Sustainable Solutions in Development Countries – Lithuania Case

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1. Introduction

The main aim of a town's sustainable development is to match up the economical growth of the town's progress, focusing on a more prudent consumption of natural resources and by maintaining the ecological balance as well as ensuring favorable living conditions for the next generation. The poverty is one of the major obstacles when implementing sustainable development (Ciegis R., 2002). Sustainability is not a digital balance among all three aspects of the conception, their objectives and needs, although it is necessary to co-ordinate them and set prerequisites in order to implement the conception (Danilov-Daniljan V.J.&Losev K.S., 2000). The most important features and requirements of town and regional sustainable development were summarized in Agenda 21 (An Agenda 21, 1998). The conception of sustainable development includes the way to match two different and sometimes contradictory attitudes: "development-progress-grows" and "stability-security-environment" (Danilov-Daniljan V.J. & Losev K.S., 2000). The problems of Lithuanian regions and towns go together with the subsequences of the impact on social life of the town when some of the towns or regions degrade. While other economical processes lead the towns towards stagnation and town or regions become unattractive for investment (Burinskiene M., *et al.*, 2003, Dzemydiene D.& Rudzkiene V, 2002). EU directives constantly highlight the importance of the regions and their equal development. During the last twenty years uneven development has been on the increase. In general, the objective of sustainable development is to protect and improve the quality of life.

Transformation of command economy into market economy has resulted in the rearrangement of economic activities in Lithuania. Changing markets of resources and goods, implementation of new industry technologies were accompanied by the development of small and medium-size business, more extensive international partnership in business and in other activities. All these processes have changed and disbalanced systems of towns, regions and villages, as territorial units, that previously existed. Innovation of industry branches, establishment of joint ventures, improvement of access to financial capital are the phenomena that have strengthened concentration of skilled potential, especially the youth, in major towns of the country. In spite of the efforts to stimulate sustainable development (Strategy of social…, 2002), the occurring phenomena have preconditioned speedier development of some regions and lacking behind of other regions and even occurrence of socially negative locations (Didžiasalis, Rukla).

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Implementation of sustainable development policy is one of the most complicated tasks and challenges faced by the global community, the achievement of which is sensitive.In 2003, the Government of the Republic of Lithuania approved the National Strategy for Sustainable Development of Lithuania which emphasises that one of the major tasks of decision-making at all levels of governance is to ensure continuity of social development, integrity of social, ecologic and economic fields, and efficiency of decisions. In the course of the changing economic relations it is not easy to maintain mutual balance and sustainability of processes (Čiegis *et al.* 2008; Viteikienė,M. & Zavadskas E.K., 2007). Theoretically, the sustainable development system is not fully set up, thus often different theoretical aspects and paradigms are used when speaking of sustainable development, and different trends of development theories and individual methodologies for future forecasting are applied (Jakimavičius M. & Burinskienė M., 2007).

Modelling the transition processes in a simplified form can be based on some broad, partly overlapping categories of models: mathematical equation-based, system dynamics, statistical, expert systems (Kauko T., 2007), and/or evolutionary or hybrid. By applying these models, the possibility of discontinuous transformation of quantity into quality (that can arise during the initial transformation phases) should be suggested (Feichtinger G., 1996; Lorenz H.W., 1993). The non-linear dynamic phase is expected when the old system enters a period of crisis. Such a dynamic period can also be observed after an economy has hit the bottom and begun to grow again (Rosser J.B., 2000; Feichtinger G., 1996; Lorenz H.W., 1993).

The goal of sustainable development is to combine economic growth, social progress and sparing use of natural resources, maintaining ecological balance and ensuring favourable living conditions for current and future generations. Development is fostered in a certain territory, in its natural environment, thus it is important to find out reasonable extent and form of development, so that life quality is maintained and negative impact on environment is reduced (Burinskienė M.& Rudzkienė V. 2004, 2007; Kavaliauskas P., 2008). Analysis of the sustainable development must be based on a systematic approach, not only planned but also include the consumption aspect, emphasising sustainable consumption and production. Planning is a political process where plans are drafted, activity directions foreseen, and decisions made by different level politicians.

2. Application of multidimensional statistical methods for direct foreign investment analysis

To describe the social-economic processes and phenomena, large sets of social–economic indicators are necessary. Most of these indicators take the form of time series in data warehouses. This causes some difficulty connected with the establishment of the interrelation structure of these indicators. In addition, many social and human-initiated events deal with incomplete or limited (by nature) information and a complex structure of their interdependencies. That is why the use of statistical methods for the social-economic process analysis and decision-making is not only justified but also indispensable. In describing the socio-economic situation, a great volume of initial data and indicators are used that characterize the development of a process, therefore it is very important to select the most important ones and to consider a small amount of indicators or their groups. Frequently the initial data is transformed so as to ensure the minimal loss of information.

2.1 The model

Investments (like other human-initiated events) are random events in space and time:

a. Observation objects of interest (towns, regions, districts, etc.) are selected, i.e., a sample $O = (o_1, o_2, \ldots, o_N)$. The object of a data set is a unit of data whose features are to be investigated. The objects have respective features (or indicators) $X = (x_1, x_2, \ldots, x_n)$ that describe their attributes. These features are measured within particular time intervals (ranges, e.g., a year interval), $\Delta t = (\Delta t_1, \Delta t_2, \ldots, \Delta t_k)$.

b. Compose an *(N×n×k)* - dimensional matrix $Q_{ij\Delta t}$ that consists of object features in the time intervals being considered, where *i* is the object considered, *j* denotes measured features, and *Δt* is a time interval.

c. When preparing data for a further analysis, we determine the homogeneity of the objects observed by investigating their properties. Cluster analysis belongs to classification algorithms and solves the issue of how to organize the observed data into meaningful structures. The general categories of the cluster analysis methods are: joining or tree clustering, two-way joining or block clustering and k-means clustering. If the clusters are clear heuristically, the methods of variance analysis are usually used. This classification problem can also be solved in other ways: using heuristics or extreme way (Дубров A.M. *et al.*, 1998). . Clusters of objects *N* are defined by choosing a fixed time interval *Δt*, and soundness of the clusters formed is verified in other time intervals.

d. When clusters of objects are formed, the structure of features characterizing the clusters is under determination. For this reasons factor analysis methods are selected for the problem's solution. The factor analysis is applied to reducing the number of variables and for detecting a structure in relationships between the variables. Generally, as a method for data reduction, principal component analysis is often preferred, and the principal factor analysis is more frequently used in the case when the goal of an analysis is to detect the structure.

e. Having verified the data adequacy/suitability to the factor analysis, variables that are not suitable for the analysis are found and eliminated. The adequacy of data (variables) for the factor analysis can be verified by the Kaiser-Meyer-Olkin measure of sampling adequacy KMO (Kaiser, H.F. 1958, 1960):

$$\text{KMO} = \frac{\sum \sum_{i \neq j} r_{ij}}{\sum \sum_{i \neq j} r_{ij} + \sum \sum_{i \neq j} \tilde{r}_{ij}} \tag{1}$$

Here r_{ij} is the correlation coefficient, and $\tilde{r}_{ij}$ is the coefficient of partial correlation. If the KMO value is low, then the indicators considered do not apply to the correlation analysis, since other indicators cannot explain the correlation of these indicators. For making the exploratory data analysis, it is recommended firstly to analyse the principal components (Kline, P., 1994). The components obtained in this analysis are not correlated and emerge in decreasing order of the amount of the variance that is explained.

f. To obtain a clear pattern of factor loadings, factor rotation strategies should be applied.

