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THE DEVELOPMENT OF REGIONAL DISPARITIES IN CZECH REPUBLIC OVER THE 2005–2010 YEARS

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Abstract

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Reduction of regional disparities and securing equal conditions of living for the population belong to the fundamental targets of regional policies both within the limits of European Union community and of Czech Republic. Assessment of changes in the progress of regions presents a comparatively complex task since a large number of indicators have to be taken into question, both those collected objectively (usually of quantitative shape) as well as those reflecting the subjective views of the population. The paper aims at assessment of changes in the sizes of regional disparities over 2005–2010 in the CR regions and it offers a discussion on chances of application of the aggregated indicators for such assessment.

regional development, disparities, conditions of living, aggregated indicators

Balanced development of regions is one of the significant tasks of regional policies both within the limits of European Union community and its Member States. In principle this is the matter of exploiting optimally the economic, human, natural and geographic potential in order to increase the competitiveness and to improve economic situation. One very important condition of a given State's citizens well-being is to secure level conditions of living in all its regions. This is also the aim of European Union and its Member States regional policy measures centered at the solution of this problem. It is a whole system of processes contributing to positive changes in economic, social and environmental situation of the regions aimed at reaching economic and social cohesion. The important condition required here is of course proper preservation of historical and cultural values of the regions.

As seen from above, it is a very broad scale of measures, primarily of subsidies, streaming into the regions for various needs. Assessment of their efficiency then presents a very complex problem. Every region has its own specificities, different geographic conditions and natural resources, it differs by the type of settlement and other factors. Every region then also has different priorities as regards its further prospective development. Anyway, one thing is common to all the regions regarding regional policies, meaning the efforts to secure economic development and satisfactory conditions of living for the population.

Considering multidimensionality of the task, designs of development strategies for the given areas have to take into account all the important regional indicators, perfect knowledge of their state and development. The opening analyses of a region's development concentrate upon a detailed description of stable conditions on the one hand – mainly those geographic and climatic, that are typical for the region given – and upon traditions and population's attitudes on the other, and also on description of the current state and projection of a future development of the indicators relevant. During all these phases of the analyses statistical methods hold an irreplaceable position. Based on the quantified development tendencies and shares of importance of separate factors they offer reasoning for decision making as concerns further ways of development of the region.

Selection of appropriate indicators is an important question. A high number of indicators

usually may bring an unclear volume of information and correlations between these may reduce quality of the output (Kuprová, Kamenický, 2006). Most authors tend to offer the assessments using aggregated indicators, where they may apply very simple tools (e.g., presenting the order of rank of selected indicators in regions) on the one hand, as well as sophisticated procedures based on the results of multivariate statistical analyses such as principal component analysis, cluster analysis or factor analysis on the other hand (Tuleja, 2012; Viturka, 2010). Aggregated indicators are in the position to describe complex notions such as prosperity, efficiency, or sustainability. They can be interpreted more easily than a complete system of partial indicators and they offer a chance of fast comparison of the regions from the viewpoint of a given aspect. However, construction of these is more complicated. When setting these up, several tasks have to be solved: selection of relevant variables and decision on their weight in the model, solution of the missing data problem, choice of an appropriate method, the entire construction of the aggregated indicator. Wrongly chosen indicators, incorrect decision on the method of analysis or construction of the indicator can be the reason of a low information power, misunderstanding or even misinterpretation of the output. An aggregated indicator then should be easily interpretable and the method of its construction should be well known and based on objective statistical approaches in order not to admit incorrect or too simplified conclusions (Svatošová, 2006).

MATERIAL AND METHODS

Regional development comprises many areas, hence an assessment of regional prosperity is a very complex question. If economic progress only is being assessed it can be expressed by means of the summary index of economic efficiency using the GDP created (Kadeřábková, 2007), or by means of the gross value added and fixed capital created (Jánský, 2009). Anyway, if the aim of regional development is to raise the level of living and population's conditions of living, such an assessment is insufficient and it has to be expanded by an assessment of further indicators. Proper attention has to be paid to the development of human resources, since these are the factor determining (Jeníček, 2010; Dufek, Minařík, 2009, 2010), thus it is necessary to take them into question. Demographic situation research in the region given has to be directed not only on current situation analyses but on population prognoses above all (Malečková *et al*., 2009; Tesárková, Šídlo, 2009). It is needed, too, to secure such a level of the human resources development conditions that a high quality level of living of the given region's population can be reached (Wokoun, 2008). In order to reach the targets defined for separate regions' development strategies it is needed to come up with high quality and detailed analyses of state and development of separate indicators describing development of the area given (Svatošová *et al*., 2005; Hrabánková *et al*., 2011). Based on a perfect knowledge of the development and effects of separate factors in the region can then complex, realistic and really accessible development concepts of the area given be prepared regarding its needs, traditions and specificities (Kutscherauer, 2010).

