POLYCENTRIC DEVELOPMENT ASSESSMENT USING THE HIERARCHY METHOD

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─Abstract ─

The concept „monocentric" describes inhabited agglomeration with one dominant centre. Latvia is a monocentric settlement with a strong main centre – Riga, which has a great specific weight in total economic system. At the same time Latvia has a wide, comparatively evenly distributed net of cities, the potential of which has not been properly used. The development of regions is unbalanced; the advantages of administrative territories are not used. Existent model of territorial development for Latvian regions cannot ensure sufficient financial resources, investment formation and dynamic pace of economic development. For the purpose of the European Union policy the settlement is polycentric, if there are several centres of equivalent value or centres, which supplement each other. Programs of polycentric development are included in program documents of the European Union; since joining the European Union these documents are mandatory also for Latvia.

The aim of the research is to identify alternatives of territorial development in Latvian regions. Within the framework of the research the expert questionnaire is performed, the results of which are being evaluated with the methodology of the Analytic Hierarchy Process. Achieved results can be used when making decision which of the territorial development alternatives needs to be developed first in order to achieve the set aim – sustainable development.

Key Words: *Planning Models, planning Policy; Size and Spatial Distributions of Regional Economic Activity; Regional Development Planning and Policy.*

JEL Classification: O21; R12; R58.

1. INTRODUCTION

The aim of the research is to provide expert questionnaire and evaluate alternatives of territorial development in Latvian regions. During the research several tasks were performed:

- distribution of studied problem in criteria groups and versions; creation of working table;
- work of experts in decision-making;
- processing and interpretation of acquired data.

Algorithm of Analytic Hierarchy Process is used to define which scenario of territorial development in regions could be recommended for the application in territory of Latvia. During the development of this article the following research methods were used: logical analysis, synthesis, and methods of hierarchical analysis. The period of the research is June-July of 2012.

2. Research of expert questionnaire

2.1. The Analytic Hierarchy Process – theoretical aspect

Decision-making or choice – it is a process, gradually defining priorities until definition of global priorities. The Analytic Hierarchy Process (hereinafter – AHP) was developed by American researcher T.Saaty. It was created for making complex decisions with the help of expert judgement. In the decision-making process with AHP several experts can be involved. It significantly reduces time and there is no necessity to evaluate priorities and look for compromises. AHP can be used only in cases, when at least three versions of alternatives and at least five criteria are available. The base of AHP is a systematic procedure for hierarchical arrangement of elements for every problem. Method includes analysis and synthesis. Hierarchy formation consists of four stages (Saaty, 1980):

- Creation of initial hierarchy;
- Defining the priorities;
- Observance of logical coherence;
- Decision-making.

The problem to be solved gradually has been divided into simpler parts (decomposition). The hierarchy of problem elements is created starting from the very top (aim), through inter-levels with criteria the next levels are subjected to; list of alternatives lies at the lowest level. Experts these parts compare in pairs and evaluate the intensity level of interaction among problem elements in the hierarchy (synthesis). Experts provide their judgement with the help of 9-point system, using scale of relative importance:

Table 1: The Saaty Rating Scale

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favour one over the other
5	Much more important	Experience and judgement strongly favour one over the other
7	Very much more important	Experience and judgement very strongly favour one over the other. Its importance is demonstrated in practice
9	Absolutely more important	The evidence favouring one over the other is of the highest possible validity
2,4,6,8	Intermediate values	When compromise is needed

Expert opinions are expressed in numerical values. Calculations are made according to the following formula (Saaty 1980:17):

$$\begin{array}{c|ccc} & A_1 & A_2 & A_3 \\ A_1 & \frac{w_1}{w_1} & \frac{w_1}{w_2} & \frac{w_1}{w_3} \\ A_2 & \frac{w_2}{w_1} & \frac{w_2}{w_2} & \frac{w_2}{w_3} \\ A_3 & \frac{w_3}{w_1} & \frac{w_3}{w_2} & \frac{w_3}{w_3} \end{array}$$

$$\sqrt[3]{\frac{w_1}{w_1}\times\frac{w_1}{w_2}\times\frac{w_1}{w_3}\times} = a_1 \qquad \sqrt[3]{\frac{w_2}{w_1}\times\frac{w_2}{w_2}\times\frac{w_2}{w_3}\times} = a_2 \qquad \sqrt[3]{\frac{w_3}{w_1}\times\frac{w_3}{w_2}\times\frac{w_3}{w_3}\times} = a_3$$

$$\frac{a_1}{S} = x_1 \qquad \frac{a_2}{S} = x_2 \qquad \frac{a_3}{S} = x_3$$

$$S = \sum_{i=1}^{3} a_i$$

where, A_1, A_2, A_3 – criteria of alternative choice;

w_1, w_2, w_3 – relative importance of criteria, chosen by the respondent;

a_1, a_2, a_3 – components of eigenvector;