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The fundamental theorem of factor analysis is invariant within rotations. The results of rotation, However, to indicate "the simplest solution among a potentially infinite number of solutions that are equally compatible with the observed correlations" (Kim J.O. & Mueller, C.V., 1978) is also essential. The simplest case of rotation is an orthogonal rotation. Typical orthogonal rotation strategies are *Varimax*, *Quartimax*, *Equamax*, and *Orthomax*. The *Varimax* rotation method is the most commonly used orthogonal rotation procedure. The overriding criterion of a simple structure is that each factor should have a few high loadings with the rest being at zero or close to zero (Kline, P., 1994). After clearing the patterns of factors, the influence of individual indicators x_n is evaluated and the factor interpretation is performed.

g. The interdependence of variables (indicators) composing the factors is evaluated and indicators are predicted by forming a multivariate regression equation for time intervals Δt.

h. A multiple regression analysis determines the relationship between several independent variables and a dependent variable. The regression function can be estimated by using the least squares estimation or any other loss function (non-linear estimation). After the regression equation has been estimated, the prediction can be computed for a set of independent variables.

2.2 Model evaluation

The target of the research was to explore, estimate, and apply the use of multivariate statistical models in the analysis and prediction of the state's situation and tendencies for even distribution of the quality of life in Lithuanian towns and regions by paying particular attention to the safety of the society. Social health and security, education opportunity, public health care, versatility of life, personal career abilities, self-expression, community, culture, social life, recreation – all these are treated as a part of the quality of life. In order to estimate the situation and make decisions it is expedient to evaluate and select the main factors that influence the direct foreign investment in Lithuanian towns and regions. Most frequently the factor and component analysis are used for this purpose. These methods make it possible to evaluate the multidimensionality of the essential data and to explain concisely and simply the multivariate structures. They reveal real and existing, but directly imperceptible regularities by means of factors or principal components.

The aim of the factor analysis is to explain the outcome of p variables in the data matrix X by using fewer variables, the so-called factors. These factors are interpreted as latent (unobserved) common characteristics of the observed $x \subset R^n$. In the factor analysis every observed $x = (x_1, \ldots x_n)^T$ can be written as:

$$x_j = \sum_{l=1}^{k} a_{jl} f_l + \varepsilon_j, j = 1, \ldots n; k \leq n \qquad (2)$$

Here f_l for $l=1,\ldots,k$ denotes the factors; ε_j is the residual of x_j on the factors. According to the logical sequence of problems solved by the factor analysis, the arising problems can be arranged in the following order: the first problem is a robustness, second one – community, third one – factors, fourth one – rotation, fifth one – estimation of factor values, and a sixth one – dynamic models (Дубров А.M. *et al* , 1998).

In the selection process of observation objects of interest a set of 13 social- economic indicators were collected for the research from 12 Lithuanian towns and 43 regions during time intervals of the period from 1996 until 2001 (Counties of Lithuania…,2002). We consider the matrix denotes as $X [n \times N]$. The matrix elements x_{ij} illustrate the value of the jth indicator at the ith research object and have particular values and semantics:

$x_{i,1}$ – registered crimes;
$x_{i,2}$– average annual number of employed;
$x_{i,3}$– unemployment rate;
$x_{i,4}$ – natural increase;
$x_{i,5}$ – migration;
$x_{i,6}$ – average monthly gross earnings;
$x_{i,7}$ – sales of industrial production;
$x_{i,8}$ – average real estate price;
$x_{i,9}$– dwelling acquisition;
$x_{i,10}$ – investment in the construction of residential houses;
$x_{i,11}$ – investment in tangible fixed assets;
$x_{i,12}$ – direct foreign investment;
$x_{i,13}$ – turnover of catering,
Where $i=1,2…N$.

Several important issues are considered preparing data for the factor analysis. First, which variables should be included into the analysis. Second, how many variables should be included. A factor cannot be defined by using a single observed variable.

While considering the Lithuanian social-economic indices of 1996-2001, the sample of objects studied has naturally to be divided into two groups: the first group consists of the largest cities and resort towns, and the second one – of regions. To form the groups, we can use cluster analysis methods, however, in this particular case, group boundaries are clear. Substantiation of the division is verified by the hypothesis Ho stating that the average number of direct foreign investment in towns and regions is equal. This hypothesis is verified by the criterion:

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{S_1^2/N_1 + S_2^2/N_2}} \qquad (3)$$

Where $\overline{x}$ is the estimate of mean, and S is the standard deviation.

Arithmetic means of the direct foreign investment calculated, values of the criterion t, degrees of freedom, and the observed significance level p are presented in Table 1.

The obtained results in Table 1 show that the significance level observed in the years under investigation is lower than 5%. Therefore, we have to reject the hypothesis H_o and to consider the direct foreign investment in towns and regions separately. After evaluating the influence of each variable on the *KMO* measure, we eliminated four variables from the list of indices considered, namely: average annual number of employed, unemployment rate, natural increase, and investments in the construction of residential houses. The KMO measure of the rest variables KMO=0.68, so, we conclude that the data is adequate for the

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factorial analysis. For making the exploratory data analysis, it is recommended firstly to analyze the principal components (Kline, P., 1994). The components obtained in this analysis are not correlated and emerge in decreasing order of the amount of variance explained.

Year	Average number of direct foreign investment in towns	Average number of direct foreign investment in regions	t-value	df	p
1996 m.	451.4	155.5	2.12	44	0.0397
1997 m.	876.7	234.1	3.14	49	0.0028
1998 m.	1384.5	288.0	4.21	48	0.0001
1999 m.	1927.1	415.8	3.97	47	0.0002
2000 m.	2421.1	438.8	4.09	48	0.0002
2001 m.	2412.1	517.5	3.45	50	0.0011

Table 1. Verification results of the hypothesis that the number of direct foreign investments in towns and regions is the same.