The living conditions present an organic and very important part of the entire level of living that usually is defined as the degree of satisfaction of the needs of life (material and spiritual) of the population and at the same time as the summary of all the benefits (material, social and moral) given at the population's disposal within time and space given as well as conditions at which the needs are satisfied and the way of life is formed (Jílek, 1998).

When assessing the population's conditions of living quality we have to take into account that, objectively arrived at quantitative measures only (GDP, employment and unemployment, population's incomes and expenses, consumption of goods and services, property, funds directed at public services, atmosphere pollution measures, crime and other) express one only face describing the concept given partially only. If the definition is mentioning satisfaction of needs, it is needed to know at the same time how the population appreciate this satisfaction. Hence, subjective feelings of the citizens have to be assessed, too, their views to what degree the needs have been satisfied are to be noted (Červenka, 2009).

The aim of the paper is to assess whether changes happened in the levels of regional disparities in the CR regions over 2005–2010 years, using appropriate statistical methods and regarding the conditions of living quality of the inhabitants.

The methodology defines three partial targets:

- selection of suitable indicators
- selection of a method for the aggregated indicator formation
- assessment of the sizes of regional disparities.

In order to select suitable indicators, areas representing population's living conditions quality have been established first and then relevant measures have been selected within separate areas. Originally, 39 indicators had been selected and the number was later reduced based on the assessment of merits (importance of the indicator) and the indicator's variability in the regions. Variation was assessed using the coefficient of variation (Hendl, 2004). The region of Prague Capital was excluded from processing regarding its specificities that may cause significant differences sometimes, in the values of the measures. This way, 8 areas were established, by means of which the living conditions can be characterized.

For the aggregated indicator formation the so-called point method was chosen (Jílek, 1998). The principal requirement of the method is to

find for each of the indicators that region where the indicator given reaches its maximum value (if growth of the indicator is understood progressive), or its minimum value (in case, decrease of the indicator is desirable). The indicator obtains 1,000 points for such a region and the other regions then obtain number of points from 0 to 1,000 according to the percentage reached. In case, minimum value is the basis of the valuation, reciprocal value of this ratio is established. The sum of points for all the separate indicators is then obtained for each region and these sums characterize levels (orders) of regions as to the quality considered. Besides the sum of points, level of the indicator can also be described using the average number of points per one indicator. The method is comparatively simple, its advantage is in its capacity of summing up indicators expressed in different units. Based on the numbers of points obtained this way, the order of rank can be established and the size of differences in the indicators given between separate regions can be assessed (e.g., how many times the level of living is higher in one region as against the other one).

Regarding that, the classical point method assigns same weight to all the variables, what sometimes is taken as a shortage, for the second and third variant of the aggregated indicator weights were assigned for separate areas of living conditions. Evaluation of weights in the second variant was based on the principal component analysis results (Hebák, 2004), and the coefficient of variation of the area (group of indicators) given, was applied as the weight in the third variant.

Based on the aggregated indicator size, establishment of the order of rank of the regions was possible by separate areas (indicator groups) as well as totally. The extent of regional disparities then was assessed based on the differences of the aggregate indicators values.

RESULTS AND DISCUSSION

For the development analyses of regional disparities 39 indicators were selected by means of which the level of living in the region can be characterized (Červenka, 2009). Indicators were selected such that all the substantial components needed for the level of living assessment were represented by them. In order to compare their variability in the regions the coefficient of variation was obtained and the behaviour of the regional differences over the period observed was assessed, i.e., whether they get reduced or, on the other hand, in which of the indicators large differences can be seen, or, even an increase of these. The data were available for 2005 and 2010. Summary comparison by the coefficient of variation size has offered the following results (indicators ordered by coefficient of variation size).