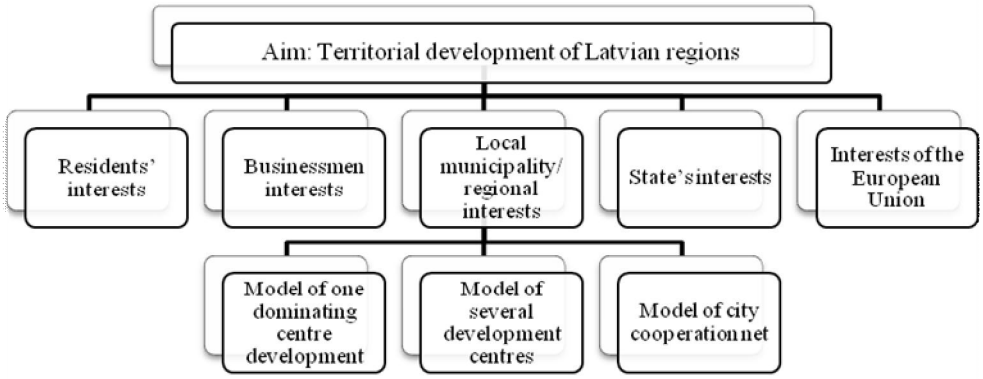
x_1, x_2, x_3 – components of priority vector.

The process of result defining evaluates criteria groups and sub-criteria, which achieved higher numerical evaluation of priority vectors. Received numerical evaluations can be used in making decision, which group of criteria and separate sub-criteria is necessary to developed first in order to achieve the set aim.

2.2. Defining the territorial development priorities in Latvian regions with the help of AHP

With an aim to define the territorial development priorities of Latvian regions the author with the help of AHP performed the current research. In the base of this research the author used criteria hierarchy of priority defining:

Figure-1: Criteria hierarchy of priority defining



Source**:** Figure made by the author I.Haite

In the first level of hierarchy the main aim of the research was set out – territorial development of Latvian regions. In the second level the author created five criteria groups, which are interested in territorial development of state's regions. Interests of criteria groups in promotion of territorial development in regions differ:

- Residents' interests are satisfactory conditions of life; possibilities to increase their quality of life; availability of working places; working possibilities according to the achieved specialty/profession/qualification.

- Businessmen interests include development of business environment; tax relief; availability of qualified labour force in administrative territory; high level of consumer purchasing power.

- Local municipality/region's interests cover keeping the existent residents and attraction of new residents in current administrative territory; implementation of program for solution of socio-economic problems; increase in local municipality budget income (taxes); advancement of territory availability and attraction; adjustment of infrastructure; increase of territory's competitiveness.

- State's interests are increase in tax income; relief of social budget; promotion of residents' living standards.

- Interests of the European Union cover implementation of Cohesion policy; promotion of European Union fund acquisition; equalization of socio-economic inequality.

In third hierarchy level the author distributed possible versions of territorial development in regions, which could promote development of Latvia. The author informs experts, which criteria affect territorial development of Latvian regions and provides three possible alternatives of territorial development in regions, which are grouped after the following principle:

Table 2: Alternatives in experts' questionnaire

Version of alternative	1st alternative	2nd alternative	3rd alternative
Title of alternative	Model of one dominating centre development	Model of several development centres	Model of city cooperation net
Division of territorial development	Monocentric	Polycentric	Polycentric