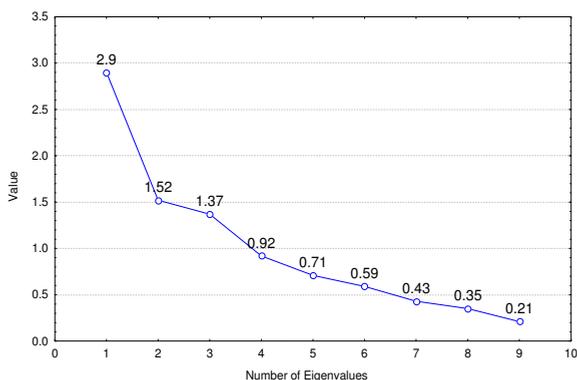The number of factors to be extracted can be determined in a screen plot (Fig. 1).

Fig. 1. The rate of change in the magnitude of eigenvalues for the factors.

A large first eigenvalue (2.9) and a much smaller second eigenvalue (1.52) suggest the presence of a dominant global factor. The most widely used criterion for finding number of factors is the *Kaiser criterion* (Kaiser, H.F., 1960), which recommends retaining only the factors whose eigenvalues are greater than 1. The scree plot (Fig. 2) also suggests a maximum of four factors. These four factors account for 64.3% of the whole variance.

After evaluating the number of factors to be extracted, the next logical step is to determine the method of rotation. The overriding criterion of simple structure is that each factor should have a few high loadings with the rest being zero or close to zero (Kaiser, H.F., 1958). In application of this criterion, the *Biquartimax* method was selected as providing the simplest structure solution. When the rotation method is applied, one part of the output from the factor analysis is a matrix of factor loadings (Table 2). A factor loading or factor structure matrix is a matrix of correlations between the original variables and their factors.

Factor Loadings (Biquartimax normalized)			
	Factor 1	Factor 2	Factor 3
Direct foreign investment	**0.66**	0.26	0.02
Migration	-0.09	**0.72**	-0.01
Average monthly gross earnings	0.53	0.03	**-0.67**
Sales of industrial production	**0.84**	-0.28	0.16
Average real estate price	0.13	**0.80**	0.15
Dwelling acquisition	-0.24	-0.17	**-0.85**
Investment in tangible fixed assets	**0.77**	0.22	-0.29
Turnover of catering	**0.81**	-0.24	0.19
Registered crimes	0.33	0.25	-0.23
Expl.Var	2.88	1.51	1.39

Table 2. Factor Loadings. Clusters of loadings are marked

2.3 Interpretation of factors

The meaning of the rotated factors is inferred from the variables significantly loaded on their factors. A decision needs to be made regarding what constitutes a significant loading. The simplest criterion is that factors loadings greater than 0.30 in absolute value are considered to be significant. As the sample size increases, the criterion may need to be adjusted a little downwards. When the number of factors increases it may be adjusted upwards. In general, the larger the absolute size of the factor loading for a variable, the more important the variable is in interpreting the factor. As we can see from results in Table 2, the most significant variables for the first factor are:

- Direct foreign investment

- Sales of industrial production
- Investment in tangible fixed assets
- Turnover of catering

We may therefore state that this factor reflects the growth of economy and the improvement of living conditions of many people. The greatest impact on this factor is made by variables such as *sales of industrial production* (*L=0.84*), *turnover of catering* (*L=0.81*), that reflect the increasing retail trade, *investment in tangible fixed assets (L=0.77),* and *direct foreign investment* (*L=0.773*) which indicates the increasing influence of foreign investment. The second factor reflects the adaptability of people to changing circumstances and it consists of two variables *migration* (*L=0.72*) and *the average real estate price* (*L=080*). The third factor is constituted of variables *average monthly gross earnings* (*L=-0.6*) and *dwelling acquisition* (*L=-0.8*). This factor reflects the improving in Lithuanian economic situation and relation between average monthly gross earnings and dwelling acquisition.

Attraction of the direct foreign investment is especially important for sustainable development of countries which have planned economics proceeding to market economics. Lithuania as well as other countries construes TUI as important capital, export expansion, increase of employment and implementation of innovative knowledge and source of growth of economics. Investment of foreign companies allows gaining an access to new foreign markets for local manufacturers also supplements national budget by income from taxes, improves national trading balance. According to Balasubramaniam et al. (1999) in order to attract TUI a country needs to have high enough educated human capital level and well expanded financial market.

Lithuania, Latvia and Estonia have high enough qualified manpower, but still they are missing capital and their technologies lag behind technologies which operate in developed countries. The attraction of foreign investment is not only a target in Lithuania, but necessity in order to materialize one of the main strategic purposes of the country – to strengthen national economy and improve the living quality of people by entering Europe's trade and capital market. Lithuania became more attractive for foreign investors after joining European Union (EU) and NATO. Harmonization of Lithuania's national law with EU law became as a safety guarantee for foreign investors.

Direct foreign investments are one of the main factors explaining the economic growth potential. In 2009 Lithuania took 47th place in the world by economic ability. Qualified and competitive manpower in Lithuania is very attractive for investors (Schwab, 2011). There are about 20 thousand of high education graduates every year in Lithuania. This index is one of the biggest not only in Eastern Europe, but in EU as well. The average wage in Lithuania is still one the lowest of EU countries. High manpower qualification and low wage level influences attractive proportion between labour quality and expenses for business. Although there is a lack of unqualified manpower in Lithuania and that is a barrier for a development of investment attraction economics. There is a lack of qualified specialists at the moment because of the emigration of manpower as people are looking for a higher salary abroad.

2.4 Hierarchical cluster analysis

The purpose of the cluster analysis in this investigation is finding regions with similar characteristics. Cluster analysis attempts to identify relatively homogeneous groups of cases

(or variables) based on selected characteristics, by using an algorithm that starts with each case (or variable) in a separate cluster and combines clusters until only one is left. In the case when a large number of variables are used for cluster analysis it is recommended to reduce the number of variables before starting cluster analysis procedure. A factor analysis often is used as one of the methods for reducing the number of variables (Bühl A. & Zöfel P, 2000). We will use factor score estimates for the regional classification.

There are two general classes of methods for estimating factor scores. The first class of methods yields approximately a standardized factor score estimate with different properties. Regression approach produces factor score estimates that maximize determinacy (Bollen, K.A., 1989).

$$F = \Phi \cdot \Lambda^T \Sigma^{-1} x \qquad (4)$$

Here F are the estimated common factors, Φ is the covariance matrix of the common factors, Λ is the matrix of loadings, Σ is the model-implied covariance matrix of the measured loadings. Matrices are based on estimated parameters. Other methods yields factor score estimates that are perfectly orthogonal (uncorrelated) (Krijnen, W. P. *et al*, 1996). Each of the refined methods is imperfect. Regression estimates will be correlated even when the factors are orthogonal, and orthogonal estimates will not maximize determinacy. Having computed the regression estimates of factor scores, the data was partitioned by separate years and performed agglomerative hierarchical cluster analysis. When creating clusters by this method, each case starts out as a cluster. At every step, clusters are combined until all cases are members of a single cluster. Squared Euclidean distance was chosen as the measure of classification. This distance is computed as $D(x,y) = \sum_i (x_i - y_i)^2$;

Agglomerative hierarchical clustering helped to determine the number of clusters. Applying this procedure were determined the optimal number of clusters - five clusters. Dividing the regions into five clusters we obtain such cluster membership (Table 3).

