontra_biologiai_aktivitas_ertek.pdf

Orosz Gy., Kőhalmi B., Skutai J., Rusvai K., Grónás V. (2022): Landscape use changes in the city of debrecen in the light of development projects. In: J, Vitková; L, Botyanszká (szerk.) Interdisciplinary Approach in Current Hydrological Research Bratislava: Slovak Academy of Sciences, Institute of Hydrology (2022) 233 p. pp. 204-211. , 8 p.

Szilágyi K.M., Almási B., Hutter D., Szabó L. (2012): A várostervezés szürke – zöld dilemmái. A városi térszerkezet alakítása és az élhető város elve. In: Fenntartható fejlődés, élhető régió, élhető települési táj 1. Budapesti Corvinus Egyetem, Budapest, pp. 205-226. ISBN 978-963-503-504-5 http://unipub.lib.uni-corvinus.hu/960/1/fenn2012_Almasi_Balazs_etal.pdf

Nagy K. (2008): Hogyan tovább biológiai aktivitás? A biológiai aktivitás érték szinten tartásának szabályozási lehetősége a fővárosban. Falu Város Régió, Területfejlesztési és területrendezési szakmai folyóirat 2008/1 ISSN: 1218-2613 https://adoc.pub/1-terletfejlesztesi-es-terletrendezesi-szakmai-folyoirat.html

Túri Z., Bánóczki K., Csorba P. (2023): "A földhasználat változása Debrecen környéki kisvárosok peremi övezetében." Debreceni szemle 31(1): 43-58.

Electronic references:

https1://www.debrecen.hu/assets/media/file/hu/26410/telepulesfejlesztesi-koncepciora-vonatkozo-javaslatok.pdf (2022.10.29)

https2://net.jogtar.hu/jogszabaly?docid=99700078.tv (2023.02.22)

https3://net.jogtar.hu/jogszabaly?docid=a2100419.kor (2023.02.22)

https4://www.debrecen.hu/assets/media/file/hu/26425/kornyezeti-ertekeles-debrecen.pdf (2022.11.03)

https5://terkep.fair.gov.hu/index.php/map (2022. 03.11)