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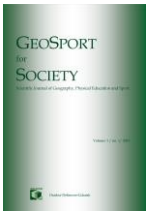

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Territorial development indexes for team sports (football)

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Abstract. The field of territorial planning through specific methods and instruments may provide significant contribution in the spatial organization and management of sports activities. Quantitative elements such as number of inhabitants at neighborhood, village, commune, town, county, region level, number of players, population on age and gender groups, level of economic development, together with specific infrastructure elements (football fields or other types of sports arenas) and with qualitative elements (competitional level, number of players on age groups, junior, senior, amateur and professional teams) etc, all these used in mathematic formulae can generate indexes which would reflect the development level or the practicing or attractiveness degree of a certain sport at territorial unit or locality level. In this study, for the game of football, we propose *the territorial development index for football* (*Tdif*) and *the football practicing index* (*Fpi*). With the values resulted, hierarchized, ranked and compared, important contribution may be provided for the elaboration of studies and of implementation and spatial development strategies of a sport or sportive activity.

Keywords: sport team, football, territorial development index, football practicing index

Introduction

In order to capture the quantitative (number) and qualitative (territorial impact) aspects (Bairner, 2011; Ilieş et al., 2016a, 2016b), to generate the possibilities and results for the scientific research into the relationship between settlements and sport (Bale, 2003; Reilly and Gilbourne, 2003; Conner, 2014; Ilieş et al., 2014; Buhaş, 2015; Kozma et al., 2015; Ilieş et al., 2016c) we propose two

calculation indexes regarding the development degree and amateur football practicing degree at territorial unit level (Bale & Vertinsky, 2004), with examples on two levels: Romania on county level and Bihor and Satu Mare Counties on commune level. One of them is the territorial development index for football (I_{tdf}) and the second one is the football practicing index on age groups (I_{fpi}). Both indexes can be used for all categories of sports, differences being made by the interpretation of the resulted values deviation.

The instruments (Indexes)

The territorial development index for football (I_{tdf}) is an index with applicability in spatial analyses and all types of territorial-administrative units such as: macro-regions, lands, regions, counties, micro-regions, towns and communes, localities (cities, towns and villages) or physical-geographic units: depressions, valleys, mountain units, hilly units or field units etc. In order to obtain a value comparable between territorial units of the same level (rank), the obtained value is multiplied by 100.

The calculation formula is: $\mathbf{I_{tdf} = (N_t/N_{loc/TAU})}$ and the used calculation elements are:

N_t – total number of teams from the analyzed territorial unit (only one team per territorial unit/locality/commune/town is taken into consideration, in case there are more than one) and

$N_{loc/TAU}$ – number of localities/communes/territorial units from the analyzed upper rank territorial unit and it includes at least two localities.

The obtained values are grouped on five classes, to which it is added for comparison the average value for the territorial unit (classes above and below the average are differentiated). The typology of classes generated by the value of the territorial development index for football, on value classes, has the significances presented in table 1.

Table 1. Classes above and below the average are differentiated

Classes	***Values of I_{tdf}***	***Peculiarities at the levels of towns and communes (Territorial Administrative Units - TAU)***
1	Over 1.00	The territorial coverage degree shows us that on the county territory there is more than one football team per territorial unit
2	0.75-0.99	High coverage degree means a high level of amateur football per territorial unit
3	0.50-0.74	Average development level means two subcategories differentiated by the index average value per territorial unit
4	0.25-0.49	Low development level
5	Under 0.30	Very low development value

The territorial development index for football (I_{tdf}), generates data comparable at the territorial unit level, cartographically transposed and which reflect the development degree and the territorial spread of amateur football game. In this case as well, for exemplification, it is applied at regional level (North-West Region) for the same competitional year (2016-2017), on counties at city, town and commune level (fig. 1) and at locality level (fig. 2). The high number of teams, together with the number of

TAUs/localities emphasize a territorial reality poorly dimensioned spatially from the point of view of the football phenomena development.

To exemplify the usefulness, for the proposed work tools, we accomplished, for the 2016/2017 competitional year regarding the amateur football game, seniors' competitions, a Romania level (0,63) and North-West region 0,66 (fig.1). According with table 2 and figure 1, in the region, only Cluj County 1.02 has total coverage at TAU level, respectively at least one football team for each city, town or commune from the administrative structure of the county. Within the second category, with high amateur football development degree and territorial coverage with values between 0.75 and 1.00, is Satu Mare 0,80. The third category (0,50-0,74) include 3 counties Sălaj, Maramureș and Bistrița-Năsăud. The lowest values, from the low development level (under 0.25-0,49 teams/TAU) is one of the biggest county or region: Bihor with 0,41 teams/TAU.