Cluster numbers are marked in brackets. Regions that are out of the listing depend on the first cluster. Evidence for the new faith in the economy of space can be found in the theories of creating regional competitiveness by localized learning, the development of governance leadership and by the development of clusters. Theories of clustering are *par excellence* theories of the economy of space, since they rely on the assumption that geographical proximity between related production units create added value and local competitiveness (Danson M. W., 2000).

The Lithuanian urban system was a very balanced one, if balance is understood as a graduated city-ranging and an equal dispersion of the centers in the territory. But now in Lithuania wealth is becoming increasingly concentrated in the capital as well. This has lifted the position of Vilnius when compared to its situation before regaining independence. The current goal - the ESDP of a polycentric urban system has similarities with the post-war regional planning in Lithuania. Since the 1960s Lithuanian regional planning followed the concept of the universal settlement system, based on Christaller's theory of central places. In the 1970s the paradigm stressed the role of urban centers and their modernizing effect on the periphery. The tools of regional planning have changed completely after the regaining

independence (Schmidt-Thome, Bengs, 1999). The Act on Territorial Planning (1995) defines the levels of territorial planning of the nation, the county and the municipality. All levels can elaborate comprehensive plans and special plans for subsystems, such as water supply or transportation development. The detailed planning is carried out at the municipality level. The Lithuanian Parliament approved the Comprehensive Plan for the Lithuanian territory in year 2002. This Plan was defined on the national guidelines for spatial planning and support the implementation of regional policy (Comprehensive Plan…, 2002). At this moment it is the main document for physical planning and also it has created preconditions for the sustainable development of the whole territory of Lithuania. In year 2002 Strategic Plans for economic sector development were finalized (Long-term Economic Development Strategy …, 2003). The connection of these strategic documents has created the background to implementing the sustainable development of Lithuanian regions. The cluster analysis used for the evaluation of the development of Lithuanian regions allows one to show changes in the 2001 year (Fig. 2, 3).

Regions	1996	1997	1998	1999	2000	2001
1	Ignalinos (2)	Alytaus (2)	Alytaus (2)	Ignalinos (2)	Ignalinos (2)	Ignalinos (2)
2	Kauno (3)	Ignalinos (3)	Anykščių (2)	Kauno (3)	Kauno (3)	Klaipėdos (3)
3	Klaipėdos (3)	Kauno (2)	Ignalinos (3)	Kėdainiai (4)	Kėdainiai (3)	Mažeikių (4)
4	Mažeikių (4)	Klaipėdos (4)	Kauno (4)	Klaipėdos (4)	Klaipėdos (3)	Vilniaus (5)
5	Trakų (5)	Kretingos (2)	Klaipėdos (4)	Kretingos (3)	Kretingos (3)	
6	Vilniaus (3)	Mažeikių (5)	Kretingos (4)	Mažeikių (5)	Mažeikių (4)	
7		Trakų (4)	Mažeikių (5)	Trakų (3)	Panevėžio (5)	
8		Vilniaus (2)	Panevėžio (2)	Utenos (4)	Trakų (3)	
9			Šiaulių (4)	Vilniaus (3)	Utenos (3)	
10			Trakų (4)		Vilniaus (3)	
11			Vilniaus (4)			

Table 3. Cluster membership of regions for factor scores in 1996-2001

The main principles for the regional policy were presented as result of a cross-sector approach. A comprehensive result of this plan in graphic form was expressed in the following main schemes:

- Macro-regional situation of Lithuania,
- Spatial concept of the territory: main territorial structures and principal model.
- Functional priorities of the territory,
- Development of the technical infrastructure (Comprehensive Plan …, 2002).

Fig. 2. Clusters analysis in 1996

Fig. 3. Cluster analysis 2001 year

A comparison of this scheme with schemes of cluster analysis according to the following years allows one to evaluate the sequences of development of Lithuanian regions. For example, Vilnius region from year 1996-2001 had a better position compared with other regions of Lithuania and in 2001 it had reached the highest cluster. From other hand in 2001 Kaunas region became equal to most of Lithuania's regions. The total amount of direct foreign investment for the whole country increased from year to year but in last period foreign investments concentrates in four main regions: Vilnius – capital, Klaipeda – sea port, Mazeikiai – Oil production plant and Ignalina – Nuclear Power Plant. The clusters analysis allows for maintaining this without changing investment policy and creating legal and economic regulations and further foreign investment will be concentrated in the largest city regions and regions with the main industrial plants that are important to the whole country, herewith increasing the gap between larger and smaller town regions that disagree with the directives of sustainable development.
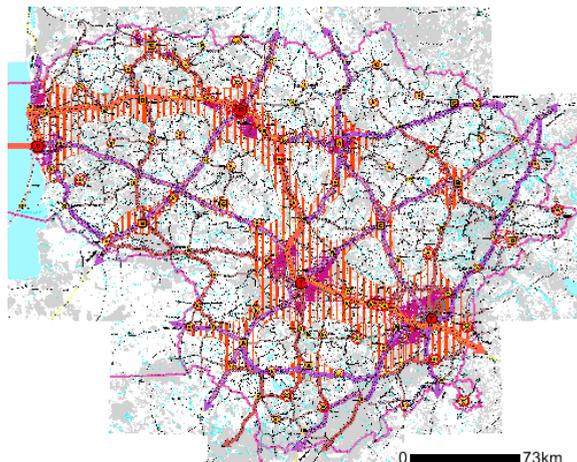
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Fig. 4. The main urbanite framework according to the Comprehensive Plan of the Territory of the Republic of Lithuania (Comprehensive Plan …, 2002).

3. Strategy Innovation

In the last decade, the strategy of innovations has become a critical factor of competition in the modern world that undergoes uneven development. Innovation strategy is ability to resume the existing model in such manner that a new value is created for consumers and intermediaries. Innovation strategy is the main way to survive under severe competitive fight and lack of resources. If success of an organisation is defined as a contribution of the organisation into a certain field, for example, national economy, transport, communications, knowledge economy, etc., then innovations become inevitable.

At present, the competitive environment being created and the strategy of development differ from the strategy conception that existed several decades ago. The modern strategy includes the following key topics: knowledge, insight, competence, networks, ecosystems, transformation, and resumption.   However, in order to secure rapid development and at the same time to win a competitive struggle, mere knowing of these popular notions and schemes is not sufficient. Unfortunately, it should be recognised that principles and theory of creation of modern strategies are still in the stage of development. Statement that endless process of planning is a strategy would be erroneous in its essence.

