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SEASONAL AND SPATIAL VARIATION OF PM10 IN AN URBAN AREA FROM ROMANIA

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Abstract. The cyclic variance of PM10 mass concentration in the urban area in the South-East of Romania has been analysed in the article. SE of Romania is considered to be a territory which has medium level of pollution for a period of last ten years, from 2009 to 2018. The spatial dispersion of PM10 concentration was obtained using the METI-LIS soft wear for each season. The objective of dispersion models is to evaluate how pollutant concentration is spread out taking into account the diffusion. The average measurements of PM10 and meteorological parameters as inputs has been used. An evident seasonal change of PM10 concentrations is observed in the article. In order to establish national measures (including economic ones) for the improvement of the atmospheric pollution control it was analysed the mechanism of atmospheric pollution. It was observed that the air quality was overall better in spring and in summer in comparison to the other two periods. With regard to the seasonal variation characteristics of PM10 significant differences for the air quality registered in different months in the researched region were observed. The impact of air temperature on atmospheric pollution was insignificant in spring and autumn; moreover, precipitation was defined as an important influence factor upon the atmospheric pollution. The impact of precipitation on the possibility of atmospheric pollution was obviously different in the four seasons. The research results indicate the meteorological parameters that influence the air pollution become active during the cold seasonal days. It was shown that relative humidity and wind speed are the meteorological parameters that impact the PM10. It was found out that the probability of atmospheric pollution decreased with the increase of air temperature in summer. The research results also testify that the air pollution mapping could be enhanced using atmospheric dispersion models and in-situ measurements.

Keywords: PM10, air pollution, meteorological parameters, seasonal variation, dispersion model.

1. INTRODUCTION

The paper focuses on the following aspects: (1) characterizing the temporal variations of PM10 in Brăila, Romania during the interval 2009-2018 and (2) analysing the effect of meteorological parameters on the dispersion of PM10. In this paper our intention is paid to the analysis of temporal and spatial dispersion of particulate matter (PM10) and its variation depending on meteorological parameters for the period of 2009-2018. The detailed analysis of meteorological factors' influence on the atmospheric pollution describe exactly the pollutants formation mechanism as well as the dispersion of the

pollutants under different meteorological conditions and ensure the forecasting of the atmospheric pollution based on meteorological conditions with the aim of decreasing the atmospheric pollution.

The most important atmospheric pollutants include nitrogen dioxide (NO2), Sulphur dioxide (SO2), particulate matter (PM) and ozone (O3). For several years particulate matter has become one of the major components of atmospheric pollutants due to its effect on public health, namely due to the increase of cardiopulmonary morbidity and mortality [1; 2; 3].

PM10 consists of inhalable particles with an aerodynamic diameter less than 10 μm. PM10 originates in several sources including industrial emissions, traffic gases and natural dust [4]. Many studies had shown that PM10 was frequently observed as the most wide-spread atmospheric pollutant in an urban area. Air quality has acquired an increasingly greater importance in recent years with respect to the investigation of the formation mechanism of pollutants and their dispersion depending on certain parameters.

Various studies using air pollutants concentration and meteorological data have concluded that meteorological conditions have direct effects on the dispersion of atmospheric pollution [5; 6; 7; 8; 9]. Statistical studies have confirmed that there are seasonal and diurnal variations of the atmospheric pollutants depending on meteorological conditions [10].

The atmospheric pollution may be influenced by meteorological conditions directly (atmospheric cycle) or indirectly (traffic during working days, increase in energy consumption for heating in cold seasons) [11; 12; 13].

Meteorological factors have a major importance through the effect of dispersion, transformation and removal of air pollutants from the atmosphere depending on a series of spatial and temporal characteristics.

Seasonal and monthly variability of atmospheric pollution has led to the conclusion that the air quality was the most polluted in spring whereas becoming better in summer with a tendency to increase in autumn and winter. On the whole, atmospheric temperature was the most important meteorological parameter influencing PM10, followed by wind speed, relative humidity, atmospheric pressure and wind direction. Nevertheless, the prevailing meteorological factors that influenced the atmospheric pollution had a different significance throughout the four seasons [14; 15].

The Directive 2008/50/EC was adopted on 1 January 2008 and according to its stipulations the maximum accepted values for PM10 in the European Union are 40 μg/m3 while the short-term maximum value refers to the fact that the 24-hour average of 50 μg/m3 is not to be exceeded more than 35 times a year. EU had assumed many directives and strategies in order to reduce the atmospheric pollution and to improve air quality [16; 17]. Air pollution is a frequent phenomenon in the developing countries.

The permanent monitoring of air pollutants concentration as well as the analysis based on the dependence between meteorological parameters and PM10 would have significant results in reducing atmospheric pollution.

2. RESULTS

In order to establish national measures for the improvement of the atmospheric pollution control it is very important to analyse the mechanism of atmospheric pollution.

Hourly PM10 concentration data were collected over a 10 years period from 2009 to 2018 by the Local Environmental Protection Agency observation stations, which are distributed crosswise the city. In our study, we analyse the relationships between PM10 and six meteorological parameters: relative humidity, atmospheric pressure, air temperature, relative humidity, wind speed, wind direction and precipitation.

The METI-LIS, model ver. 2.03 is a Gaussian dispersion model and calculates, in steps of one hour, the pollution dispersion in lower atmosphere using the pollutant concentrations and meteorological data. Wind direction, wind speed and atmospheric stability have a major contribution to dispersion.

The METI-LIS model includes the downdraft effect, which often influences the atmospheric dispersion from lower emission sources and gives solutions of simple Gaussian plume and puff formula [18] for elevated sources [19].

The parameters in the dispersion widths describing the downwash effect are based on that of the US Environmental Protection Agency's (EPA) Industrial Source Complex (ISC) model. Sources with line-shaped characteristics are calculated in the model by numerically integrating the point-source plume equation (Formula 1),

$$C(x,y,z)=\frac{Q}{2\pi\sigma_y u}\exp(-\frac{y^2}{2\sigma_y^2})[\exp(-\frac{(z-He)^2}{2\sigma_z^2})+\exp(-\frac{(z+He)^2}{2\sigma_z^2})], \quad (1)$$

where C is the concentration (g/m³), x is the downwind distance from the emission source (m), y is the crosswind distance from the emission plume centreline (m), z is the distance above the ground level (m), Q is the pollutant emission rate (g/s), *He* is effective plume-rise height, *u* is wind speed (m/s), σ_y is horizontal dispersion width (P-G curve) (m), σ_z is vertical dispersion width (P-G curve)(m).

With regard to the seasonal variation characteristics of PM10 there were significant differences for the air quality registered in different months in Brăila. The 2009-2018 air quality was the worst in December, 36.5 μg/m³ and the best in July, 19.5 μg/m³.

Having a seasonal perspective, we can state the fact that the air quality was the best in summer (June-August). There was a pollution proportion of 20.67% in summer, followed by spring (March - May) with 24.63% and autumn (September - November), 26.42% on average, respectively. The air quality was the worst 34.5 %, in winter (December - February) (Table 1). Lower atmospheric pressure, 1008 hPa, resulted in a lower atmospheric pollution in summer, 20.92 μg/m³. When the atmospheric pressure was lower, the probability of occurrence of the atmospheric pollution was reduced, especially in summer.

	PM10 μg/m³	**Air temperature °C**	**Precipitation l/m²**	**Relative humidity %**	**Atmospheric pressure hPa**	**Wind direction °nord**	**Wind speed m/s**
Winter	34,50	-1,09	47,53	87,83	1012,58	11,60	8,92
Spring	26,38	12,50	29,31	70,17	1009,50	10,25	4,32
Summer	20,92	23,84	26,50	66,33	1008,08	9,33	1,38
Autumn	25,58	13,63	32,18	76,75	1012,83	11,00	2,75

Tab. 1. Seasonal average of PM10 and meteorological parameters, for 2009 - 2018

The probability of occurrence of the atmospheric pollution increases when atmospheric pressure increases in spring. The influences of the atmospheric pressure had a similar effect in autumn (1012,83 hPa) and a concentration of 25,58 μg/m³ and 34,50 μg/m³ in winter with 1012,58 hPa. Lower relative humidity had the effect of a lower atmospheric pollution in summer whereas higher relative humidity easily led to atmospheric pollution in other seasons, especially in winter. In summer, relative humidity had a value of 66.33% and a PM10 concentration of 20,92 μg/m³. When relative humidity reached 87.83% the probability of atmospheric pollution increased to the maximum in winter, with a 34.50 μg/m³ PM10 concentration.

The probability of occurrence of the atmospheric pollution had a medium level in autumn and in spring, when relative humidity reached a value close to 70%. In this case the probability of atmospheric pollution was still smaller in comparison with the winter period. The probability speeds up in accordance with the increase of relative humidity.

The impact of wind speed on air quality was mainly different in the four seasons. Under the circumstances of a wind speed around 1.38 m/s, the probability of atmospheric pollution was reduced in summer. The probability of occurrence of atmospheric pollution was higher when the wind speed was 8.92 m/s in winter. Furthermore, a medium level of the wind speed reached a mean probability of

atmospheric pollution in spring and summer. For example, in spring the wind speed was 4.32 m/s with a 26.38 μg/m^3 PM 10 concentration while in autumn the wind speed was 2.75 m/s with a PM 10 concentration of 25.58 μg/m^3.

Analysing the wind direction, we found that an average of 9.33°north in summer led to a lower air pollution while 11.60°north, the highest value corresponds to the higher pollution in winter.

The influences of air temperature had significantly different effects in the four seasons. The atmospheric pollution mainly occurred when air temperature had an average of 1.09°C in winter. This phenomenon occurs especially when it develops a thermal inversion layer in winter that would cause a stable atmospheric condition. Consequently, the dispersion of pollutants is reduced and remains accumulated on the soil surface, in the low atmosphere. Likewise, the atmospheric pollution occurred when the air temperature was around 20°C. Higher radiation heats urban area in summer.

Atmospheric turbulence and atmospheric instability have a major effect, rapid pollutant dispersion and diffusion. This phenomenon leads to the conclusion that the probability of atmospheric pollution decreased with the increase of air temperature in summer. The average value of air temperature in summer was 23.84°C and the PM10 concentration had a value of 20.92 μg/m^3.

The impact of air temperature on atmospheric pollution was insignificant in spring and autumn. Moreover, precipitation was an important influence factor upon the atmospheric pollution. The impact of precipitation on the possibility of atmospheric pollution was obviously different in the four seasons. A larger amount of precipitation resulted in major pollution, whereas a small quantity of precipitation resulted in lower air pollution. In winter the 2009- 2018 average of precipitation was 47.53 l/m^2 and the PM10 concentration was of 34.50 μg/m^3, in comparison with summer when the PM10 concentration was 20.92 μg/m^3 and the precipitation average level was 26.50 l/m^2. In spring the average of precipitation was 29.31 l/m^2 while in autumn was 32.18 l/m^2.

The diffusion, dilution and accumulation of the pollutants are influenced by meteorological conditions. Pollutant concentration depends to a great extent on meteorological conditions even under the same conditions of pollutant sources. In this paper, the correlation degrees between PM10 and meteorological factors, including relative humidity, precipitation, atmospheric pressure, air temperature, wind speed and wind direction were analysed by using the SPSS software (Figure 1).