Tabelul 2. Romania. North-West Region. *The territorial development index for football (I_{tdf}) at county level* (sources: www.frf.ro)

No	County	Towns (no of TAU)	Communes (no of TAU)	Villages (no)	Total (TAU) c+d	Total c+e	Teams (no)	I_{tdf} At level of TAU	I_{tdf} at level of localities
a	b	c	d	e	f	g	h	i	*j*
1	Cluj	6	75	420	**81**	**426**	**83**	1,02	*0,19*
2	Satu Mare	6	59	220	**65**	**226**	**52**	0.80	*0,23*
3	Sălaj	4	57	281	**61**	**285**	**43**	0,70	*0,15*
4	Maramureș	13	63	214	**76**	**227**	**40**	0,53	*0,17*
5	Bistrița-Năsăud	4	58	235	**62**	**239**	**31**	0,50	*0,13*
6	Bihor	10	91	430	**101**	**440**	**41**	0,41	*0,09*
	North-West Region average	**43**	**403**	**1800**	**446**	**1843**	**290**	**0,66**	***0,16***
	Romania average	***320***	***2861***	***12957***	***3181***	***13277***	***2012***	***0,63***	***0,15***

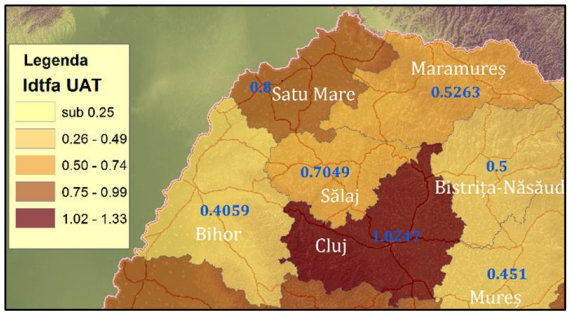

Figure 1. *The territorial development index for football (I_{tdf}) at county level* by TAUs (sources: www.frf.ro)

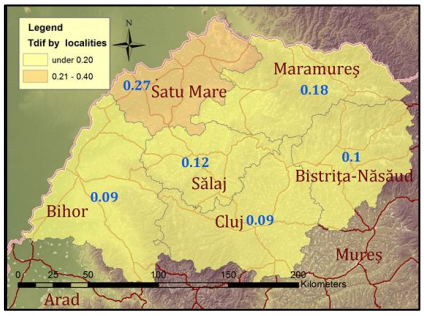

Figure 2. *The territorial development index for football (I_{tdf}) at county level* by localities (sources: www.frf.ro)

The same index, at *locality level* and on the same value scale, emphasizes even more the interest manifested by population and local authorities for amateur football (fig. 2). Figure 2 and table 2 emphasizes according with national average

(0,15 team/locality), Satu Mare County (0,23), Cluj County 0,19 and Maramureş County 0,17 are over national average.

Amateur football practicing index (I_{fpi}), just as the previously presented tool, is the second analysis tool proposed and with its values there can be emphasized the impact of a sport and of the specific competition upon the population of a certain area (territorial unit, country, region, county, locality, village), by reporting the number of signed players to one thousand inhabitants, which can represent the total population or differentiated according to gender, age groups, occupation, education level etc. In this case, we propose the I_{afi} index resulted from reporting the male population from the 19-40 age group of the reference territorial unit (administrative or physical-geographic one) as follows:

$$I_{fpi} = (N_p / P_{m19\text{-}40}) \times 1000$$

The calculation elements are:

N_p – total number of players from each territorial unit;

$P_{m19\text{-}40}$ – population with specific age between 19 and 40, since it is about senior teams, we used the male population from the territorial unit.

The values correspond to the territorial reality as much as the age group of the reporting population is close to that of practicing the analyzed sport and the territorial unit overlaps the locality. Thus, generally, for juvenile sport the 10-19 age group is recommended, or even younger, while for seniors, the 18-40 groups. The calculation formula can be adjusted according to specifics of the analyzed sport as well. The analysis can also be made on environments (urban and rural) or on gender (males, females).