Setting of advance assumptions is one of the key conditions for development of innovation strategies. A complex theory states that processes are generated by formation of necessary premises (Kauffman, 1995). What are prerequisites that would condition success of innovation strategy and of all organisations? Usually, when developing or presenting strategies, a complicated artificial system is constructed and contemplations are related to innovations rather than to assumptions that precondition occurrence of innovation strategies. A complicated artificial system is constructed in this was but no efforts are laid to perceive and create conditions for the occurrence of this system. It is considered that successful creation of innovation strategies is aided by the implementation of some presumptions (Davenport, T. & Prusak L., 1992, Strategic Thinking…, 2001).

4. Development of IT (Information Technology) infrastructure of regions of Lithuania

Systematic development of IT infrastructure of Lithuanian regions was started in 1995-1996 when implementing the project KIS Municipality, when the first websites of Lithuanian municipalities occurred on Internet. In 1997, implementing the Phare project, websites of Lithuanian Municipality Association (LMA) were designed; they gave short information on all municipalities – their arms, a short presentation of a region, contacts, a short version in English. The analysis of social-economic data in time from 1996 till 2003 of Lithuania shows that higher developing was reached in regions located close to biggest cities and main plats, important for whole Lithuania economy (Burinskienė M. & Rudzkienė V., 2003, 2004).

The research deals with the territorial units of Lithuania, i.e. regions; it analysis their distinction and peculiarities, and evaluates presumptions necessary for technological progress of municipalities and for successful development of IT infrastructure. The empirical study consists of two parts: the first part analyses qualities that precondition the increase in the unevenness of development of urban and regional municipalities, the second one deal with the presumptions that have influence on uneven development of infrastructure in regions. Carrying out an empirical study the data of the Department of Statistics of Lithuania and the data of Census 2001, also the data of Lithuanian Municipality Association and of the study initiated in 2001 by the *Open Society - Lithuania* were used.

4.1 The initial stage of the study – Changes in prevailing systems of towns, regions and villages

The goal of this study is to find out the key features that are incidental to unevenly developed areas so that the most appropriate innovation strategies are selected with the help of which a higher speed and sustainable development of areas would be stimulated. Modern development brings about transformation of society, which makes people not only undertake intensive learning but also change the way of thinking (Bourdieu, P. & Wacquant L.J.D., 1998; Evers, 2000). If we accept that knowledge is the base for the modern growth of economy, then investment into communication technologies is a critical factor for the spread of knowledge and for the stimulation of active learning. Investment into communications is necessary in order to achieve higher-level know-how and to improve the efficiency of knowledge economy, which, in its turn, would further economic growth.

Basing on the performed calculations 13 indicators have been selected that best discriminate life quality level in towns and at countryside: university education, dwellings completed, municipal budgets revenue, stock of emergency, migration, dwellings uncompleted, morbidity by circulatory system, part of agricultural land in total area of district, towns and regions as per cent in the country's industry, retail turnover in trade and public catering enterprises, direct foreign investment, unemployment rate, and investments in the construction of residential houses. According to the value of *F* criterion, Lithuanian towns and regions mostly differ in the following indicators:

- University education,
- Municipal budgets revenue,
- Towns and regions as per cent in the country's industry,
- Migration.

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According to analysis results we could predict that uneven of development of towns and districts evidence not only in economic sphere, but also in knowledge, because indicator which is most discriminating towns and districts is university education. The performed analysis prove the tendencies that educated residents and especially the educated youth want to live in bigger towns, which even increases the gap between potency and knowledge economy of towns and countryside. Negative values of the coefficient at the variable "migration" indicate a decreasing number of residents both in town and at countryside. Lower indicator of region migration is influenced by internal migration when part of residents move from towns to town regions. The present results are just a part of analysis of impact of transition economy evolution on common situation and living conditions. Due to complexity of the object it can be analyzed in various hierarchical levels and time frames.

4.2 The second stage of the study – Preconditions for the development if IT infrastructure in regions

When the key features by which Lithuanian towns and regions are distinct are found out, the second stage is started, which covers assessment if presumptions that precondition successful IT development in regional municipalities. In this stage of the study, one of the studied groups – Lithuanian regions, the set of which is not homogeneous either – was analysed. To assess the progress of IT development at regional municipalities, different criteria are used: overall assessment of IT system state at municipalities; IT budget (percentage of the total budget of a municipality); supply of municipality employees with computers; share of computers connected into the intranet; number of email accounts (percentage of the total number of municipality employees); Internet access – type and speed of connection; quality of information given in municipal portals. This study used the data given in the portal of Open Society – Lithuania. The portal included the methods that were used for the assessment of IT development level of municipalities and with the help of those methods each municipality was given a certain number of points and the general level was assessed taking into consideration the sum of the points under all criteria. Carrying out the study, two suburban regions were eliminated form the set of 40 regions (Vilnius region and Klaipėda region), as these two regions have features that are more characteristic of a town municipality rather than that a region. Although general trends of IT development are positive in all regions, their development is uneven. Assessing development in points, the obtained amount of points differs several times. In solving the question whether changes in the values of IT infrastructure variable tend to be associated with changes in the others, we can use several different statistics. These statistics are: Pearson's sample coefficient of correlation r, the sample coefficient of multiple determination R^2, the coefficient of multiple correlation R, a partial coefficient of determination R_p and a partial correlation coefficient r_p. To assess the relationship between variables (indicators) we calculate the coefficients of multiple correlation R and partial correlation r_p. As in regions the number of people having college education is on the average three to four times higher than that of people having university education, a common index – i.e. the level of education, when the overall number of people having college and university education is 1000 – was introduced for the analysis of regions. Analysis results show that education level has the most significant influence on IT infrastructure ($r=0.43$, $r_p=0.26$). Having verified the significance of these indices with the help of t criterion, we see that both indices are significant at the significance level equal to 5 %. The two indices that have significant influence on IT infrastructure are the average

monthly brutosalary (in litas) and the share of agricultural land in the total region's land area (%). The relationship between IT infrastructure and average monthly gross earnings (r=0.34, r_p=0.21) takes the second place, between IT infrastructure and the agricultural land in the total region's area (%) r=-0.35, r_p=-0.27. Although correlation coefficients r, that assess this relationship, are significant when the level of significance is equal to 5 %, partial coefficients of correlation r_p are not significant. Thus, it could be stated that their direct influence on IT infrastructure is not significant. Illustration of the relation between IT infrastructure and general education level of inhabitants of the region (Figure 5) shows that the sample is not homogeneous, thus for further study we will use classification algorithms and will form groups of similar regions.
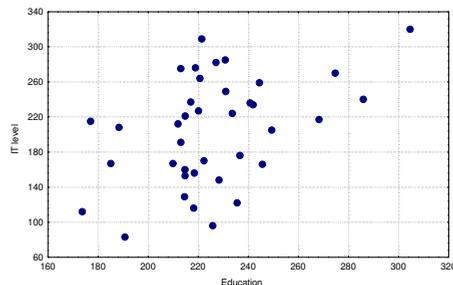
Fig. 5. Scatterplot of education of inhabitants of the region and IT level at regional municipalities

The purpose of cluster analysis in this investigation is finding regions with similar characteristics. Theories of clustering are *par excellence* theories of economy of space since they rely on the assumption that geographical proximity between related production units creates added value and local competitiveness (Danson, 2000).