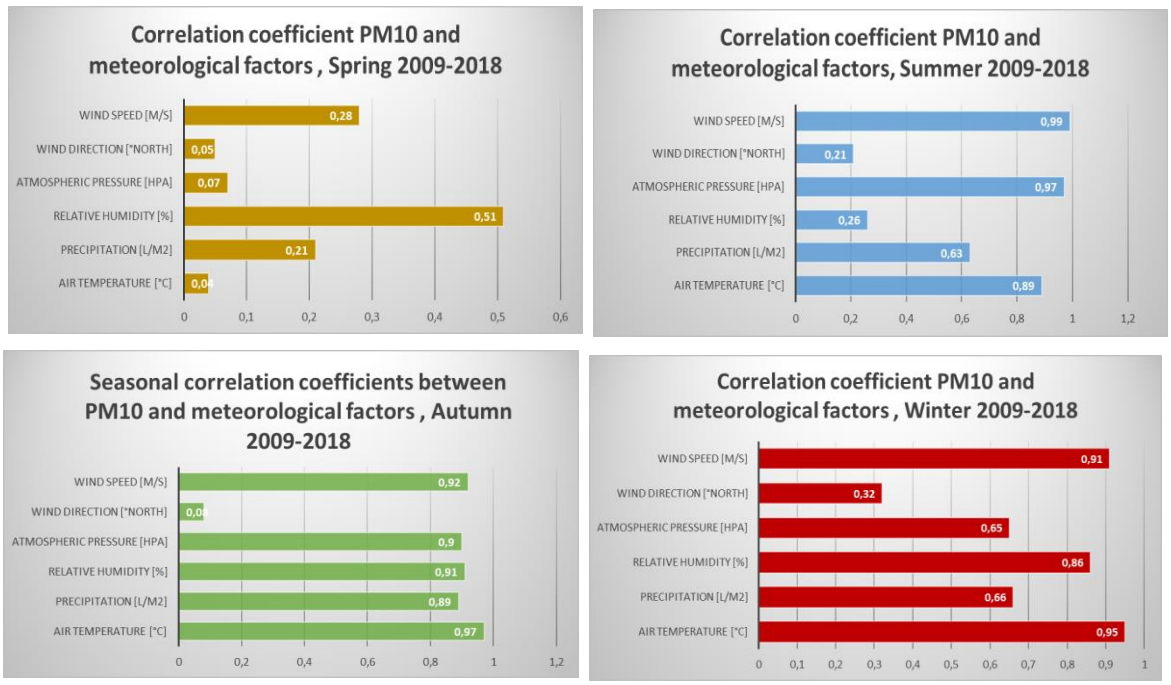

Fig. 1. Correlation of coefficients between PM10 and meteorological factors, 2009 - 2018

The relationships between PM10 and meteorological factors were complex. The correlation degrees were particularly influenced by seasons. The dominant meteorological factors influencing the atmospheric pollution were different in each season. The influence of air temperature on PM10 was most significant in winter with the worst air quality. Air temperature, wind speed and atmospheric pressure were the dominant meteorological factors in spring. In addition, the impact of precipitation should not be omitted.

Furthermore, air temperature, precipitation, relative humidity, wind speed and atmospheric pressure had an evident impact on PM10 in autumn. In summer when the air quality was the best, air temperature, wind speed and atmospheric pressure influenced PM10. On the whole, air temperature, wind speed and atmospheric pressure were the most important meteorological parameters influencing PM10, followed by relative humidity and precipitation. Wind direction has the lowest influence on the PM10 dispersion in an urban area.

The METI-LIS model was used to produce PM10 seasonal dispersion maps for 2009-2018, which are presented in figure 2.

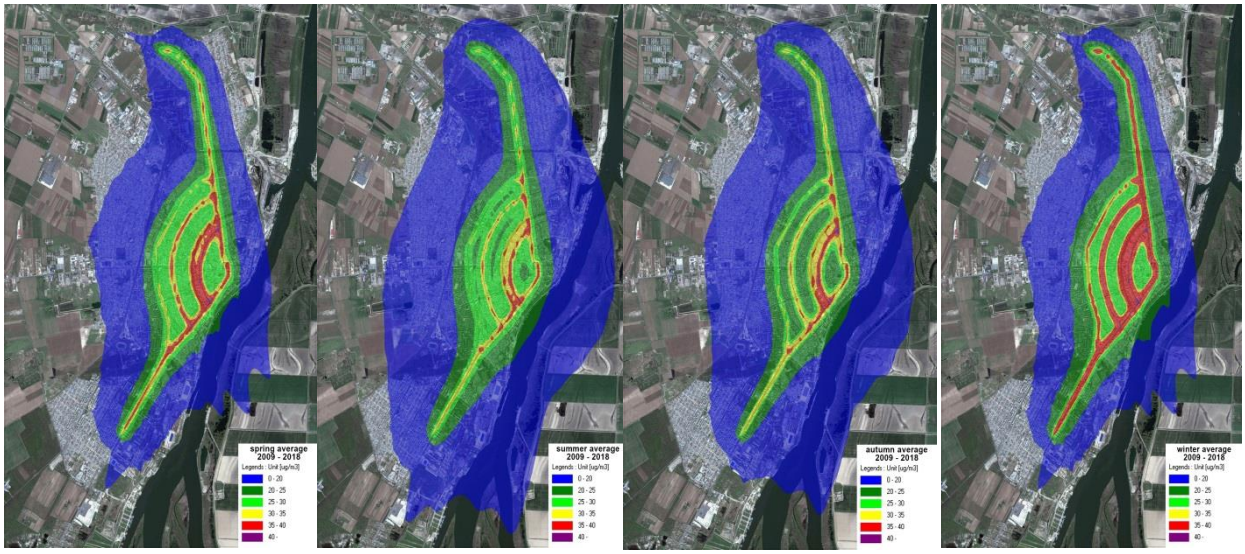

Fig. 2. Dispersion of PM10 for 2009-2018. PM10 concentrations between 0 and 20 μg/m³ are displayed in blue colour, the concentrations from 20 to 25μg/m³ are displayed in dark green, 25-30 μg/m³ - in light green, 30-35 μg/m³ - in yellow, 35-40 μg/m³ - in red and concentrations over 40μg/m³ – in violet. Note that the intense green/blue on the SE of the map is due to superposition with the dark colours used in the map

For the purpose of obtaining a spatial distribution of seasonal averages of PM10 emission in Brăila four maps were created. A different scale pattern provides distinct influence on the air quality dispersion and assesses sundry precision of air quality analyses. The METI-LIS soft calculates the PM10 concentration dispersion in a wide area, such as Brăila with a 50 × 50 m square spatial grid. In order to determine a high precision of PM10 dispersion we should use smaller grids. The most polluted areas were in the closeness of crowded streets and boulevards in connection with the traffic.

The highest PM10 concentration has been registered alongside the major streets in winter in the interval 2009-2018, with some intermittence on the outskirts of Brăila. In spring and autumn, the PM10 concentration was lower compared to winter, but higher than in summer. The lowest level of PM10 pollution is observed in the summer season.

Several intermittencies are outlined progressively in the city centre and disappear towards the less circulated areas. This phenomenon may occur due to the influence of meteorological parameters, i.e. the wind speed, air temperature and relative humidity. Likewise, a detailed analysis of the four maps points out that spots of PM10 crop up close to the cross-roads and near the traffic lights.

3. CONCLUSIONS

In reality, the effects of meteorological conditions on PM10 atmospheric pollution were evidently different in the four seasons, during the analysed period. There were clearly seasonal variations of atmospheric pollution in Brăila. The air quality was the best in summer, followed by autumn and spring, and the air quality was the worst in winter. The influence of meteorological parameters (including air temperature, relative humidity, atmospheric pressure, wind speed, wind direction and precipitation) on atmospheric pollution was analysed by using the correlation analysis method.

On the whole, air temperature and wind speed were the most important meteorological parameters influencing PM10, followed by atmospheric pressure, relative humidity and wind direction and precipitation.

Nevertheless, the prevailing meteorological factors influencing the PM 10 atmospheric pollution were different in each season. The influence of wind speed on PM10 was most significant in spring. Wind speed and air temperature were the main meteorological factors in summer. In autumn the most important parameter was air temperature, while relative humidity had a significant contribution in winter. In addition, wind direction had an important influence on atmospheric pollution. Besides this, for the period 2009 -2018, air temperature and wind speed had the most considerable impact on PM10 dispersion.

Taking all of the afore-mentioned aspects into account, this paper has analysed the seasonal specific feature of PM10 and its dependence on meteorological factors between 2009 and 2018, and the final purpose is the feasible actions to ameliorate the air quality in Brăila urban area. All in all, it is extremely important to explore and to understand the impact of different meteorological factors on the atmospheric pollution and the effects on human health, taking into consideration the urbanization process.

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Баланіца Драгомір Маріана Кармелія, Мунтеніта Крістіан, Сіміонеску Аурель Габріель, Даніела Єкатеріна Зека, Крамар Ірина, Мариненко Наталія. Сезонна і просторова варіація PM10 в міській місцевості Румунії. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 7–14.

У статті проаналізовано циклічну дисперсію масової концентрації PM10 у міській місцевості в Південній Румунії. Південна Румунія вважається територією, яка має середній рівень забруднення протягом останніх десяти років (2009-2018 роки). Просторову дисперсію концентрації PM10 отримували, використовуючи м'який знос METI-LIS для кожного сезону. Мета дисперсійних моделей - оцінити розподіл концентрації забруднюючих речовин з урахуванням дифузії. Були використані середні вимірювання PM10 та метеорологічні параметри в якості вхідних даних. У статті спостерігається очевидна сезонна зміна концентрації PM10. Для встановлення заходів держави (в т.ч. економічного характеру) щодо вдосконалення контролю над забрудненням атмосфери було проаналізовано механізм її забруднення. Визначено, що якість повітря в цілому покращувалася навесні та влітку порівняно з двома іншими періодами. Щодо сезонних коливань характеристик PM10, то встановлено значні відмінності у якості повітря, зафіксованому у різні місяці у досліджуваному регіоні. Вплив температури повітря на забруднення атмосфери спостерігали весною та восени; крім того, виявлено, що атмосферні опади є важливим фактором впливу на забруднення атмосфери. Встановлено, що вплив опадів на можливість забруднення атмосфери був різним у кожному з чотирьох сезонів. Результати досліджень вказують на те, що метеорологічні параметри, що впливають на забруднення повітря, стають активними в холодні сезонні дні. Показано, що відносна вологість і швидкість вітру - це метеорологічні параметри, що впливають на PM 10. З'ясовано, що ймовірність забруднення атмосфери зменшувалася зі збільшенням температури повітря влітку. Результати досліджень свідчать також про те, що картографування забруднення повітря можна покращити за допомогою моделей дисперсії атмосфери та вимірювань на місці.

Ключові слова: PM10; забруднення повітря; метеорологічні параметри; сезонні зміни, дисперсійна модель.

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FORMULATION OF A TYPICAL DEVELOPMENT STRATEGY FOR AGRICULTURAL ENTERPRISES (BY THE METHOD OF HOSHIN KANRI)

IRYNA BORYSHKEVYCH

Abstract. Modern conditions of business globalization, considerable limitation of resources, strengthening competition and acceleration of technological innovations demand from the agricultural enterprises' ability to adapt quickly to changing conditions of the external environment. The key to their successful product development is to ensure the most effective use of the available resource potential. In science and practice, there is a large variety of methodological tools that contribute to improving the functioning of economic entities. One such tool that ensures the achievement of effective development, forming a sustainable competitive advantage is a strategy. We are talking about a complex model that covers all processes in the enterprise. The use of advanced methods of strategy development by managers of agricultural enterprises is the key to its successful effective implementation and increase the competitive advantages of the enterprise in the market environment. The article analyzes the existing methods of strategic planning which are based on various methodologies of building strategies. The following methods are characterized: resource method, target method, extrapolation method, interpolation method, statistical testing method, criterion method, normative method, balance method, matrix method and strategic plan construction. The Hoshin Kanri method based on the application of the Deming cycle and representing the concept of cyclic control is investigated based on the studied sources. A typical strategy for the development of an agricultural enterprise in the form of an X-matrix has been developed. This strategy is designed for 3 years and includes strategic and tactical goals, processes and results, between which appropriate correlations are established. Among the strategic goals that are typical for agricultural enterprises, the following are highlighted: improving business efficiency, increasing the efficiency of sales activities, introducing innovative technologies into production and optimizing business processes. Accordingly, the management of agricultural enterprises can form a greater number of promising goals, based on the needs of economic entities. The obtained results form the basis for further studies of the mechanism of the development strategy formation and implementation in the agricultural enterprises.