Source**:** Table made by the author I.Haite

The concept „monocentric" describes inhabited agglomeration with one centre, respectively – it is a settlement, where only one centre takes the dominant place. Monocentric development is a set of activities, which is directed towards promotion of centre development. First alternative is „*Model of one dominating centre development",* which is a part of monocentric direction of territorial development in regions and was given to experts for assessment.
The concept „polycentric", in its turn, describes inhabited agglomeration with many centres. It is a settlement with several centres, which are equivalent or supplement each other. Polycentric development means set of activities, which is directed forwards development of many centres. The author provided to experts two identified models of polycentry for evaluation (Maier, 2006:16):

1) *Model of several development centres (2nd alternative)*. This model outlines spatial development, which is characterized by idea that mutually independent development centres are promoters of region development. This development is characterized by relationship between centre and outlying area; i.e., when centre – a strong city develops, also neighbouring cities and outlying areas develops together with the centre.

2) *Model of city cooperation net (3rd alternative)*. The principle of the model: cities cooperate and functionally supplement each other in order to promote total development. Due to cooperation and functionally supplementary synergy, cities of the net form greater economy than separate cities.

The author for this questionnaire chose experts whose field of activity, post and experience is significant to evaluate offered priorities of territorial development for the regions of Latvia. Experts, chosen for the research on territorial development of regions with the help of AHP, are the following:

Table 3: Participants of expert questionnaire

No.	Description of expert
1.	Representative of Ministry of Environmental Protection and Regional Development in field of regional development planning
2.	Representative of planning region
3.	Head of local municipality
4.	Representative of business environment – employers' association
5.	Representative of European Union institution in Latvia

Source: Table made by the author I.Haite

Questionnaire consisted of 2 parts: in the first part experts evaluated criteria set in the 2nd level in pairs against the aim – define priorities of territorial development in Latvian regions, defining priorities among criteria groups; in the second part experts had to compare criteria, defined in 3rd level against each of criteria, set out in the 2nd level. Experts provided their assessment with 9-point system, using the scale of relative importance. Acquired questionnaire results were processed according to AHP methodology.

2.3. Analysis of expert judgment

In order to ascertain about exactness of expert judgments, the coherence relation is defined. The author of AHP T.Saati indicates that coherence relation must be smaller than 10% or 0.10; coherence relation, smaller than 20% also can be permissible. Calculating the coherence relation for questionnaire of each expert in criteria group of 2nd and 3rd level it was calculated from 0.00 to 0.20, therefore it can be stated the results are in permissible margins.

After the data procession, summarizing all experts' assessments on territorial development in Latvian regions after the criteria groups, the following results are achieved:

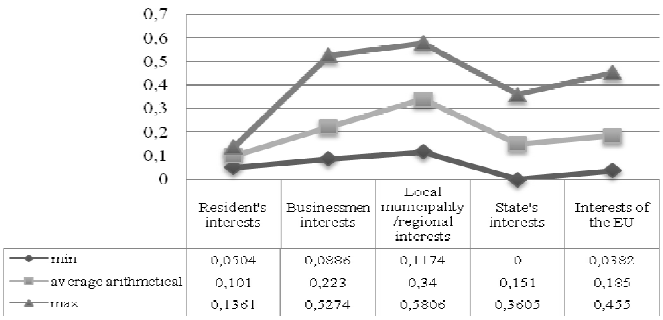
Table 4: Assessment of priority vector after the results of expert questionnaires in criteria group of 2nd level

Criteria groups	Assessments of priority vector for responses of each expert					Average arithmetical value
	1.	2.	3.	4.	5.	
Residents' interests	0,126	0,064	0,136	0,050	0,128	0,101
Businessmen interests	0,527	0,162	0,089	0,124	0,213	0,223
Local municipality/regional interests	0,267	0,117	0,581	0,227	0,507	0,340
State's interests	0,041	0,202	0,154	0,360	0,00	0,151
Interests of the European Union	0,038	0,455	0,040	0,238	0,151	0,185

Source: Results of expert questionnaire made by I.Haite

Data in table No.4 and figure No.2 indicate the greatest interest about territorial development in Latvian regions show local municipalities/regions with the average arithmetical indicator 0.340. It can be explained with the fact that representatives of local municipalities and planning regions want residents to stay in their administrative territory and work there for the further development, which could generate an increase in local municipality budget income. Representatives of local municipalities and planning regions work with provision of territory availability, increase of its attraction and competitiveness, implementing both investment projects and input in human capital.