Applying agglomerative hierarchical clustering procedure the optimal number of clusters - three clusters were determined. Now the goal of the next step is to apply the optimal method for dividing a number of objects into three clusters. The *k*-means method is the most suitable for this purpose, whereas this method produces exactly *k* different clusters of greatest possible distinction (Everitt B. S., 1993). Examining the means for each cluster for each dimension we identify the nature of each cluster. The summary of the information is presented in Fig. 6.
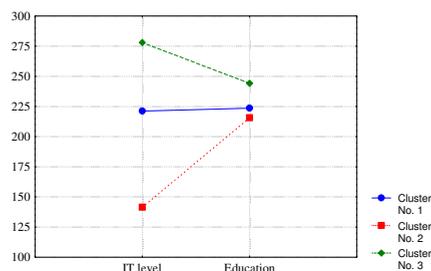

Fig. 6. Plot of means for each cluster of regions

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The location of region's groups in Fig.7 represents the IT development of the groups of regions as well as the level of education. Looking at the lines for the third cluster as compared to the first and second clusters in the diagram below, we can found that: a)the members of the third cluster are distinguished by the most developed IT level and the members of the third factor have the best education, b) the level of IT development of the first and second cluster are lesser than the third cluster. The peculiarity of this cluster is the lower level of the education comparing with the third cluster (Fig.7).

Fig. 7. Clusters of the Lithuanian regions identified by the methods of cluster analysis, 2002

The most developed and modern are regions in the top of the diagram and less attractive are in the bottom. Having compared the average differences in inhabitants' education of the clusters with the help of ANOVA method, we see that these differences are significant when the level of significance is equal to 5% (F=3.95, p=0.028). Having studied the unevenness in the development of towns and regions and groups of regions, having found out the attributes that help to distinguish groups of regions and having assessed the quality if discrimination, we see that education of inhabitants if the key attribute by which unevenly developed groups differ.

5. Methodologies and ways for sustainable development insights

Planning their future, public authorities make decisions that will have significant impact on future events and processes. The results of the taken decisions have a long-term effect. The fact that the present-day scientific and technological development allows assessment of the outcome of decisions to be or not to be taken and getting ready for such outcome is very important for the public, politicians, and authorities. Obviously, before making a significant decision it is necessary to assess the aspects of its impact on other processes. Traditionally, such type analyses may be classified into 3 (estimating, if-then planning, forecasting) or 4 classes, namely: forecasting, investigative analysis, presumption and projecting. Forecasting and projecting usually are applied to find out the future situation, and an investigative analysis and presumption may be applied for generating new ideas or opinions on situations with a high level of uncertainty. Among different methodologies it can be achieved using strategy of self-management tools (Paulauskas, S. & Paulauskas, A. 2008).

Successful implementation of the strategy might be expected only if the developed strategy is widely approved by the public. To explain the success or failure of the sustainable development policy, researchers usually focus on technological solution of ecologic problems and the arising difficulties. The strategy is doomed to failure if people at whose decisions are targeted or the staff responsible for the introduction fails to understand the decisions and disapprove them.

Future insights are one of the key measures that could help the public realise its freedom conception through changing the future. Future insights are a new field the emergence of which was to the largest extent influenced by creative and innovative practicing who came with excellent methods and algorithms to satisfy the needs of their clients rather than by scientists/theorists. The key method for insight forecasting is the *scenario* method. A scenario is a plot of potential multiple future versions: from a simple consideration of potential events of unknown future to analytically grounded future shapes linked by complex relations. One of the best-known futurologist, Peter Schwartz, in his book *The Art of the Long View* (1991) stated that practically a scenario reminds of a range of stories written or told according to accurately constructed plot. Stories may express many complex perspectives of event development, while scenarios give them special meaning. The methodology for scenario creation is based on the following main principles: a)   reflection on the future and estimation of potential changes, b) as the future is indefinite and only presumptions may be made concerning it, the range of potential future versions is very wide.

Several methods for scenario creation may be singled out, and each of them consists of several variations. For example, P. Bishop, A. Hines ir T. Collins (2007) single out 8 groups of methods for scenario creation. Scientists prefer methods that combine mathematical forecasting methods and human presumptions (Chermack,T.J.& Lynham S.A., 2004; Illés I., 2006). Where a forecast is based only on quantitative data, it is not able to consider the indefiniteness of the future. On the other hand, human opinion contains only a subjective estimation of the future. Therefore, considering that both human presumption and mathematical extrapolation have objective shortcomings, their complex application helps foresee critical events and make more accurate estimation of future trends.

The application of the scenario method is based on several ideas. Mathematical forecasting may be successful only under stable conditions. Due to various factors (economic, political solutions, global condition changes), however, events rarely develop in an expected way. The scenario method solves the task of forecasting by applying the principles of decomposition when individual potential variants (scenarios) of the development of events are singled out (Millett S., 2003; Neumann I. & Overland E. 2004). The whole set of scenarios covers all possible development variants. At the same time, each individual scenario has to present an adequately accurate forecast of the future, and the total number of scenarios should be manageable.

Two stages are singled out when applying the scenario method:

- Development of a comprehensive, still manageable set of scenarios;
- Comprehensive forecasting in the framework of each specific scenario and a possibility to get answers to the questions important for the analysis.

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The procedure of estimation by experts allows to combine opinions of individual experts and to formulate a joint solution. In a general case the methodology of estimation by experts is grounded on the following presumptions: a) an expert has accumulated a large amount of rationally processed information (he has sufficient knowledge and experience and may count on his intuition), thus an expert may serve as a source of quality information, b) the opinion of the group of experts hardly differs from the real solution of the problem.

Different methods are applied to get estimations by experts. In some cases an expert works individually, sometimes without even knowing that he/she serves as an expert. This method helps to avoid an influence of the opinion of known authorities (Bardauskienė D., 2007). In other cases experts gather together and discuss a problem, assess the expressed reasoning and reject the wrong one. In some cases the number of experts is strictly fixed and calculated, it must satisfy the presumptions of statistical compatibility methods. Sometimes the number of experts increases in the course of examination.

Forecasting or planning situations or events, the experts usually are given a task: to estimate a problematic and complicated situation and to come up with several possible alternative situation estimations and several versions of a forecast or a plan. When analysing the possible versions, experts assess their importance, inter-relations, and, when planning further actions they may also take account of material and human resources, foresee the period and estimate the financial expenditure.

6. Principles of the scenario construction

Although construction of scenarios is not strictly regulated, such construction incorporates all qualitative and quantitative forecasting methods. The basis for scenarios consists of mixtures of analysis, scenarios usually use data and methods of different fields of science: economics, law, ecology, engineering, etc., they are based on legislation and regulations, discourses, historical analogies.