Keywords: strategy, method, agricultural enterprise, Hoshin Kanri, strategic planning.

1. INTRODUCTION

In the conditions of high market competition, uncertainty, unpredictability and quick-changing external environment, the main task that the heads of agricultural enterprises face with is to improve the efficiency of the enterprise with the aim of its stable and progressive development in the long term. In addition, managers ' excessive focus on achieving short-term financial results and solving current problems leads to insufficient funding for long-term projects and the creation of future values. In such circumstances, it is important to have foresight, strategic thinking and relevant knowledge to create an effective strategy for further development.

The agricultural enterprise must find new best practices to manage activities to adapt to the future of external factors that are constantly changing. The presence of the developed strategy makes it possible to achieve clearly defined goals, including: improve the resource availability of the enterprise, expand partnerships, improve the management system, and grow the number of consumers, which ultimately increases the profitability and financial independence of the enterprise.

2. RESULTS

In the conditions of dynamic economic development, it is increasingly difficult for managers of agricultural enterprises to gain competitive advantages only through effective financial management and a sufficient level of investment in tangible assets. The strategy is a long-term orientation of the enterprise and directs its efforts to achieve higher performance in relation to competitors. An important contribution to the development of methodological approaches to the formation of the enterprise development strategy was made by such Ukrainian and foreign scientists: Chi-Lin Yang, Min-Hsien Chiang and Chien-Wei Chen [2], Dara G. [3], Gorlachuk V. V. and Yenenkova V. V. [4], Grabovetsky B. E. and Pityk O. V. [5], Jackson T. [6], Karpishchenko O. I, Ilyashenko K. V. and Karpishchenko O. O. [7], Kutsyk V. I. and Chaus V. M. [8], Ridler N., Wowchuk M., Robinson B., Barrington K., Chopin T., Robinson S., Page F., Reid G., Szemerda M. and Sewuster J. [9], Tinbergen J. [10] and others. However, the existing issues on the development of an effective development strategy for agricultural enterprises using modern techniques remain open. That is why research in this area is very relevant.

The article aims to develop a typical development strategy for an agricultural enterprise by the Hoshin Kanri method in the form of an X-matrix, which is based on the establishment of different strength of impact (strong, significant, weak) correlations between strategic and tactical goals, business processes and expected results.

Modern economic conditions require the use of progressive methodological approaches to strategy development. A formed strategy should take into account all activity areas of the enterprise, all divisions and processes. Its development should involve employees of the enterprise, that is, use participatory management, which will ultimately contribute to its better implementation.

Nobel laureate Jan Tinbergen, developing models of economic development, formulated some methodological requirements for their creation, which can be taken into account in the construction of models of agricultural systems development. One of these requirements is the availability of clearly formulated forecasts or hypotheses based on which the model will change [10].

Among the methods of strategic planning, there are the following: resource method, target method, extrapolation method, interpolative method, statistical testing method, criterion method, normative method, balance method, matrix method and strategic plan construction.

Resource planning method consists of accounting for resources owned by the enterprise and assessment of management market conditions. This method is mostly applied in the case of low competition or the case of a monopolistic market position of the enterprise.

The target method of strategic planning, on the contrary, is used by enterprises in the presence of strong competition. In such conditions, the initial moment of planning is the demand for products and the needs of the market [8].

The extrapolation method is to develop assumptions that the rates and proportions achieved at the time of plan formation will remain the same in the future. This takes into account the dynamics of past years, which is the basis for further strategic planning.

The interpolation method, on the contrary, is carried out in the opposite direction, from the final value of the planned indicators and a certain goal with the calculation of intermediate values to the present state of the enterprise.

The statistical testing method consists of using the actual statistical data for the previous years and calculating on their basis the average values that form the base of the planned indicators.

The method of extrapolation, interpolation and statistical testing method are used mainly in enterprises where the indicators of economic activity are stable [4].

According to the criterion method, the planned indicators values are determined by calculating the influence of the most important factors that cause changes in these indicators. This method is used when planning production efficiency.

The most common and accurate method used for strategic planning needs is the normative method. According to this method, the planned indicators are calculated, taking as a basis the progressive norms of use of resources, taking into account the changes as a result of the implementation of organizational and technical measures in the planning period. Accordingly, the normative method provides for the creation of a certain regulatory framework at the enterprise, based on modern market conditions of management. Such a base is developed by the enterprises independently and is formed in the form of the automated system of standards [8].

The balance sheet method of strategic planning is a set of techniques used to ensure the consistency of interrelated indicators: planning needs and the necessary resources to meet them. This method involves the development of balances for different resources. Its goal is to achieve a balance between indicators [7].

The matrix method is used in the planning of multifactorial models and involves the construction of relationships models between production indicators and departments. The main advantage of balance and matrix methods is the prevention and elimination of imbalances, as well as the establishment of effective proportions [4].

B. Ye. Hrabovetskyi and O. V. Pityk highlight that "the strategic plan is a system of the relevant written documents that formalize the efforts of the entire team of the enterprise and aimed at the organization of the implementation of strategic objectives with a description of specific goals, deadlines and responsible persons for their implementation" [5].

Currently, different scientists and practitioners use different methodological approaches to strategic planning. Thus, Chi-Ling Yang, Ming-Xing Chiang, Chiang-Wei Chen in their works analyzed the impact of financial leverage on the strategic planning process using the methods of internal strategic analysis [2].

N. Ridler, M. Vovchuk, B. Robinson, K. Barrington, T. Chopin, S. Robinson, F. Page, G. Reid, M. Semerda, J. Sister and S. Boyne-Travis use scenario analysis and modelling techniques to determine the strategic development potential of enterprises in Canada [9].

Dara G. Schniederians investigated the relationship with consistent business process innovation between SQM and supply chain performance by the causal relationship method [3].

The Hoshin Kanri method involves the development of a strategic plan. It is a key element of the "Six Sigma" methodology, which is used in strategic management to improve the production process and manufacture the product with the smallest deviations from the specified parameters. Such leading world-known companies as Motorola, Toyota, General Electric and others use the Hoshin Kanri method in their operations. This method is also known as the policy deployment method.

The Hoshin Kanri method is based on the application of the Deming Cycle, or PDCA, and is a concept of cyclic control. PDCA stands for "Plan-Do-Check-Act" and is a continuous process of improving every aspect of the company. To develop a Hoshin Kanri strategy one needs four groups of teams, namely, Hoshin team, tactical team, operational team, and execution team. The Hoshin team is generally responsible for strategic planning. It develops and manages a long-term strategy (5 to 100

years), a medium-term strategy (3 to 5 years), and an annual Hoshin plan (6 to 18 months). Tactical teams, which are formed by the Hoshin team, are responsible for developing specific tactical initiatives (for a period of 6-18 months) at functional levels: production, financial, marketing, and so forth. Operational teams are formed by tactical teams and are responsible for operational projects (3-6 months' duration) aimed to improve specific products and processes. Teams of executors are formed by the operational teams and are responsible for the realization of specific projects (from 1 week to 3 months period) implemented in order to apply new tools and technologies in everyday standard work operations (kaikaku) and short-term operations (in real-time) related to shortages, errors, failures and other deviations arising. They are also responsible for the implementation of improvements proposed by employees (Kaizen) [6]. The Hoshin Kanri method requires all teams to work together to achieve the ultimate goal, which is accomplishment a long-term strategy.

The fundamental document of Hoshin Kanri method, which records all strategic, tactical, operational objectives and the relationship between them, is the X-matrix. The main advantage of the X-matrix is the ability to present the entire process of strategy development on a single page of A3 format.

The strategy is the main factor in the matrix, it is written to the left of the letter "X". Here are the main strategic objectives of the enterprise. Depending on the strategic goals, tactics are formed within the framework of current projects and initiatives, which is written at the top of the letter "X". Tactics require the implementation of specific processes to improve the activities of the enterprise. Those are placed on the X-matrix to the right of the letter "X". With high-quality process management, you can get the corresponding results, which are recorded in the lower part of the x-matrix. It is also necessary to calculate the financial effect of investments in business processes and enter them in the column to the right of the results. In "Team members" block fit the names of the people responsible for the implementation of tasks. The block "Scope of responsibility/accountability" makes it possible to record the most significant relationships between people, teams, departments, as well as partners. The blocks that belong to the "Correlation" part of the matrix record the relationships between the most essential factors of the entire business strategy.

The use of the A3 format according to the Hoshin Kanri method is an indicator of integrity, conciseness and simplicity. Besides, it enables top-level managers to collaborate with lower-level managers and directly with employees, thereby involving all people in the company in the process of strategy development and implementation.

The main advantages of the Hoshin Kanri method are simplicity and functionality, personnel involvement and interconnection of all levels of management.

In the conditions of dynamic state of market, globalization of the world economy, rapid pace of scientific and technological progress, agricultural enterprises should set a goal of further development and use such a management system that is able to ensure sustainable and most effective functioning during the current period and form a high potential for development in the future.

Given the rapid pace of development, predictively in 5 years, agricultural enterprises should use more progressive methods of building the strategy. This is precisely the Hoshin Kanri method. This method is complex in its structure but very effective and representative in the strategy implementation. For this purpose, a typical development strategy of an agricultural enterprise was developed based on the given x-matrix template (tab. 1). This strategy is designed for 3 years and includes strategic goals, tactical goals, processes and results.

Among the strategic goals that are typical for an agricultural enterprise, we have identified the following:

1) increasing business efficiency;
2) increasing the efficiency of sales;
3) introduction of innovative technologies in production;
4) business-process optimization.

Managers of agricultural enterprises can form a greater number of strategic goals based on the needs of enterprises. According to the outlined strategic goals, tactical goals (project programs) were formed, which are detailed according to what needs to be done.

X-matrix						Topic: Development strategy development of agricultural enterprise for 3 years														
Correlation					Correlation / contribution												Subordination			
◙	□	○	○		To improve the efficiency of operating and investment activities	◙	◙	○	□	□	□	□	□	○	○					
□	□	○	○		To increase productivity	○	◙	◙	□	□	□	□	□	○	○					
○	□	□	○		Expand the product range	○	○	□	○	◙	□	□	□	□	○					
○	□	□	○		Expand the existing market and enter new markets	○	□	□	◙	◙	◙	□	□	□	○					
○	◙	□	○		Improve sales efficiency (increase margins, conversions)	○	□	□	○	□	○	◙	◙	□	○					
○	○	◙	□		Implement employee development training programs	○	□	□	□	□	□	□	○	◙	□					
○	□	◙	□		Introduce innovative technologies into production	○	◙	◙	□	□	□	□	□	◙	□					
○	○	□	◙		To optimize business processes	○	○	□	○	○	○	○	○	□	◙					
					… tactical goal															
Increase of business efficiency	Increase of the efficiency of sales	Introduction of innovative technologies in production	Business process optimization	… strategic objective	tactics (project programs) Strategy (3 years) **X** process results	To approve the investment policy of the agricultural enterprise	Introduce progressive forms of production and labour organization	Implement a program of modernization and renewal of the material and technical base	To analyze the consumer market of agricultural products	Set up and start production of a new type of products	Identify market opportunities and introduce marketing programs	To improve the process of sales activities. To improve call-back	Provide timely and quality customer service	To approve the program of introduction of innovative technologies in production	Implement an automated business process system	… process	"Smart" organization Project participant 1	Project participant 2	Project participant 3	Project participant n
1	2	3	4	n		1	2	3	4	5	6	7	8	9	10	n	Correlation symbols			
◙	□	○	□		Increase in profitability of the enterprise operations, increase of organizational culture level															
◙	□	◙	○		Increase in the amount of investment, increase of ROI															
◙	□	◙	○		Improvement the efficiency of the work equipment															
◙	◙	□	○		Compliance with commercial quality indicators															
◙	□	◙	○		Improvement of the production efficiency															
○	□	◙	○		Increase in labour productivity															
○	□	◙	◙		Reducing the cost of core business processes															
					…result															

Correlation symbols:
◙ – strong connection, team leader
○ – significant connection, one of the key team members
□ – weak connections, occasional team member

*Tab. 1. A typical development strategy of agricultural enterprises (according to the method of Hoshin Kanri). *Source: author's development*

The tactical goals that ensure the implementation of these strategic goals include:

1) to improve the efficiency of operating and investment activities;
2) to increase productivity;
3) expand the product range;
4) expand the existing market and enter new markets;
5) improve sales efficiency (increase margins, conversions);
6) implement employee development training programs;
7) introduce innovative technologies into production;
8) to optimize business processes.