Variation up to 10 %

2005 – 17 indicators: mean length of life–women, mean length of life–men, mean age men and women, number of pupils per teacher, mean amount of old-age pension, mean amount of total social benefits, rate of economic activity, mean amount of wages, share of old-age pensioners, share of total social benefits earners, mean length of sick leave, mean size (area) of apartment, mean number of rooms per person, share of accomodation expenses, total population increment per 1,000 inhabitants, gross domestic product per head.

2010 – 17 indicators: mean length of life –women, mean length of life–men, mean age men and women, number of pupils per teacher, mean amount of old-age pension, mean amount of total social benefits, rate of economic activity, mean amount of wages, share of old-age pensioners, share of total social benefits earners, mean length of sick leave, mean size (area) of apartment, mean number of rooms per person, net income of household, index of age, gross domestic product per head.

Variation 10–50 %

2005 – 11 indicators: index of age, number of head per one physician, net income of household, share of households where the accomodation expenses create a heavy loading, share of roads of 2nd class, number of explained crime cases per 1,000 inhabitants, share of roads of 1st class, rate of unemployment, share of households who do not manage easily with their expenses, compact emissions, population density.

2010 – 14 indicators: share of accomodation expenses, number of inhabitants per one physician, nitrogen oxide emissions, share of households where the accomodation expenses create a heavy loading, share of roads of 2nd class, rate of unemployment, share of roads of 3rd class, share of roads of 1st class, compact emissions, share of households who do not manage easily with their expenses, number of vacancies per 1,000 inhabitants, population density, number of explained crime cases per 1,000 inhabitants, number of job candidates per 1,000 inhabitants.

Variation over 50 %

2005 – 11 indicators: number of crime cases per 1,000 inhabitants, number of vacancies per 1,000 inhabitants, share of households below the life minimum income limit, share of population in communities up to 500 head, number of job candidates per 1,000 inhabitants, share of motorways and high-speed roads, natural population increment per 1,000 inhabitants, nitrogen oxide emissions, carbon dioxide emissions, sulphur oxide emissions, share of roads of 3rd class.

2010 – 8 indicators: share of households below the life minimum income limit, number of vacancies per 1,000 inhabitants, population density, number of crime cases per 1,000 inhabitants, natural

population increment per 1,000 inhabitants, nitrogen oxide emissions, sulphur oxide emissions, share of motorways and high-speed roads, total population increment per 1,000 inhabitants.

It can be seen from above that, the smallest differences in the regions appear in the age of inhabitants when aging of the population proceeds in all the regions. Also the mean amounts of wages and the pensions are not too different, as well as the rate of economic activity and the GDP created in theregions. These indicators reported low variation in all the years observed.

Very strong fluctuations, hence a shift to higher differentiation in the regions, can be observed in the fundamental indicators of population's level of living – household incomes, expenses, problems with expenses, share of households below the life minimum income limit. Unemployment rate and the number of vacancies per 1,000 inhabitants also is more variable in the regions. In 2010 the variation of environment indicators rose very strongly. In 2010 the carbon dioxide and sulphur oxide emissions variation coefficients were over 100%. Also the crime indicators are very variable; in 2010 the coefficient of variation here rose as against 2005. In all the regions also the natural and total population increments develop unfavourably. An extremely high variation has been recorded in 2010 in the total increment per 1,000 inhabitants. This was caused by the high increase of immigrants to Středočeský Region where the satelite townships around Prague are getting strongly inhabited. Values of this indicator in the other regions have been fluctuating much less.

Based on a total assessment 8 areas have been formed with following indicators:

- Economic situation in the region – GDP per head (ECO)
- Unemployment – rate of registered unemployment, number of job candidates per 1,000 inhabitants, number of vacancies per 1,000 inhabitants (UN)
- Environment – annual SO, N0, C0 in ton per km square (ENV)
- Demographic situation – total increment per 1,000 inhabitants, index of age (DEM)
- Level of living – mean size (area) of apartment, number of rooms per person, share of house holds below the life minimum income limit, net income of household, share of accomodation expenses, share of households where the accomodation expenses create a heavy loading, share of households who do not manage easily with their expenses (LC)
- Social area – share of social benefit earners, share of old-age pensioners, mean amount of old-age pension (SOC)
- Crime – number of crime cases per 1,000 inhabitants (KRIM)
- Health of the population – mean length of life – men, women, number of physicians per 1,000 Inhabitants (HEA).