Validity of scenarios depends on logic and logical links. Several typical parts are characteristic of a scenario:

1. *Introduction* that presents the beginning position, i.e. the present situation, and tells the problems and the relevance of those problems to the decision-maker.
2. *The main part of a scenario* that gives details of one of many possible future ways of development of a problem. This part gives a detailed view of the main *drives, beginning and finishing conditions, main events and episodes*.
3. Comments. Comments draw attention to the main elements of the scenario. They give other development versions that are possible in case of different initial presumptions and conditions of development. They may also describe critical events, pay attention to unexplored fields and emphasise the importance and peculiarities of decision versions.

A methodological basis of scenario analysis is of major importance to decision-making. An analysis of possible scenarios may give a better view not only of potential future events but also of the potential impact of decisions made on the public and environment. Besides, an analysis of scenarios facilitates the estimation of the period for achieving the expected results and the sequence of actions necessary for that. Recently, literature offers a wide range of scenarios that forecast potential trends of society and state development. One of the

best known scenarios are scenarios constructed by Gartner, Inc. in 2005, covering government perspectives and methods in 2020 (Government in 2020 ..., 2005). Four scenarios (Status Quo Development, Free-Enterprise Government, Coverining Phantoms, The Good "Big Brother") were singled out applying the GBN scenario planning method, and those scenarios give a different picture of the role and development of governments, perspectives of regions and provision of public services.

Recently, the European Union has been constructing a number of scenarios of future insights (Schwab P. *et al.* 2003; Four futures of Europe 2004; Lindgren M., Bandhold R., 2003). Scenarios aim at estimating the economic efficiency and competitiveness, and at the same time equity and cohesion. Several alternatives of these scenarios might be singled out:

1. *Supporting scenarios.* Continuation of the processes that currently take place serve as the grounds for this scenarios type. It is based on the structural EU aid and pay regard to common EU regulation norms.
2. *Green scenarios.* These scenarios see agriculture not like a producer but as a countryside conservator. The main drives are policy and management of landscape and soil.
3. *Market scenarios.* These scenarios are based on liberalisation of agricultural market and trade in agricultural products. These scenarios are divided into 2 classes:
   a. Gradual rearrangement of agricultural activities by instilling new methods and improving work efficiency.
   b. Cooperation. According to this scenario, small landowners should cooperate

7. Lithuania's territorial development scenarios and solutions

In 1999, Finnish scientist Jari Kaivo-oja wrote that analysis of the widely applied development scenarios (the Deep Ecology Scenario, the Strong Sustainable Development Scenario, the Weak Sustainable Development Scenario, the Doomsday Scenario and the World Bank "Policy Tunnel" Scenario) revealed that the sustainable development is not a conflict-free concept as the criteria of sustainability (environmental sustainability, economic efficiency and social equality) under many scenarios might be not complied with, and the named global strategies serving as the basis for the concept of sustainable development might even be harmful for developing societies. Sustainability planning based on the analytical positioning of the existing situation is a useful approach towards the formation of the sustainable development policy. This plan was applied when drafting the general plans of municipal territorial planning of the Republic of Lithuania, and at the stage of conceptual framework drafting the following is being defined:

- territorial planning and spatial structure development principles;
- territorial use functional priorities;
- territorial management, regulation, use and protection principles.

The conceptual framework of the spatial development of the district area is drafted for 20 years and it is to be approved at the Municipal Council of a concerned district. For example, analysis and assessment of the current state of the territory of Moletai region revealed that the concept of special development of dwelling areas are conditioned by the following main factors: adverse trends of development of population and socio-demographic structure, changes in the system of population areas are necessary, tourism

potential is not exploited. According to the rules of municipal area general plan drafting, the drafters of a general plan must propose at least two alternatives for developing the planned municipality, i.e. Moletai district. The analysis of secondary sources, the expert analysis and the examination of the received data resulted in two territorial development scenarios.

Status quo alternative. Status quo (the existing situation to be maintained in future, too) on the grounds of the existing urban infrastructure that should be maintained; the existing network of institutions of education, culture, health, social protection, social care should also be maintained but the services being provided and the quality of living environment and public spaces should be improved; promotion of modernisation of agriculture and forestry within the existing limits of land use and landholding system and efforts to keep employment in agriculture. This alternative guarantees the existing service relations and relations between adjacencies, accessibility and continuity of the existing working places and social infrastructure objects.

The implementation of the status quo alternative demands large financial resources of the state and especially of the municipality and plenty of administrating staff with managerial skills. By choosing the status quo alternative essentially efforts would be laid to improve the existing urban administrative structure quality and that would demand vast financial resources. Such dispersion of municipal objects and objects to be supported will determine retardation of development of Moletai district if compared with other districts of Lithuania with the urban structure concentrated to a higher extent as the trends of the decrease of population in rural areas is 2,6 times higher than the average of Lithuania.

The attractiveness of Moletai for investment will be conditioned not only by the development of the existing socio-economic, urbanistic, legal and administrative systems but also by other factors: supply of skilled staff, the level of development of socio-technical infrastructure, the level of professional mobility of labour, clear and specific principles of district development to attract investment. Socio-economic development of Moletai district will also depend on the following external factors: ability and failure of Moletai district and other neighbouring towns (especially Vilnius) and regions of Lithuania to offer better living conditions and activity conditions.

The name threats are not subject to direct management but municipal activities should be directed towards mitigation of outcome of threats. Therefore, the status quo alternative is not perspective with regard to the management of socio-economic and environmental development and territorial organisation.

An alternative of active development is a development which would identify priorities for individual settlements and aim at connecting adjacent settlements. This alternative could be called decentralised concentration.

Drafters of the general plan offer to accept the alternative of active development; the essence of this concept is the following: a) to create a hierarchical system of centres and other residential areas, b) to reduce the prevailing position of de facto centre, Moletai, in the territory of the region, c) to ensure even distribution of the standard of living in the region territory,d) municipal council and administration of Moletai should initiate qualitative and quantitative development of selected and approved local centres, e) adjacent settlements should be connected. Conditions should be created for a single system of administration, institutional, social and engineering provision, also for rational use of land.

Alternative I is maintenance of status quo. The alternative provides for the maintenance of the socio-economic structure of Moletai district aiming at improving the quality of socio-economic environment without making changes in the formed infrastructure network.

Alternative II, also known as *decentralised concentration*. This alternative of district development provides for qualitative and quantitative development of socio-economic infrastructure in the local centres of the district, and promotes sustainable development of the district.

This alternative generates larger socio-economic benefit for the whole district of Moletai in the long-term perspective.