Implementation of this development strategy of the agricultural enterprise will allow achieving the following results:

1) increase in profitability of the enterprise, increase of organizational culture level;
2) increase in the amount of investment, increase of ROI;
3) improvement the efficiency of the equipment;
4) compliance with commercial quality indicators;
5) improvement in production efficiency;
6) increase in labour productivity;
7) reducing the cost of core business processes.

To optimize the implementation of the development strategy, correlations between strategic and tactical goals, tactical goals and processes, strategic goals and results were presented.

Managers of agricultural enterprises are responsible for the final performance results and quantitative indicators arising in this case [1].

To implement the developed strategy, an agricultural enterprise should create a "smart" organization consisting of project participants who will be responsible for a certain area of work. By identifying project participants, it will be possible to establish subordination and correlations with project programs.

3. CONCLUSIONS

The article analyzes various methods of strategic planning based on the use of different methods of strategy building. It is established that under the conditions of formation of high-level strategic management at the enterprise, the implementation of the strategy will be successful and effective. Using the Hoshin Kanri method, a typical agricultural enterprise development strategy in the form of an x-matrix was developed. This strategy is designed for 3 years. It includes strategic and tactical goals, processes and results, between which appropriate correlations have been established. Managers of modern agricultural enterprises should form a new type of thinking and use progressive approaches to the formation and implementation of enterprise strategy.

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Боришкевич Ірина. Розробка типової стратегії розвитку сільськогосподарського підприємства (за методом Хосин Канрі). *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 15–21.

Сучасні умови глобалізації бізнесу, значна обмеженість ресурсів, посилення конкуренції та прискорення технологічних нововведень вимагають від сільськогосподарських підприємств здатності швидко пристосуватися до мінливих умов зовнішнього середовища. Запорукою їх успішного продуктивного розвитку є забезпечення максимально ефективного використання наявного ресурсного потенціалу. У науці та практиці існує велика кількість різноманітних методичних інструментів, які сприяють покращенню функціонування суб'єктів господарської діяльності. Одним із таких інструментів, що забезпечує досягнення результативного розвитку, формуючи стійкі конкурентні переваги, є стратегія. Йдеться про складну модель, яка охоплює усі процеси на підприємстві. Використання керівниками сільськогосподарських підприємств прогресивних методів розробки стратегії є запорукою успіху її ефективної реалізації та нарощення підприємством конкурентних переваг в ринковому середовищі. У статті проаналізовано існуючі методи стратегічного планування, в основі яких лежить різна методика побудови стратегій. Проведено характеристику наступних методів: ресурсний метод, цільовий метод, метод екстраполяції, інтерполятивний метод, пробно-статистичний метод, критеріальний метод, нормативний метод, балансовий метод, матричний метод і побудова стратегічного плану. На основі опрацьованих джерел досліджено метод Хосин Канрі, що базується на застосуванні циклу Демінга та являє собою концепцію циклічного управління. Розроблено типову стратегію розвитку сільськогосподарського підприємства у вигляді Х-матриці. Дана стратегія розрахована на 3 роки і включає стратегічні і тактичні цілі, процеси і результати, між якими встановлені відповідні кореляційні зв'язки. Серед стратегічних цілей, що є типовими для сільськогосподарських підприємств виокремлено наступні: підвищення ефективності бізнесу, підвищення ефективності збутової діяльності, впровадження інноваційних технологій у виробництво та оптимізація бізнес-процесів. Відповідно керівництво сільськогосподарських підприємств можуть формувати більшу кількість перспективних цілей, виходячи із потреб суб'єктів господарювання. Отримані результати формують підґрунтя для подальших досліджень механізму формування та впровадження стратегії розвитку сільськогосподарських підприємств.

Ключові слова: стратегія, метод, сільськогосподарське підприємство, Хосин Канрі, стратегічне планування.

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CEV MODEL WITH STOCHASTIC VOLATILITY

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Abstract. This paper develops a systematic method for calculating approximate prices for a wide range of securities implying the tools of spectral analysis, singular and regular perturbation theory. Price options depend on stochastic volatility, which may be multiscale, in the sense that it may be driven by one fast-varying and one slow-varying factor. The found the approximate price of two-barrier options with multifactor volatility as a schedule for own functions. The theorem of estimation of accuracy of approximation of option prices is established. Explicit formulas have been found for finding the value of derivatives based on the development of eigenfunctions and eigenvalues of self-adjoint operators using boundary-value problems for singular and regular perturbations. This article develops a general method of obtaining a guide price for a broad class of securities. A general theory of derivative valuation of options generated by diffusion processes is developed. The algorithm of calculating the approximate price is given. The accuracy of the estimates is established. The theory developed is applied to a diffusion operator, which is decomposed by eigenfunctions and eigenvalues. The purpose of the article is to develop an algorithm for finding the approximate price of two-barrier options and to find explicit formulas for finding the value of derivatives based on the development of self-functions and eigenvalues of self-adjoint operators using boundary-value problems for singular and regular perturbations. Price finding is reduced to the problem solving of eigenvalues and eigenfunctions of a certain equation. The main advantage of our pricing methodology is that, by combining methods in spectral theory, regular perturbation theory, and singular perturbation theory, we reduce everything to equations to find eigenfunctions and eigenvalues.

Keywords: derivative pricing, stochastic volatility, local volatility, spectral theory, singular perturbation theory, regular perturbation theory.

1. INTRODUCTION

Spectral theory was widely used in the second half of the 20th century by many economists. In recent years spectral analysis has become an increasingly popular tool for use in financial mathematics to analyze diffusion models which are based on the expansion of eigenfunctions and eigenvalues of linear operators. For example, it is used to find the price of a European option using Black-Scholes model [8]. Among the scientific problems that can be solved by applying spectral methods: predicting option prices, [5] securities interest rates [11], modeling the volatility of financial assets [4].

Assets estimation problems are solved analytically by methods of spectral theory [5]. Spectral theory as well as stochastic volatility models has become an indispensable tool in financial mathematics, for the matter of that, two barrier option prices are subjected to Brownian motion and are

correlated with volatility [6]. The study of stochastic volatility, volatility assets in particular, underlies the derivative and is controlled by nonlocal diffusion.

In this article we continue the area of our research [1; 2], expending it on the theory model CEV (constant elasticity of variance model), which was designed by John Cox in 1975, employing his methods [3; 9; 10].

Combining the methods of spectral theory and regular perturbance, we are able to calculate approximately the opportunity cost as expansion of eigenfunctions. We will work with infinitesimal generators of three-dimensional diffusion.

2. PROBLEM STATEMENT

First, consider the one-dimensional diffusion $dX_t = v(X_t)dt + a(X_t)dW_t$ which has the possibility to show default jump at a speed $h(X_t) \geq 0$, W_t- geometric Brownian motion, X is always strictly positive. We add two nonlocal volatility factors to the total diffusion: $a(X_t) \to a(X_t)f(Y_t, Z_t)$. The first factor Y is dynamic. The second factor Z changes slowly. So, our model is a multidimensional volatile stochastic model.

Let (Ω, F, P) denote probability space that supports correlated Brownian motion $(\mathrm{W}^x, \mathrm{W}^y, W^z)$ and an exponential random variable $\varepsilon \sim Exp(1)$, which is not independent of $(\mathrm{W}^x, \mathrm{W}^y, W^z)$. We assume that the economy with three factors is described by homogeneous time, continuous Markov process $\chi = (\mathrm{X}, \mathrm{Y}, \mathrm{Z})$, which takes values in some state space $\mathrm{E} = I \times \mathrm{R} \times \mathrm{R}$, $I = (e_1, e_2)$, $-\infty \leq e_1 < e_2 \leq \infty$. Suppose that χ begins in E and instantly disappears once $X \notin I$, that is:

The dynamics of χ according to the physical value $\mathbb{P}$, is as follows:

$$\chi_t = \begin{cases} (X_t, Y_t, Z_t), & \tau_I < t \\ \Delta, & \tau_I > t \end{cases}, \quad \tau_I = \inf(t > 0 \colon X_t \notin I),$$

where (X, Y, Z) are assigned

$$\begin{cases} dX_t = v(X_t)dt + a(X_t)f(Y_t, Z_t)dW_t^x, \\ dY_t = \frac{1}{\epsilon}a_{11}(Y_t)dt + \frac{1}{\sqrt{\epsilon}}a_{12}(Y_t)dW_t^y, \\ dZ_t = \delta a_{21}(Z_t)dt + \sqrt{\delta}a_{22}(Z_t)dW_t^z, \\ d(W^x, W^y)_t = \rho_{xz}dt, \\ d(W^x, W^z)_t = \rho_{xy}dt, \\ d(W^y, W^z)_t = \rho_{yz}dt, \\ (X_0, Y_0, Z_0) = (x, y, z) \in E. \end{cases}$$

where $(\rho_{xy}, \rho_{xz}, \rho_{yz})$ such as $|\rho_{xy}|, |\rho_{xz}|, |\rho_{yz}| \leq 1$ and $1 + 2\rho_{xy}\rho_{xz}\rho_{yz} - {\rho_{xy}}^2 - {\rho_{xz}}^2 - {\rho_{yz}}^2 \geq 0$, and matrix correlation of Brownian model is positive. The process X can display, for instance, index value, short interest rates, option pricing. The physical value $\mathbb{P}$ of the process X, we consider as an instant drift $v(X_t)$ and stochastic volatility $a(X_t)f(Y_t, Z_t) > 0$, which has two components: local $a(X_t)$ and nonlocal $f(Y_t, Z_t)$. Nonlocal volatility component $f(Y_t, Z_t)$ is based on two factors: Y and Z, so for infinitesimal generators have

$$\mathrm{M}_Z^{\epsilon} = \frac{1}{\epsilon}\left(\frac{1}{2}a_{12}^2(y)\partial_{yy}^2 + a_{11}(y)\partial_y\right), \qquad \mathrm{M}_Z^{\delta} = \delta\left(\frac{1}{2}a_{22}^2(z)\partial_{zz}^2 + a_{21}(z)\partial_z\right),$$

Therefore, Y and Z have an internal timeline $\epsilon > 0$ and $1/\delta > 0$. We assume that $\epsilon << 1$ and $\delta << 1$, the internal timeline Y is small, whereas the internal timeline Z is large. So, Y is volatility of fast variable factor, whereas Z is vitality of a slow variable factor. Note that M_Y^{ϵ} and M_Z^{δ}t are

$$L = \frac{1}{2}a^2(x)\partial_{xx}^2 + a_1(x)\partial_x - a_2(x), \; x \in (e_1, e_2). \tag{1}$$

Suppose you have to pay share dividends $S_t = \mathbb{I}_{\{\tau>t\}}X_t,\ S > 0.$ then the state space X will be $e_1, e_2 = (0,\infty)$. Consider a multidimensional diffusion process at Killing (default jumps) of constant variable model. In particular, $\widetilde{\mathbb{P}}$ dynamics of X default is set as

$$dX_t = \left(\mu + cX_t^{2\eta}\right)X_t dt + f(Y_t, Z_t)X_t^{\eta+1} d\widetilde{W}_t^x,\ \ h(X_t) = \mu + cX_t^{2\eta}.$$