Figure-2: Assessment of experts on territorial development in Latvian regions for criteria groups



Source: research by the author I.Haite

Experts have expressed their opinion that also interests of businessmen and the European Union is significant, but interests of residents and state, in their turn, were evaluated with average arithmetic indicator of only 0.101 to 0.151. Minimum interest of residents about the territorial development of regions can be explained with the fact that currently there is no appropriate quality of life for residents in regions of Latvia. High unemployment rate limits the availability of

working places and possibilities to work according to acquired speciality and qualification which, in its turn, promotes the migration of residents from state regions to the capital of Latvia and abroad.

Basing on the acquired results the author has performed calculation of global priority vector, which gives the possibility to define the most optimal distribution of priorities of territorial development for Latvian regions.

Table 5: Global priority vector for priorities of territorial development in Latvian regions (the average arithmetic value)

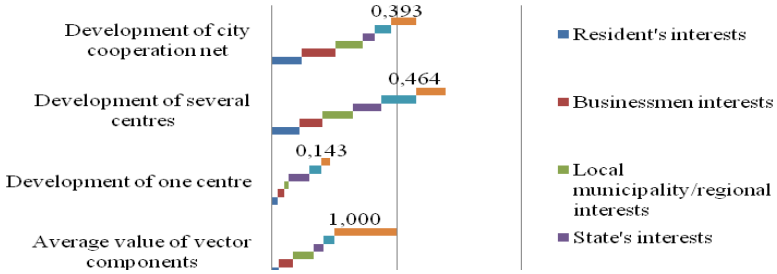
Criteria groups	Residents' interests	Businessmen interests	Local municipality/ regional interests	State's interests	Interests of the European Union	Global priority vector
The average value of vector components	***0.101***	***0.223***	***0.340***	***0.151***	***0.185***	***1.000***
Development of one centre	0.094	0.091	0.084	0.332	0.184	0.143
Development of several centres	0.432	0.365	0.488	0.465	0.558	0.464
Development of city cooperation net	0.475	0.544	0.428	0.203	0.259	0.393

Source: Results of expert questionnaire made by I.Haite

Data of the table represent the fact that direction of territorial development in regions, chosen by „Residents" and „Businessmen", is formulated in favour of „Development of city cooperation net", i.e., polycentric development, which is expressed with average arithmetical value – 0.475 and 0.544. Value of „One centre" (monocentric) development, in its turn, in the abovementioned criteria groups was four times lower. The average arithmetical value for „Several centres" (polycentric) development direction from criteria groups „Local municipality/regional interests", „State's interests" and „Interests of the European Union" is 0.488, 0.465, and 0.558, respectively. The model of city cooperation net (polycentric model) also shows indicators of supportive direction. The abovementioned criteria groups show different judgement for development of „One centre" (monocentric), for example, criteria group „State's interests" show high average arithmetical value – 0.332, which indicates that direction of polycentric development, set out in all state's long-term planning documents partly is in conflict with the current situation.

Though state is interested in tax income increase and according to guidelines of the European Union state shall ensure an increase in life standards of residents and implementation of Cohesion policy, still existent tendencies of monocentric development negatively affect implementation of polycentric policy for regions.

Figure-3: Expert judgement on alternatives for territorial development in Latvian regions



Source: Results of expert questionnaire made by I.Haite

Calculated global priority vector shows that priorities for territorial development in Latvian regions are polycentric development – model of several development centres (global priority vector 0.464). Representatives of local municipality/regions should continue their work in promotion of this model, strengthening representation of their interests in national level or in the European Union, at the same time involving residents and businessmen of their administrative territories in different activities.

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CONCLUSION

Results of expert questionnaire within the context of initially set aim – sustainable development can be assessed positively. The experts' chosen alternative of territorial development in regions – „Development of several cities" is polycentric division of territory. According to guideline of sustainable development, countries with a model of polycentric development have better possibilities for development, if compared to countries with monocentric direction. Tendencies of monocentric territory development in Latvia prevent state's direction towards polycentric development. Latvian regions can be characterized with low

competitiveness, insufficient city development and low connection with surrounding territories. It also should be mentioned that evenly distributed net of cities in Latvia is favourable for polycentric and balanced country development in future. Expert judgement can be taken into consideration when implementing future programs of sustainable development and common regional policy in Latvia.

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