Table 3. North-West Region from Romania. *Amateur football practicing index by ages group(I_{fpi}) at the level of county* in 2016/2017 competition (sursa datelor: www.frf.ro)

no	County	Seniors teams (number) Leagues 4-7	Average number players /teams	Total number of players (c * d)	19-40 age male population	I_{afi} (c/f)*1000
a	b	c	d	e	f	g
1	Sălaj	*43*	20	860	28237	**30.5**
2	Satu Mare	*52*	20	1040	49964	**20.8**
	Region average	*290*	20	5800	384610	**17,2**
3	Bistrița-Năsăud	*31*	20	620	38487	**16.1**
4	Cluj	*83*	20	1660	115524	**14.4**
	National Average	***2012***	**20**	**40240**	2839013	**14.2**
5	Maramureș	*40*	20	800	68596	**11.7**
6	Bihor	*41*	20	820	83802	**9.8**

To exemplify the usefulness, the second proposed work tools, we accomplished, for the 2016/2017 competitional year regarding the amateur football game, seniors' competitions, a Romania level and North-West region (figure 3 and table 3).

Thus, the Ifpi calculated at Romania level by using the counties as reference units was for 2016 of 14.2‰ male gender players, aged between 19 and 40. Region's amateur football map generated by the values obtained at county level (figure 3) emphasize the high level of attractiveness areas such Sălaj 30,5‰ and

Satu Mare 20,8‰. The lowest values are recorded, paradoxically, in counties with high economic potential such as: Cluj 14,4‰, Bistrița-Năsăud 16,1‰ or Bihor 9.8‰ and Maramureș 11,7‰, bouth counties under national average (14,2‰). The resulted values reflect combinations at county level between elements such as: spatial dimension of the county, economic development level, demographic potential, population ratio on specific age group, football tradition, interest shown by local authorities, etc.

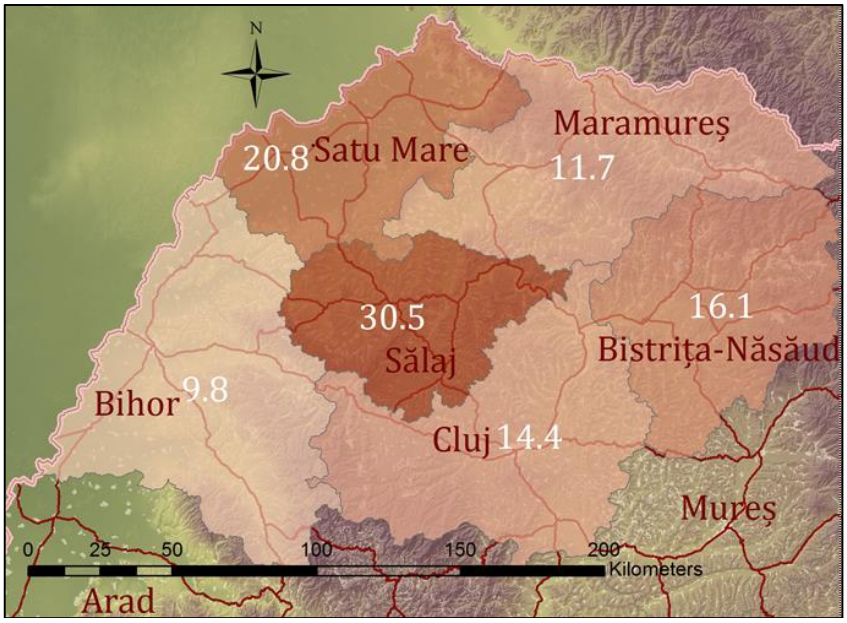

Figure 3. North-West region of Romania. Amateur football practicing index (I_{fpi}) by age group (19-40) male population, by counties 2016/2017 (sources: www.frf.ro)

In conclusion, the two proposed indexes, through the obtained values and value classes, can be extremely useful spatial analysis tools with results applicable in elaboration of strategies of territorial organization and planning of sports activities and sports in particular.

The two indexes, apparently simple, generate values comparable between the same types of territorial units and reflect through cartographic transposition the development degree, attractiveness degree, territorial spread and the development perspective of a sports game.

The resulted values reflect combinations at county level between elements such as: spatial dimension of the county, economic development level, demographic potential, population ratio on specific age group, football tradition, interest shown by local authorities, etc.

Applied to amateur football at different territorial levels, the values generated on specific age groups and genders reflect a situation very close to the territorial reality, and the use of a class typology with specific features together with the adjusted cartographic representation represent an important scientific endeavor to support federations and regional and local administrations in order to implement

and develop amateur football. Also corroborated with economical-type elements, the values of these indexes multiply the importance of such a study at TAU level and reflect even more accurately the territorial reality if the analysis is made at the lowest level. The resulted values, at federation or local and regional level, are very useful in elaborating the development strategies and plans of sports activities.

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