To simplify calculations assume that the risk-free interest rates $r = 0$, $\mu > 0,\ c > 0$, Y and Z are fast and slow variables of volatility, which are defined

$$\begin{cases} dX_t = \left(a_1(X_t) - a(X_t)f(Y_t,Z_t)\Omega(Y_t,Z_t)\right)dt + a(X_t)f(Y_t,Z_t)d\widetilde{W}_t^x, \\ dY_t = \left(\frac{1}{\epsilon}a_{11}(Y_t) - \frac{1}{\sqrt{\epsilon}}a_{12}(Y_t)\Lambda(Y_t,Z_t)\right)dt + \frac{1}{\sqrt{\epsilon}}a_{12}(Y_t)d\widetilde{W}_t^y, \\ dZ_t = \left(\delta a_{21}(Z_t) - \sqrt{\delta}a_{22}(Z_t)\Gamma(Y_t,Z_t)\right)dt + \sqrt{\delta}a_{22}(Z_t)d\widetilde{W}_t^z, \\ d\langle\widetilde{W}^x, \widetilde{W}^y\rangle_t = \rho_{xy}dt, \\ d\langle\widetilde{W}^x, \widetilde{W}^z\rangle_t = \rho_{xz}dt, \\ d\langle\widetilde{W}^y, \widetilde{W}^z\rangle_t = \rho_{yz}dt, \\ (X_0, Y_0, Z_0) = (x, y, z) \in E, \end{cases}$$

where

$$d\widetilde{W}_t^x := dW_t^x + \left(\frac{v(X_t) - b(X_t)}{a(X_t)f(Y_t,Z_t)} + \Omega(Y_t,Z_t)\right)dt,$$
$$d\widetilde{W}_t^y := dW_t^y + \Lambda(Y_t,Z_t)dt,$$
$$d\widetilde{W}_t^z := dW_t^z + \Gamma(Y_t,Z_t)dt,$$

In our study, there may be two possible ways of default when X is beyond the time-frame I, or at random time τ_h, $(h(X_t) \geq 0$ stochastic value (the so-called level of danger). Mathematically default time τ can be expressed as follows [2].

Volatility X includes the local component X_t^η and nonlocal component of multidimensionality $f(Y_t, Z_t)$. We assume, η <0, that is local volatility component X_t^η increases when X_t, decreases. It means that prices and volatility have negative correlation. Stochastic danger level $h(X_t)$ increases when X decreases. Now let's calculate the approximate price of European option for assets S. The European option price can be defined by the formula (2).

$$\langle \mathrm{M}_2\rangle = \frac{1}{2}\bar{\sigma}^2 x^{2\eta+2}\partial_{xx}^2 + (\mu + cx^{2\eta})x\partial_x - (\mu + cx^{2\eta}), \tag{2}$$

M_2– infinitesimal generator, the end of the time-frame that is the point $e_2 = \infty$ is a natural border. However, the classification of point $e_1 = 0$ depends on the value η and $c/\bar{\sigma}^2$. Therefore, we present the following classification:

1) $c/\bar{\sigma}^2 \geq 1/2,\ \eta < 0,\ e_1 = 0$ – trivial case,
2) $c/\bar{\sigma}^2 \in (0, 1/2),\ \eta \in \left[\frac{c}{\bar{\sigma}^2} - 1/2, 0\right),\ e_1 = 0$ – this number serves as the initial moment,
3) $c/\bar{\sigma}^2 \in (0, 1/2),\ \eta < \frac{c}{\bar{\sigma}^2} - \frac{1}{2},\ e_1 = 0$ under such circumstances the start of time-frame is stable.

If parameters $(\mathrm{c}, \bar{\sigma}, \eta)$ are satisfying $c/\bar{\sigma}^2 \in (0, 1/2)$, and $\eta \in \left[\frac{c}{\bar{\sigma}^2} - \frac{1}{2}, 0\right)$, $e_1 = 0$, then e_1 is considered as Killing border. To calculate the approximate price of the European option, we must find eigenfunctions $\{\psi_n\}$, eigenvalues $\{\lambda_n\}$ operator $\langle \mathrm{M}_2\rangle$. Note that $\langle \mathrm{M}_2\rangle$, presented in (2), looks like infinitesimal generator of the one-dimensional diffusion (1) with volatility $\bar{\sigma}a(x)$, deviation $\left(a_1(x) - \overline{f\Omega}a(x)\right)$ and Killing $a_2(x)$, $dom(\langle \mathrm{M}_2\rangle)$ includes marginal conditions which are to be imposed at the end e_1 and e_2 equation $-\langle \mathrm{M}_2\rangle\psi_n = \lambda_n\psi_n,\ \psi_n \in dom(\langle \mathrm{M}_2\rangle)$, at the interval $(0, \infty)$ with $\langle \mathrm{M}_2\rangle$ is defined as (5) follows

$$\lim_{x\to 0}\psi_n = 0, \text{ if } \frac{c}{\bar{\sigma}^2}\in\left(0,\frac{1}{2}\right).$$

3. RESULTS

The results of this research result from the article [2]

$$\psi_n = A^{\frac{\upsilon}{2}}\sqrt{\frac{(n-1)!\,\mu}{\Gamma(\upsilon+n)}}\,x\,exp(-Ax^{-2\eta})L_{n-1}^{(\upsilon)}(Ax^{-2\eta}),\qquad n=1,2,3,\dots,$$

$$A=\frac{\mu}{\bar{\sigma}^2|\eta|},\qquad \lambda_n=2\mu|\eta|(n+\upsilon),\qquad \upsilon=\frac{1+2(\frac{2}{\bar{\sigma}^2})}{2|\eta|},$$

where $L_n^{(\upsilon)}=\sum_{i=0}^{n}(-1)^i\binom{n+\upsilon}{n-i}$ is the generalized Laguerre polynomials. Write expressions for the operators $\mathcal{A}$ and $\mathcal{B}$:

$$\mathcal{A}=-\nu_3 x^{\eta+1}\partial_x x^{2\eta+2}\partial_{xx}^2-\nu_2 x^{2\eta+2}\partial_{xx}^2,\ \ \mathcal{B}=-\nu_1 x^{\eta+1}\partial_x-\nu_0.$$

Analytical expressions for $\mathcal{A}_{k,n}, \mathcal{B}_{k,n}$ and $\widetilde{\mathcal{B}}_{k,n}$ can be obtained by making a change of variables [1] $Ax^{-2\eta}\to y$, using

$$\partial_y L_n^{\upsilon}(y)=-L_{n-1}^{(\upsilon+1)}(y) \text{ and } \int_0^\infty y^\alpha e^{-y}L_n^{(\alpha)}(y)L_m^{(\alpha)}(y)dy=\frac{\Gamma(n+\alpha+1)}{n!}\delta_{nm'}$$

where δ_{nm} — Kronecker symbol. Formulas for determining $\mathcal{A}_{k,n}, \mathcal{B}_{k,n}$ i $\widetilde{\mathcal{B}}_{k,n}$, have the following form [3]

$$c_n=(\psi_n,1)=\frac{2}{\bar{\sigma}}\sqrt{\frac{\pi}{\kappa}}\mathcal{N}_n A^n e^{-A^2/4}.$$

The European option profit with strike price $\mathrm{K}>0$ can be decomposed as follows [9]:

$$(K-S_t)^+=(K-X_t)^+\mathbb{I}_{\{\tau>t\}}+K\left(1-\mathbb{I}_{\{\tau>t\}}\right). \tag{3}$$

The first item on the right hand side (3) profit option is submitted to default at time t. The second item is profit option which is submitted after the default, which occurs at time t. So, the value of the option with strike price K – is denoted as $u^{\epsilon,\delta}(t,x;K)$ and can be expressed as the sum of:

$$u^{\epsilon,\delta}(t,x;K)=u_o^{\epsilon,\delta}(t,x;K)+u_D^{\epsilon,\delta}(t,x;K),$$

where

$$u_o^{\epsilon,\delta}(t,x;K)=\widetilde{\mathbb{E}}_{x,y,z}\left[(K-X_t)^+\mathbb{I}_{\{\tau>t\}}\right],$$

$$u_D^{\epsilon,\delta}(t,x;K)=K-K\widetilde{\mathbb{E}}_{x,y,z}\left[\mathbb{I}_{\{\tau>t\}}\right]=K-K\int_0^\infty\widetilde{\mathbb{E}}_{x,y,z}\left[\delta_{x'}(X_t)\mathbb{I}_{\{\tau>t\}}\right]dx'$$

$$=K-K\int_0^\infty u_1^{\epsilon,\delta}(t,x;x')dx',$$

$$u_1^{\epsilon,\delta}(t,x;x')=\widetilde{\mathbb{E}}_{x,y,z}\left[\delta_{x'}(X_t)\mathbb{I}_{\{\tau>t\}}\right],\qquad 1\notin L^2(\mathbb{R}^+,\mathfrak{m})$$

We used that $1=\int_0^\infty\delta_{x'}(X_t)dx'$ on the set $\{\tau>T\}$.

So, as the functions of profit $H_0(x)=(K-x)^+$ and $H_1(x)=\delta_{x'}(x)$ are $L^2(\mathbb{R}^+,\mathfrak{m})$, we can calculate:

$$c_{0,n}=(\psi_n(\cdot),(k-\cdot)^+),\quad c_{1,n}=(\psi_n,\delta_{x'}).$$

Expressions for $c_{0,n}$ and $c_{1,n}$ can be found in [10].

The estimated value of the European option can now be calculated using the theorems 1, 2, 3 [2]. For the European variant the option volatility $I^{\epsilon,\delta}$ with price $u^{\epsilon,\delta}(t,x;K)$ is determined by using

$$u^{\epsilon,\delta}(t,x;K) = u^{BS}\left(t,x,I^{\epsilon,\delta};K\right)$$

where $u^{BS}\left(t,x,I^{\epsilon,\delta};K\right)$ Black-Scholes price with volatility $I^{\epsilon,\delta}$.

The calculation results are presented in Figure 1

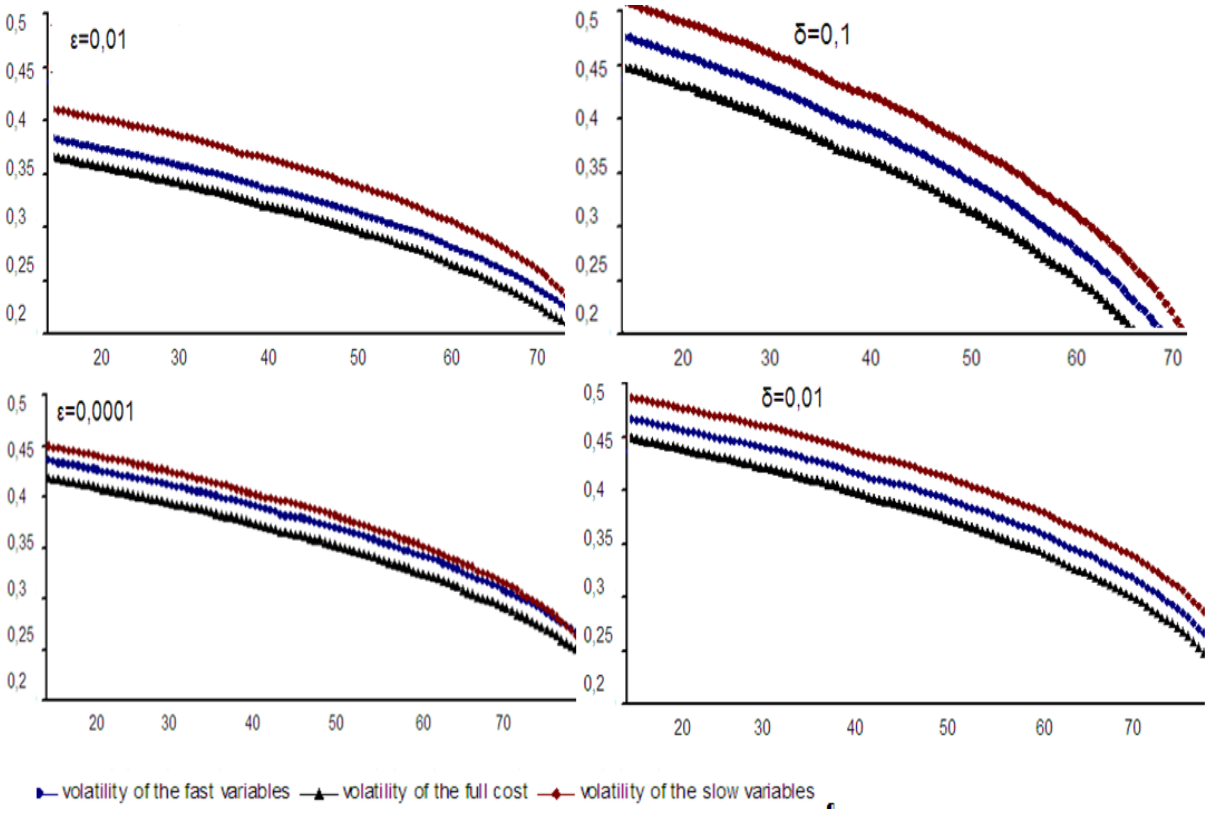

Fig. 1. Volatility Dynamics

Volatility is constructed on the left hand side of Figure 1 depends on the price, the option for the model, which has only volatility of the fast variables. Dynamics Y and volatility function f are defined by the formula.