Selected indicators then have been included in the aggregated indicator based on the so-called point method. The aggregated indicator was presented firstly for the separate areas of research, secondly as the summary one for the 2005 and 2010 years. Based on the aggregated indicator values the order of rank of the regions has been established.

As it is obvious from above, positions of the regions differ in separate years and areas of research. Observing the differences in the total positions of regions in the 2005 and 2010 years we can see that, in case of the regions with the worst positions almost no differences have appeared, while positive changes in the ranks have been registered in the

I: *Order of rank of the regions by the areas of research in 2005*

REGION	Area of research								
	ECO	UNEM	ENV	DEM	LIV	SOC	CRIM	HEAL	TOTAL
Středočeský	2	2	10	1	6	4	10	7	3
Jihočeský	3	3	3	3	4	12	6	2	2
Plzeňský	1	1	5	5	9	2	8	5	4
Karlovarský	12	11	9	11	3	13	11	4	11
Ústecký	9	12	12	4	8	3	13	12	12
Liberecký	8	5	6	2	10	6	12	6	7
Královéhradecký	5	4	7	8	7	7	4	3	5
Pardubický	10	6	11	6	12	9	3	9	10
Vysočina	7	7	1	7	1	8	1	1	1
Jihomoravský	4	9	2	10	2	5	7	13	6
Olomoucký	13	10	4	9	5	1	5	10	9
Zlínský	11	8	8	13	11	10	2	11	8
Moravskoslezský	6	12	13	12	13	11	9	8	13

Footnotes: ECO – economic sphere, UNEM – unemployment, ENV – environment, DEM – demographic situation, LIV – living conditions, SOC – social sphere, CRIM – criminality, HEAL – healts

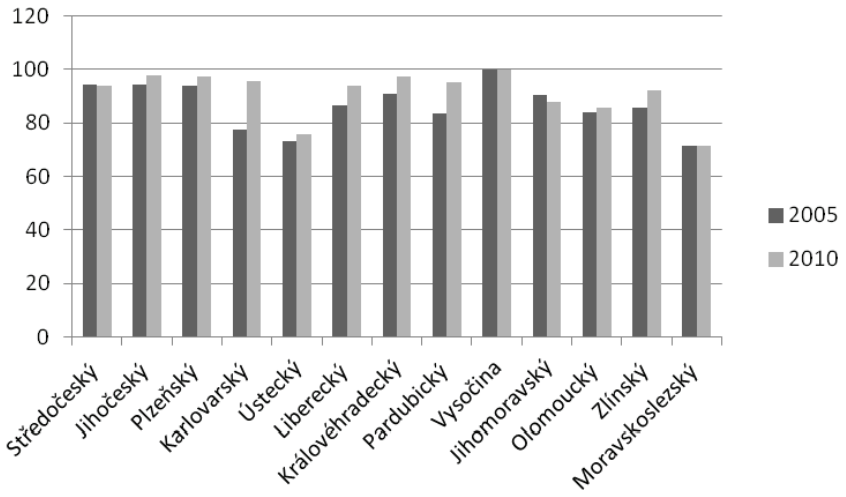
II: *Order of rank of the regions by the areas of research in 2010*

REGION	Area of research								
	ECO	UNEM	ENV	DEM	LIV	SOC	CRIM	HEAL	TOTAL
Středočeský	2	6	11	1	2	1	12	12	8
Jihočeský	4	4	1	5	5	4	9	5	2
Plzeňský	5	1	4	9	4	7	8	3	3
Karlovarský	13	7	9	7	6	2	1	8	5
Ústecký	7	13	12	3	12	3	11	13	12
Liberecký	12	5	3	2	9	5	7	11	7
Královéhradecký	3	3	7	8	3	13	5	2	4
Pardubický	10	2	10	6	10	9	3	6	6
Vysočina	9	8	2	11	1	12	2	10	1
Jihomoravský	1	10	6	4	7	10	10	1	10
Olomoucký	11	11	5	10	11	8	6	4	11
Zlínský	6	9	8	12	8	11	4	9	6
Moravskoslezský	8	12	13	13	13	6	13	7	13

Footnotes: ECO – economic sphere, UNEM – unemployment, EVN – environment, DEM – demographic situation, LIV – living conditions, SOC – social sphere, KRIM – criminality, HEAL – healts
Source: own calculation

regions Karlovarský, Pardubický, Zlínský, Plzeňský, Královéhradecký, and negative changes have taken place in the regions Středočeský, Jihomoravský and Olomoucký. Comparing separate areas of research the largest changes have been registered in the ECO, HEAL and CRIM areas.