Advantages of the implementation of Alternative I are the following: investment of Moletai district is targeted at improving the public infrastructure and public services aiming at the quality and safe environment for living. Investment of the municipality of Moletai district should be used for the renewal of equipment at health care institutions, introduction of modern information technologies for a more efficient servicing the patients. In this way, accessibility of such services would be improved without making quantitative changes in the network of these institutions. However, the status quo alternative does not promote optimisation of social services in Moletai district which are rather limited at present. The implementation of the status quo alternative could entail the improvement of the education services. This alternative creates conditions for improving the quality of tourism services by making tourist objects more attractive, improving the public infrastructure and information system of the sightseeing objects as well as expanding the range of complex services.

The implementation of all these services would serve as the grounds for the quality improvement of the existing structure and formation of higher standard living environment. However, conditions would not be created for the sustainable development of the district, which would impede the development of the socio-economic potential of the region. Negative demographic and different social trends of the district condition the fact that quality improvement of the existing infrastructure is not efficient in the long-term perspective. The implementation of the status quo alternative would not contribute to the achievement of the main goals of the general plan.

Comparison of the second alternative is better than the first one, as its implementation should result in better accessibility of public services for region's population, as social and institutional provision would be concentrated not only in Moletai town but also in localities. Formation of a hierarchical structure of local centres would reduce the impact of Moletai town on the region. Occurrence of local centres should stimulate their development and increase attractiveness of residential areas, improve living conditions in remote settlements. Quality living environment should stimulate more rapid socio-economic development of the whole region. Concentration of service infrastructure in local centres should narrow the gap between towns and rural areas.

The implementation of the decentralised concentration variant would result in the fact that the increased significance of local centres of category **b, c, d** in Moletai district would condition the improved standard of living in these centres, and the socio-economic development of the centres should stimulate investment in them (Fig. 3). It is probable that the improving living standard and the development of the public infrastructure would have a negative impact on the reduction of population emigration in the long-term perspective.

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Having chosen the alternative of decentralised concentration, the municipality of Moletai district should foresee measures for solving socio-economic problems that would ensure a proper development of local centres.

8. Conclusion

When analyzing the socio-economic situation, we have to use much interrelated initial data and indicators that characterize the development of the process. In employing multivariate statistical methods from many possible probabilistic – statistical models, the model that describes the real behavior of the explored set of objects best and that provides substantiated and exact conclusions was obtained.

In order to evaluate the situation and make decisions the described knowledge discovery process enables evaluation of the main factors and selection of the influencing space of the direct foreign investment in the regions of Lithuania. To this purposes the integration of factorial and component analysis methods have been used. These models allowed for the estimation of essential data multidimensionality and a concise and simplified explanation of multivariate structures of data. By means of factors and principal components they displayed the existing reality but directly imperceptible regularities.

After analyzing the factor scores it has been established that the influence of individual cases on the investment was best when using the z–score scale. This allows us to evaluate a dynamic model of the situation that is being considered.

Analysis of clusters results in time from 1996 till 2001 shows that higher development was reached in regions located close to the largest cities and the main industrial plants and are therefore important to the Lithuanian econology. The statistical analysis shows that it is necessary to change investment policies and to create legal and economic directives for investment regulation and without these measures investment will be concentrated in regions nearer to the largest cities and all Lithuania important industrial plants, herewith increasing the gap between cities and peripheral towns as well as their regions all of which opposes sustainable development.

The study has revealed that education of inhabitants is the key attribute that has the greatest influence on IT development and on technological progress of municipalities and discriminates the uneven development of towns, regions. Education level is higher in towns and surrounding regions, inhabitants of such towns and regions are apt to adopt modern IT technologies and stimulate active expansion of e-gov services of municipalities and implementation of new communication methods. The created information networks in their turn have further impact not only in governing quality but also on development of society; besides they increase social and organisational capital.

Transformation of command economy into market economy, that causes migration of higher educated inhabitants to major towns and regions, has resulted not only in economic differences among rural areas of towns but also the knowledge gap that inhibits implementation of modern technologies and spread of knowledge. For successful development of knowledge economy, it is necessary to make the best conditions not only for general education of inhabitants but also for development of their skills and application of life-long learning programmes.   Although results of this investment are not seen

immediately, they precondition successful competition in the development of knowledge economy.

The key method for insight forecasting is the *scenario* method. A scenario is a plot of potential multiple future versions: from a simple consideration of potential events of unknown future to analytically grounded future shapes linked by complex relations.

Estimation by experts is understood as a summarised opinion of an expert group drawn on the basis of knowledge, experience and intuition of experts. The goal of estimation by experts is getting, encoding, structural processing and interpretation of knowledge of an expert. The procedure of the estimation by experts allows combining opinions of individual experts and formation of a joint solution. Forecasting or planning situations or events, the experts usually are given a task: to estimate a problematic and complicated situation and to come up with several possible alternative situation estimations and several versions of a forecast or a plan.

In those cases where uncertainty degree is high, scenario analysis becomes the main method for assessing future changes and making rational decisions. All scenarios are analytical and clearly defined constructions of the future that present a set of possible alternatives. Every scenario is based on certain presumptions and conditions. They help a decision-maker to assess the importance of these presumptions and to decide which scenario is most suitable. The goal of scenario method is to look at the functioning and internal links of a complex dynamic system.

The drafters of a general plan must propose at least 2 alternatives for developing the planned municipality, i.e. Moletai district. The analysis of secondary sources, the expert analysis and the examination of the received results resulted in 2 territorial development scenarios: a *status quo* alternative and an *active development* alternative. The implementation of the alternative of active development (decentralised concentration management) would result in higher significance of smaller categorised local centres in Moletai district, which would precondition the improvement of the standard of living in them. Socio-economic development of the centres should stimulate investment in them. It is probable that the improving living standards and the development of the public infrastructure would have a negative impact on the reduction of population emigration in the long-term perspective.

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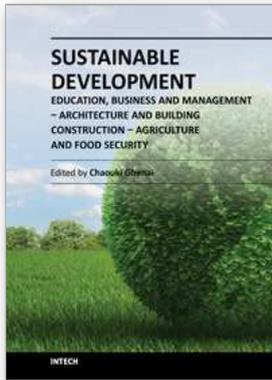
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Edited by Prof. Chaouki Ghenai

Securing the future of the human race will require an improved understanding of the environment as well as of technological solutions, mindsets and behaviors in line with modes of development that the ecosphere of our planet can support. Some experts see the only solution in a global deflation of the currently unsustainable exploitation of resources. However, sustainable development offers an approach that would be practical to fuse with the managerial strategies and assessment tools for policy and decision makers at the regional planning level. Environmentalists, architects, engineers, policy makers and economists will have to work together in order to ensure that planning and development can meet our society's present needs without compromising the security of future generations. Better planning methods for urban and rural expansion could prevent environmental destruction and imminent crises. Energy, transport, water, environment and food production systems should aim for self-sufficiency and not the rapid depletion of natural resources. Planning for sustainable development must overcome many complex technical and social issues.

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