$$dY_t = \left(-\frac{1}{\epsilon}Y_t - \frac{1}{\sqrt{\epsilon}}a_{12}\mathrm{Er}f(Y_t)\right)dt + a_{12}d\widetilde{W}_t^y, \quad f(Y_t) = \frac{\sigma\exp(Y_t)}{\exp\left(-\frac{a_{12}^2}{2}\right)},$$

$$\mathrm{Erf}(y) := \frac{2}{\sqrt{\pi}}\int_0^y e^{-t^2}dt.$$

Volatility was built for comparison of full value u^{ϵ} and on the right hand side of Figure 1 is shown volatility caused by approximate price, the option for the model with volatility of the slow variables. Dynamics Z and volatility function f are set

$$dZ_t = \left(-\delta Z_t - \sqrt{\delta}a_{22}\mathrm{Erf}(Z_t)\right)dt + a_{22}d\widetilde{W}_t^z, \quad f(Z_t) = \frac{\sigma\exp(Z_t)}{\exp(z)}.$$

As expected, ε and δ which move to the zero, volatility moves to volatility price implied by full value.

4. CONCLUSIONS

This paper, extends the method of finding approximate price for a wide range of derivative assets. One of the main advantages of our pricing methodology is that by combining methods of the spectral theory of singular and regular perturbance, the calculation of asset prices leads to solving the equation by eigenvalues and eigenfuntion methods as well as by solving Poisson equation. Once this equation is solved, the approximate price of a derivative asset may be calculated formulaically.

Price finding is reduced to the problem solving of eigenvalues and eigenfunctions of a certain equation. The main advantage of our pricing methodology is that, by combining methods in spectral theory, regular perturbation theory, and singular perturbation theory, we reduce everything to equations to find eigenfunctions and eigenvalues.

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Буртняк Іван, Малицька Ганна. CEV модель стохастичної волатильності. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 22–28.

У цій роботі розроблено систематичний метод розрахунку наближених цін для великого спектру цінних паперів, що передбачає використання інструментів спектрального аналізу, сингулярної та регулярної теорії збурень. Ціни деривативів залежать від стохастичної волатильності, яка може бути багатовимірною, в тому сенсі, що вона може бути обумовлена одним швидкозмінним і одним повільно змінним фактором. Знайдена наближена ціна двобар'єрних опціонів з багатофакторною. Встановлено теорему оцінки точності наближення цін опціонів. Знайдені явні формули для знаходження значення похідних цінних паперів, що ґрунтуються на застосуванні власних функцій та власних значень самоспряжених операторів з використанням крайових задач для сингулярних та регулярних збурень. У цій статті розроблено загальний метод отримання орієнтовної ціни для широкого класу цінних паперів. Розроблена загальна теорія оцінки ціни деривативів, породжених дифузійними процесами. Наведено алгоритм розрахунку наближеного рівня цін опціонів. Встановлюється точність наближення. Розроблена теорія застосовується до дифузійного оператора, який розкладається за власними функціями та власними значеннями. Мета статті - розробити алгоритм пошуку наближеної ціни деривативів та знайти точні формули знаходження значень похідних цінних паперів на основі знаходження власних функцій та власних значень самоспряжених операторів з використанням граничних значень для сингулярних і регулярних збурень. Знаходження цін деривативів зводиться до розв'язування задач на знаходження власних значень та власних функцій певного рівняння. Основна перевага нашої методології ціноутворення полягає в тому, що, поєднуючи методи спектральної теорії, регулярної теорії збурень та сингулярної теорії збурень, ми зводимо все до розв'язання рівнянь, які дають можливість для пошуку власних функцій та власних значень операторів.

Ключові слова: ціноутворення деривативів, стохастична волатильність, локальна волатильність, спектральна теорія, сингулярна теорія збурень, регулярна теорія збурень.

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THE INTRODUCTION OF INNOVATIVE CONCEPTS IN THE MANAGEMENT SYSTEM OF THE SANATORIUM-RESORT ENTERPRISE IN THE CONTEXT OF ENSURING SOCIO-ECONOMIC SECURITY

ZORIANA BURYK

Abstract. Goal. Coverage of introduction of innovative concepts in the system of management of activity of sanatorium and resort enterprises. Research methodology. The following methods were used: analysis (theoretical review of scientific literature on the problem of research); a synthesis that made it possible to integrate individual parts of the facility into a single unit (development of a Balanced Scorecard for health resort enterprises in terms of socio-economic security); benchmarking that allowed us to map concepts (spa marketing, business performance management, and balanced scorecard). Results. The peculiarities of the management system of the sanatorium and resort enterprises in the conditions of social and economic security are considered. It is stated that the concept of management in terms of ensuring the socio-economic security of any enterprise of the sanatorium and resort complex is based on clearly formed systems of organization of management of socio-economic development. The basic methods of implementation, organization and management of social and economic security at the enterprise are distinguished. It is noted that spa marketing is a concept of management of the spa enterprise, which provides a comprehensive study of the needs of clients in the spa treatment and recreation for their fullest satisfaction through complex efforts to produce, sell and promote the spa product in a competitive market with the aim ensuring socio-economic security and profit. The basic processes covered by the concept of Business Performance Management for spa companies are presented. The Balanced Scorecard Balance Scorecard system has been developed for sanatorium and resort enterprises in terms of social and economic security. Scientific novelty. The basic innovative concepts (spa marketing, Business Performance Management and Balanced Scorecard) are proposed, which introduction into the enterprise management system will ensure effective management decisions, achievement of strategic goals, increase of profit and social and economic security in general. Practical importance. The introduction of our proposed concepts into the management system of sanatorium and resort enterprises will provide such an institution with a complete and effective implementation of processes for managing its activities, providing customer service and optimizing the functions and management procedures performed.

Keywords: enterprise, concept, management system, activity, safety.

1. INTRODUCTION

Problem statement in general and its relevance to important scientific or practical tasks. The radical transformation of the state socio-economic system of Ukraine over the last two decades, significant economic transformations, changes in the organizational and legal forms of economic entities have contributed to significant changes in the sanatorium and resort complex, contributed to the formation of market approaches to the management of sanatorium and resort enterprises, new technologies in resort service. The place of the sanatorium-resort complex in the system of public relations has also changed, which contributed to the systematic (primarily financial) withdrawal of the state from this sphere.

The decrease in the level of state regulation of the sanatorium and resort industry has influenced that the quality of service to the population, as well as the availability of sanatorium and resort services, now depend on the efficiency of functioning of certain subjects of the sanatorium and resort complex. New business conditions require participants of market relations of high business activity and new concepts in the management system.

Analysis of recent research and publications in which a solution of the problem to which the author refers. The study features management companies devoted to the works of G. Atamanchuk [1], V. Vasylenko [3], E. Dukhonin [8], D. Isaev [8], R. Kaplan [16-19], E. Mostovoy [8], D. Norton [16- 19], N. Podolchak [11], Y. Sytnik [12], V. Sitnichenko [13]. The study of management problems sanatorium and resort institutions are engaged in domestic and foreign scientists, such as: S. Voitovich [4], B. Gender, E. Krykavsky, O. Kuzmin, R. Murdik, L. Konechna [9], R. Russell, V. Romanovich, A. Sidorova, V. Stakhanov, K. Haksever, and others. The methodological and theoretical basis of the study are works devoted to the consideration and analysis of the state of socio-economic security of enterprises, mechanisms of organization and management of socio-economic security, the following scientists: O.V. Bazhenova [2], V. Geyets [5], V. Ortinsky [10].

Considering the current developments of the above research on this topic, however, should focus on issues that remain unresolved and insufficiently developed both in theoretical and practical aspects. These include the study of innovative concepts in the system of management of the activity of sanatorium and resort enterprises in the context of social and economic security.

2. RESULTS

Outline of the main research material with full justification of scientific results. The effective functioning of sanatorium and resort establishments while ensuring socio-economic security is determined by the conditions of their market activity, opportunities for the fullest satisfaction of the needs of end users of such services, and effective management of the UPC [11, p. 49]. The basis of their functioning, effective implementation of functions, methods and processes of management is based on the peculiarities of implementation of processes of management of such enterprises. They are implemented through the introduction of concepts in the system of activity management [4, p. 60].

The peculiarities of the management system of sanatorium and resort enterprises in the conditions of social and economic security include the following:

1) reflecting the processes and management procedures inherent in other service businesses, the management of health resorts (according to the purpose of operation), generates specific, specific features related to the provision of healthcare and some services, which, for their part, due to a sufficiently high level of standardization, do not allow flexible management (except regulation) [9];

2) considering the multidimensional nature of management within a spa resort, managers must simultaneously apply differentiated approaches, concepts, functions, management techniques that cannot always be combined or structured to formulate strategies at all levels. [1, c. 76];

3) as the processes of activity and customer service are combined in the sanatorium and resort establishment, the manager of the establishment and his assistants must not only be aware of the peculiarities of such service processes (economic, medical, service), used resources and technologies,

but also possess appropriate competencies making effective management decisions (for example, managing an institution's marketing, medical treatment, or placement) [12];

4) organizational construction of the management system of the sanatorium and resort establishment has a block system that reflects the levels and ramifications of both the management structure and the sphere of managerial influence (according to the processes occurring in the institution) [13];

5) decision-making and management system in general spa facilities are characterized by a high degree of dependence on the market situation, customer load, level of government influence and regulation, and so managers often have to apply elements of situational management in managing such establishments [3, c. 87].

The concept of management in terms of ensuring the socio-economic security of any enterprise of the sanatorium-resort complex is based on clearly formed systems of organization of management of socio-economic development. Creation and implementation of the concept occurs from the very beginning of the establishment of the enterprise and in the subsequent process of conducting business activities. The effectiveness of the implemented concept is evaluated by the indicators of qualitative and timely ensuring the growth of socio-economic development of the enterprise and the volume of own resources, implementation of innovative technical equipment, ensuring financial stability and competitiveness. Also, the establishment of proper information for the subjects of management of sanatorium-resort enterprises, the system of organization and management of socio-economic security, the guarantee of information independence of managers, information security, economic efficiency, systematic. The concept of effective management of the socio-economic security of a spa resort also includes a set of methods for organizing, managing and preventing hazards and threats. The complex of methods and tasks of security management consists of: forecasting and identification of real dangers and threats; identify ways and methods of prevention; the elimination of the consequences of exposure to dangers and threats; interaction of the enterprise with law enforcement and control bodies in order to prevent offenses; establishment of enterprise security service [1; 5].