Large differences in the rank in separate areas of research have been registered in Vysočina Region. Considering demographic situation and health of the population this region belongs to the weakest, according to the economic situation and unemployment it belongs to those worse ones, but contrariwise, from the crime, environment and living conditions standpoint it is one of the best. In the total assessment this region, not very surprisingly, is the best one in both the years. Similar large differences have been discovered in Středočeský Region where environment, health and crime have been assessed among the worst ones, while economic, demographic and social situation is very good. Considering the worse position of this region as concerns areas of research producing the largest differences in the regions, it stands on the tenth place in the total assessment. Lesser differences then have been obtained in the remaining regions. What's interesting is the assessment of living conditions. Already in previous research projects it was documented that, if subjective assessment was included, too, in this area of research, a comparatively strong correlation appeared between positive assessment of living conditions and higher share of smaller communities in the region.



1: *Share of points reached as compared with the best region assessed (%)*

The order of rank of the regions offers a certain assessment but it does not give the degree of disparity. This can be derived simply from the differences in total numbers of points reached. Picture 1 is presenting these differences in assessment in percentages (the region with highest points number has 100 %).

It is obvious from the picture that, disparity was higher in 2005. The fall of the points reached as compared with the best region assessed fluctuated between 5.79–28.54%, the average difference was 13.42%. A fall up to 5% has not been registered, a decrease above 5% up to 10% has been registered in five regions, namely the regions Středočeský, Jihočeský, Plzeňský, Královéhradecký and Jihomoravský, a decrease above 10% up to 20% in four regions – Liberecký, Pardubický, Olomoucký and Zlínský, above 20% was the decrease in Karlovarský, Ústecký and Moravskoslezský regions.

In 2010 the range of decrease of the numbers of points reached in the regions was 2.07–28.61%, the average decrease was 8.93%. In five of the regions the fall was below 5%, in three others it was between 5–10%, in two between 10–20%, and in the remaining two – Ústecký and Moravskoslezský regions the decrease was above 20%.

All in all, we can see that, certain decrease of disparities there was, considering the given aspect of assessment. With the exception of Jihomoravský, Středočeský and Moravskoslezský regions there definitely was a fall in the differences as compared with 2005. Also the average number of points in 2010 assessment was higher.

Considering that, in this assessment approach all the areas of research have been taken with equal weights, what usually is considered a shortage of this method, it also was examined how the final order of rank changed if different weights for the separate areas were applied. This comparison was performed for the 2010 data. The weights were established using two methods. In the first stage the principal component analysis was applied. As the heaviest weight areas the unemployment and population health areas were identified and against these the areas of environment, level of living, crime, and economics were alloted half-weights. Very low weights were given to social and demographic areas. Weights were applied in the aggregated indicator construction and based on it, the order of rank of the regions was established again. As it is seen in the Tab. III (Variety II), some changes have appeared in the order of rank in some of the regions, but the changes have not been significant.

The second approach in establishing the weights chose variability. Coefficient of variation served the basis for weights evaluation. Neither here (see Tab. III – Variety III) any significant changes in the order were found. In the evaluation following the subjective population assessment was removed from the level of living area. Neither here any significant changes in the total order have been found.