The main methods of implementation, organization and management of socio-economic security at the enterprise are [10, p. 156]:

– method based on the estimation of deviations of the limit indicators and observations on the current state of work at the enterprise;

– method based on the assessment of individual components of socio-economic security;

– method based on investment regulation and innovation: assessing the country's innovation potential by comparing quantitative and qualitative indicators with those of other countries;

– method that is based on the development of an economic intelligence system: an analysis is conducted and an economic intelligence system is formed to identify and minimize destabilizing and destructive factors of influence;

– method based on the diagnosis of current, tactical and strategic levels of socio-economic security.

The combination methods of management and socio-economic security of spa businesses can prevent and minimize the key threats to the provision of services related to the economic, technical, environmental, social enterprise components. In turn, the complex methods of prevention of dangers and threats are regulated by the following functions: forecasting, detection, prevention, mitigation of dangers and threats, security of activity of the enterprise and its personnel, preservation of property, creation of charitable competitive environment, elimination of consequences of the caused losses, etc. [1, p . 69].

As a result, the transition of the sanatorium-resort complex to market relations and the need to ensure socio-economic security have led to the introduction of management concepts in market management, one of which is marketing.

Sanatorium is a marketing management concept spa and resort company, which provides a comprehensive study of customer needs in a spa treatment and rest for their fullest satisfaction through integrated efforts of the production, sale and promotion of spa products in a competitive market to ensure social-economic security and profit [4, p. 62].

Marketing in the field of sanatorium services includes external, internal and interactive marketing. External marketing determines the work of the sanatorium on pricing, sales permits, promotion of sanatorium services. Internal marketing includes the whole complex of relations of the UPC administration with the staff (training, motivation, promotion, etc.), aimed at attracting every employee to marketing activities and providing high quality of vacationers service [1, p. 279].

Interactive marketing defines the ability of staff to serve the customer. Result of resort service - pleasure of the recreation - consists not only of technological, but also functional component. The first component is the material part of the sanatorium product (the level of medical base, room comfort, catering, etc.), the second - directly the process of providing sanatorium services, in which the leading role is played by well-trained and motivated staff [4, p. 63].

One of the basic principles of marketing, including the marketing of UPC, is the principle of feedback. In addition to making economic decisions, depending on the market, recreational businesses actively influence consumers and competitors by all possible methods and means. Thus, UPC does not passively respond to demand, but pursue a well-thought-out and well-coordinated policy of conquering the market, forming new consumers.

As a result, health resort marketing as a conceptual basis of the market system of management of the sphere of production of sanatorium and resort services takes into account the new conditions of the domestic resort market, which, under the influence of increasing the concentration of sectoral production, largely lose the chaotic nature inherent in this market and are subject to regulatory influences. the practice of resorts of traditional economic relations, in which the main role is given to the consumer.

From our point of view, in order to effectively manage and ensure socio-economic security, it is necessary to create a marketing service in the UPC.

Marketing services must equally successfully address a number of issues regarding the implementation of the accepted concept of marketing, as they represent the interests of the enterprise in the relationship with the consumer. Thus, the marketing department should be able to identify and identify market needs, outperform its competitors in identifying trends in needs development, refining them into ideas, and be actively involved in planning and developing a new resort product.

Marketing, as a new function of linking the UPC to the market, is based on a comprehensive and strategic approach to solving traditional problems. Organizational structures that are suitable for operational leadership may not meet the criteria necessary to implement a marketing strategy.

In general, there are two groups of marketing organizational structures: hierarchical (mechanical) and organic.

There are several types of hierarchical structures: linear, functional, linear-functional, divisional, mixed. UPC marketing services should be formed on a functional basis.

Functional structures are characterized by the distribution of personnel by functional blocks (Fig. 1).

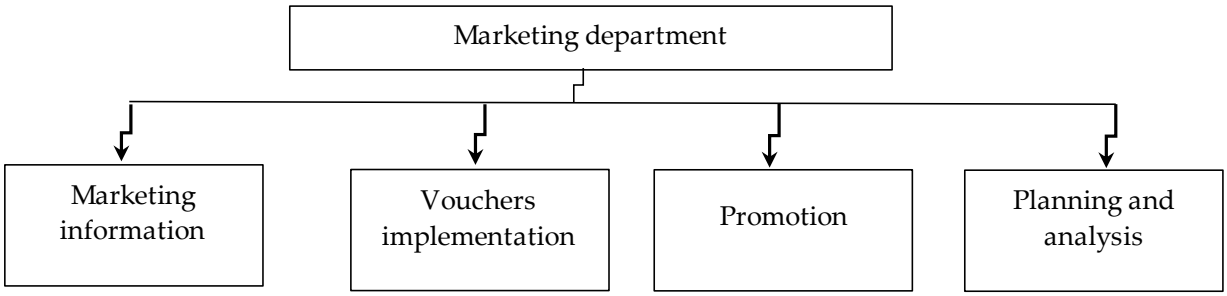

Fig. 1. Functional structure of the marketing department of the UPC
**compiled by the author based on [1; 4]*

The basic principles of building a UPC marketing service are:

- simplicity;
- effectiveness of the system of links between units;

- low sound;
- flexibility and adaptability.

The location of the marketing service in the organizational structure of the UPC and its relationship with other units deserves special consideration. It is optimal to attribute the marketing service to the headquarters subordinate directly to the first manager. There are variants of subordination of this service to the CFO or Special Vice President of Marketing. In any case, the particular importance of the marketing department for the UPC is due to the need for personal involvement, coordination and control by the CMO (Chief Medical Officer).

Nowadays, in order to be successful in a dynamic environment, UPC needs to be able to quickly adapt to changing market conditions and outperform its competitors in quality, speed of delivery, breadth of range and price of services, which in many respects provides a properly formulated concept in the management system.

By far, the most innovative concepts in the enterprise activity management system, incl. UPC is a Business Performance Management and Balanced Scorecard.

Business Performance Management (BPM) is a fundamentally new trend, known as "business performance management". It is a holistic, process-oriented approach to managerial decision-making, aimed at improving the enterprise's ability to assess its condition and manage its performance at all levels by combining owners, managers, staff and external contractors within a common integrated management environment [8, p. 65].

BPM is a concept that aims to optimize strategy implementation and consists of a set of integrated cyclical analytical processes supported by relevant technologies and relevant to both financial and operational information. BPM enables an enterprise to identify, measure and manage the effectiveness of its activities towards strategic goals. BPM's key financial and operational processes include planning, consolidation and reporting, analysis of key performance indicators and their dissemination within the enterprise [15].

Until some point, the evaluation tools for the efficiency of the enterprise were financial. Such instruments were financial statements. But according to research by R. Kaplan and his colleagues, these tools reflect the results of decisions and actions taken in the past and cannot be judged effective in the future. That's why the BPM concept was developed. It is closely linked to financial management. Financial performance is a universal indicator of business success, but not its driving force. To reflect the true results of an enterprise at a certain point in time, a link between them and financial results is required. Waiting to report for a month or a quarter is too long, given that these are figures that affect daily activities. A rapid feedback mechanism is required to be able to coordinate, correct, or direct the work of a particular department of the enterprise whose activities need to be aligned with the overall strategy [6].

As a result, from our point of view, this concept in the system of management of activity of the UPC is useful for the whole enterprise, as it allows the staff to know exactly what they are required and expected. This is due to the fact that individual employees are able to evaluate the effectiveness of their activities and use a feedback mechanism to identify areas that need improvement. Such operational feedback reduces the time for decision making and error correction. The results are the best operational efficiency and benefits of the UPC.

The main processes covered by the BPM concept can be seen in Table 1.

Thus, the introduction of the concept of BPM in the management system of activities of sanatorium and resort enterprises in terms of socio-economic security can be expected: improving the quality of reporting and analytics, leading to greater financial transparency, improving the interaction of divisions of the UPC, reducing reporting cycles, which improves the ability respond to changes and threats, reduce the number of errors; more rigorous process management leading to better control; the ability to increase the time to analyze data by reducing the time to manage it.

Process	Content
Strategize	Allows managers of sanatorium and resort establishments to develop strategies and bring them to business units, identify opportunities for value creation and create a system of documents that provides an assessment of management effectiveness and its dynamics
Plan	Helps managers of all UPC units set their local goals, develop and simulate planning scenarios, create programs and budgets that support operations, and set targets for different metrics over different time periods
Monitor and analyze	Allows to evaluate individual and group performance using relevant key metrics at all levels of the UPC, as well as providing users with additional information to help them take action
Take corrective actions	Helps UPC managers respond to emerging situations and threats in a timely manner

Tab. 1. The main processes covered by the BPM concept for sanatorium and resort enterprises

** compiled by the author based on [3; 14]*

The concept of Balanced Scorecard, or "Balanced Scorecard", is one of the latest advances in modern management science. Its authorship is owned by David Northon (David Northon) and Robert Kaplan (Robert Kaplan), who in 1992 published an article in The Harvard Business Review "The Balanced Scorecard - Measures That Drive Performance" [16; 17; 18].

The advantage of the Balanced Scorecard concept is that it gives senior management a completely new management tool that translates overall enterprise strategies into a set of interconnected strategic goals, programs to achieve them, and correspondingly balanced metrics that evaluate the achievements of these units across four major projections: finance, consumers, internal processes, learning and growth. The system of Balanced Scorecard indicators for sanatorium and resort enterprises in terms of socio-economic security can be seen in Fig. 2.

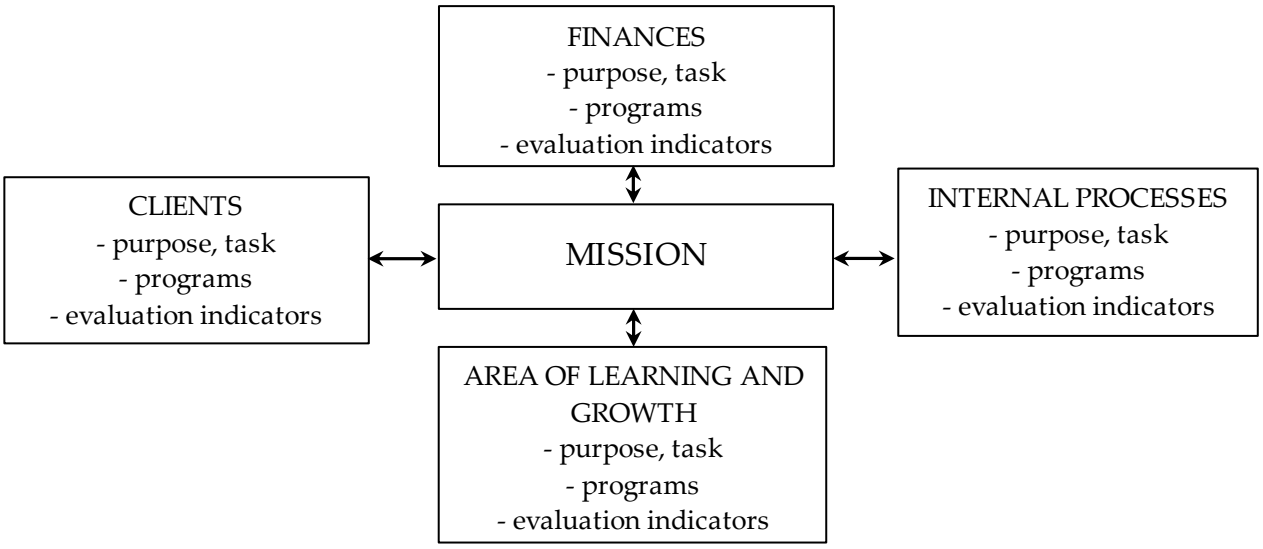

Fig. 2. Balanced Scorecard for sanatorium enterprises in the socio-economic security

** compiled by the author based on [7; 16; 17]*

Studies conducted on the BSC concept indicate that it reflects the core activities of spa businesses - such as customer service, operational and financial efficiency - in the form of a set of performance indicators - Key Performance Indicators (KPI). Their number should be 20-25 (financial indicators, indicators of the client component and training and growth are approximately 22%, indicators of internal processes - 34%). The enterprise captures and analyzes these indicators to understand whether strategic goals are being achieved or not [19].