A different look at the order is being offered by the variety IV, where the economic area only is being considered (GDP), unemployment and demographic development. Here the order of regions is different as compared with the other stages of assessment and it confirms actually the UNDP Commission on the Measurement of Economic Performance and Social Progress, CMEPSP, conclusions stating

III: *Order of regions by separate varieties of the aggregated indicator evaluation in 2010*

REGION	Variety			
	I	II	III	IV
Středočeský	8	11	8	1
Jihočeský	2	4	2	4
Plzeňský	3	3	4	5
Karlovarský	5	8	6	10
Ústecký	12	13	12	9
Liberecký	7	7	3	6
Královéhradecký	4	2	5	3
Pardubický	6	10	9	7
Vysočina	1	1	1	11
Jihomoravský	10	5	11	2
Olomoucký	11	9	10	8
Zlínský	6	6	7	12
Moravskoslezský	13	12	13	13

Footnotes:
Variety I Aggregated indicator without weights applied
Variety II Aggregated indicator with weights from principal component analysis
Variety III Aggregated indicator with weights from coefficients of variation
Variety IV Aggregated indicator without weights applied, covering the ECO, UN and DEM areas only
Source: Own calculation

that, measurement of economic product only is not a sufficient indicator and it is desirable to shift to the measurement of well-being of the population (Report of the Commission, 2009). All the four varieties of the order of regions mentioned, as stated based on the aggregated indicator, are gathered in Tab. III.

CONCLUSIONS

It is obvious from the analyses performed that, the positions of the regions underwent certain changes in 2010 as against 2005. The positions remained unchanged for the regions assessed best – the Vysočina and Jihočeský, and for those assessed worst – Moravskoslezský and Ústecký. Positions of Karlovarský and Pardubický regions improved significantly over the period, while for Středočeský and Jihomoravský regions the positions worsened.

Assessing the size of disparities, positive changes can be stated based on the research performed; most regions show the differences in assessment reduced. In Ústecký and Moravskoslezský regions the significant differences have endured.

From the methodology viewpoint the assessment of positions of the regions and of the degree of regional disparities present a rather complex problem. Firstly, selection of indicators is to be decided. Too large a number of indicators can bring a deformation of results since a strong correlation exists between some; moreover, the output can be less comprehensible and interpretable. Essential indicators only have to be selected hence, covering the problem given. Various techniques exist, facilitating exclusion of correlated variables or variables offering minor information only. A rather simple criterion has been applied here, assessing the indicators according to their variation and material contents.

Construction of the aggregated indicator can be based on various procedures. As a starting point the multivariate statistical methods can serve, the given indicator's information power can be based on these and its weight determined. One has to realize, anyway, that construction of such indicators can be less comprehensible to a layman. A wider use of aggregated indicators requires a simpler and better comprehensible a procedure. The evaluations performed for the separate varieties have shown that, use of the same indicators has not brought up much changes in the resulting order and the simple point method without weights presented itself appropriate. Using this method, simple in the computations, a concise information, well comprehensible to the user, can be obtained.

SUMMARY

The paper has aimed at assessment of regional disparities, considering quality of the population's conditions of living in CR regions in comparison of 2005 and 2010 years. The methodology procedure of assessment consisted of three partial targets: selection of suitable indicators, selection of suitable construction method for the aggregated indicator construction, and assessment of changes in the size of regional disparities.

The selection of suitable indicators started by establishing the areas representing quality of population's living conditions and then relevant indicators were selected for separate areas. When deciding on inclusion of an indicator into the selection the information power and variability of the indicator was taken into question. Eight groups were formed this way and the indicators grouped in these.

In order to assess the indicator groups formed this way the point method was applied, based on which the positions of regions by separate areas and in total were assessed in the 2005 and 2010 years and changes in positions followed. In order to express the degrees of disparities a relative measure was applied – the difference (in %) of the number of points as against the region standing best. It followed from the analyses performed that, certain changes in the regions' positions in 2010 as against 2005 have taken place.Unchanged remained the positions of the regions assessed best – the Vysočina and Jihočeský regions, and the regions assessed worst – the Moravskoslezský and Ústecký regions. A significant improvement over the period in question has taken place in case of the Karlovarský and Pardubický regions, while positions of the Středočeský and Jihomoravský regions worsened rather much. Assessing the size of disparities, positive changes can be found based on the research done. At the average the difference has been reduced (against the 100% optimum) from 13.4% down to 8.9%. Most regions offer the differences in assessment reduced, only in Ústecký and Moravskoslezský regions the significant differences remain.

The selection of suitable construction method for the aggregated indicator construction concentrated upon comparison of results of separate methods applied. As it came up from the calculations done for the separate varieties, inclusion of the same indicators did not cause much changes in the resulting orders and the simple point method confirmed itself as appropriate. Using this computationally simple method a concise and user friendly and comprehensible information can be obtained.

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