A significant advantage of the Balanced Scorecard is the use of not only financial but also non-financial performance indicators of the enterprise to evaluate customer satisfaction, internal processes efficiency, employees' potential to ensure socio-economic security and long-term financial success. However, the number of Balanced Scorecard projections and estimates presented is rather limited and can be greatly expanded depending on the industry of the enterprise. Also, existing projections can be adjusted - generalized or more narrowly oriented - depending on the specific activity of the enterprise. However, it can be noted that the presented concept does not require much adaptation and can successfully operate in the resorts of Ukraine.

3. CONCLUSIONS

Conclusions from this study and prospects for further development in this direction. Thus, our proposed concepts in the management system of sanatorium and resort enterprises, taking into account the above features will allow such an institution to fully and effectively perform the processes of managing its activities, customer service and provide optimization of functions and management procedures.

A promising direction for further research is the construction of a methodology for assessing the quality of management of the sanatorium and resort enterprise.

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Бурик Зоряна. Впровадження інноваційних концепцій в систему управління санаторно-курортним підприємством в контексті забезпечення соціально-економічної безпеки. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 29–36.

Метою дослідження є висвітлення впровадження інноваційних концепцій в систему управління діяльністю санаторно-курортних підприємств. Використовувалися наступні методи: аналіз (теоретичний огляд наукової літератури з проблеми дослідження); синтез, котрий дозволив інтегрувати окремі частини об'єкта в єдине ціле (розробка збалансованої системи показників для санаторно-курортних підприємств з точки зору соціально-економічної безпеки); бенчмаркінг, що дозволив зіставити поняття (санаторно-курортний маркетинг, управління ефективністю бізнесу, збалансована система показників). У статті розглянуто особливості системи управління санаторно-курортними підприємствами в умовах соціально-економічної безпеки. Стверджується, що концепція управління в частині забезпечення соціально-економічної безпеки будь-якого підприємства санаторно-курортного комплексу базується на чітко сформованих системах організації управління соціально-економічним розвитком. Виділено основні методи реалізації, організації та управління соціально-економічною безпекою на підприємстві. Відзначається, що санаторно-курортний маркетинг - це концепція управління санаторно-курортним підприємством, яка передбачає всебічне вивчення потреб клієнтів у санаторно-курортному лікуванні і відпочинку для їх найбільш повного задоволення допомогою комплексних зусиль з виробництва, реалізації і просування санаторно-курортного продукту на конкурентному ринку з метою забезпечення соціально-економічної безпеки і отримання прибутку. Представлені основні процеси, що охоплюються концепцією управління ефективністю бізнесу для санаторно-курортних компаній. Система збалансованих показників розроблено для санаторно-курортних підприємств з точки зору соціально-економічної безпеки. Запропоновано основні інноваційні концепції (спа-маркетинг, управління ефективністю бізнесу та збалансована система показників), впровадження яких у систему управління підприємством забезпечить прийняття ефективних управлінських рішень, досягнення стратегічних цілей, підвищення прибутку та соціально-економічної безпеки в цілому. Впровадження пропонованих нами концепцій в систему управління санаторно-курортними підприємствами забезпечить такій установі повну та ефективну реалізацію процесів управління його діяльністю, забезпечення обслуговування клієнтів та оптимізацію виконуваних функцій і процедур управління.

Ключові слова: підприємство, концепція, система управління, діяльність, безпека.

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ORGANIZATIONAL AND ECONOMIC MECHANISMS OF TRANSPORT SYSTEM DEVELOPMENT BASED ON LOGISTICS

INNA IRTYSHCHEVA, OLENA ISHCHENKO, JULIA BARABANOVA

Abstract. It is determined that the existence of a developed transport and logistics infrastructure is one of the defining dominants of the effective functioning of the transport and logistics system at the regional, national and international level, provides effective supply, marketing, production and social communications between the subjects of economic activity.

It is proved that the main directions of state policy implementation in the field of transport and logistics are: directions of innovative development of transport and logistics technologies on energy-saving and environmentally safe principles; construction of efficient economic systems in accordance with the principles of logistics and marketing; development of strategic planning; improvement of regulatory policy.

Institutional, organizational and economic mechanisms for ensuring the effective development of national transport and logistics systems have been researched and systematized, among which the following have been identified as priorities: the development of public-private partnerships and decentralization reform, which will solve the problems of financing infrastructure development, the formation of multi-branch integration structures (transport-logistics clusters, transport hubs and logistics-outsourcing platforms), which will improve the quality of transport and logistics services, intensification of the integration processes of the transport and logistics system in the international transport of the network, which will increase the competitiveness of the national economy, increase in productivity of transit potential and attraction of foreign investments in the development of the industry.

Keywords: transport and logistics systems, logistics, national economy, infrastructure, transport, strategic development.

1. INTRODUCTION

One of the defining conditions for the development of the national economy, ensuring the dynamism of socio-economic processes, an adequate level of business activity and a favorable business climate is the development of transport and logistics services. The problem of developing an efficient national logistics system capable of integrating and securing Ukraine's worthy place in the international market of transport and logistics services is of particular relevance in the context of the implementation of the European Development Vector. The experience of developed European countries shows that the development of transport and logistics services is the basis for competitive development of the national economy in the context of integration processes.

The experience of European countries shows that the high level of development of the transport sector and logistics infrastructure in the country directly affects the economic efficiency of business and the increase of material resources turnover, leads to savings in transport, general logistics and warehousing costs. As a result of the development of national transport and logistics infrastructure, there is an increase in business activity and business mobility.

On this basis, the concept of improving the mechanisms of development of the national transport and logistics system needs to be further researched.

2. RESULTS

The analysis of the state of the transport and logistics system of Ukraine made it possible to identify the main problems, the solution of which lies in the field of improvement of economic, organizational, administrative, legal and institutional mechanisms of functioning of both national transport and logistics systems and the national economy as a whole. The main disadvantages that impede the effective development of the transport and logistics system include:

1) Poor quality of transport services, which in many cases is caused by the organization of work of transport carriers and the efforts to organize logistic processes on their own enterprises. In Ukraine, unlike most developed countries, integrated logistics services provided by specialized logistics companies are in their infancy. Most logistical services are combined with transport operations for a specific type of cargo, which involves different software and significant differentiation of documentary, financial and information support, which among other things adversely affects the speed of freight and the cost of transportation, especially when combining different modes of transport.

2) High level of transportation deterioration. The analysis showed that the highest level of wear is observed primarily in rail and sea transport (more than 60%), which leads to a decrease in quality and increase the risk of transport services.

3) Poor information support of the transportation process, which leads to certain complications of delivery control and coordination of logistics flows when conditions change.

4) Undeveloped rolling stock, which negatively affects the cost of transportation. This problem arises first of all for organizational reasons and is related to the unwillingness or inability to carry out picking of dispatch from different subscribers by domestic carriers and the lack of logistical coordination.

5) Low level of insurance culture among consignors, insufficiently developed system of cargo insurance.

6) It is difficult to organize the interaction of different modes of transport.

7) High energy consumption and low environmental friendliness of transport.

According to Y. Vovk, one of the systemic causes of the crisis in the transport industry is that market mechanisms have not become its main regulator at the moment. "The mechanisms of competition and self-organization of transport enterprises are underdeveloped, and the state regulation of the market of transport services is not effective enough. The monopoly in potentially competitive segments of rail transportation remains, and the existing inefficient management system of state transport enterprises leads to unsatisfactory results of their work, loss, inability to provide renewal of their own rolling stock and reconstruction of outdated transport infrastructure"[1, p. 10].

It is quite clear that the development of transport and logistics systems in Ukraine in a strategic context requires improvement of the existing management system based on the development of harmonized organizational and economic mechanisms and institutional legal mechanisms using leading foreign experience in this field.

Considering the transport and logistics system from the standpoint of the system management approach, we can conclude that it is an orderly managed system within which the range of transport and logistics services is created, creating the conditions for their most effective cross-sectoral and territorial distribution in accordance with the needs of consumers and providing uninterrupted supply. In accordance with these considerations, the transport and logistics system is an integrated socio-

technical-information structure, the main purpose of which is the uninterrupted supply of the economy with transport and logistics services, characterized by the most optimal value for money. Fig. 1 shows the structure of the transport and logistics system in the context of the system-management approach.

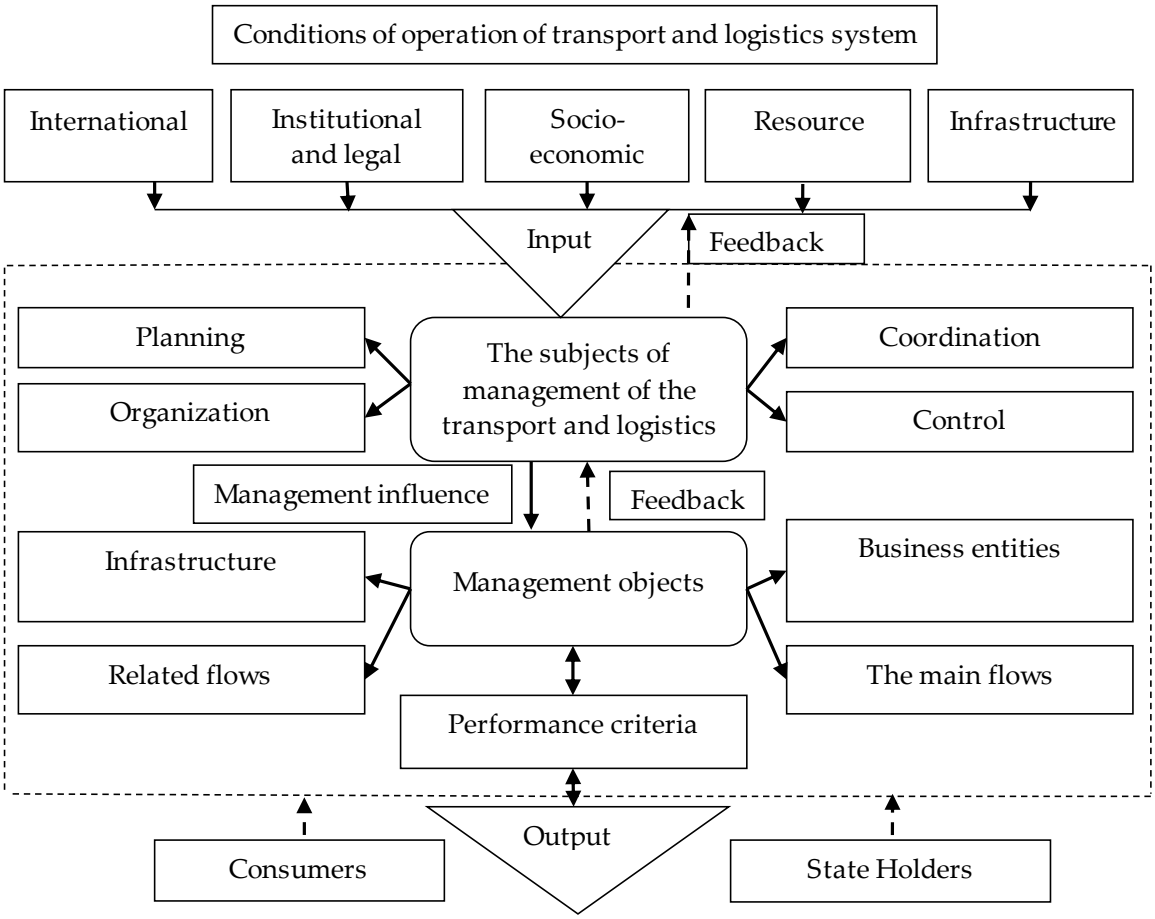

Fig. 1. Elements of transport and logistics system in the context of management approach.

** Source: Developed by the author*

According to this approach, the operating factors determined by the set of factors are important factors and at the same time the input parameters of the national transport and logistics system functioning. International factors significantly influence the level and dynamics and trends of the development of transport and logistics flows through the formation of supply and demand for transport and logistics services and transit, the competitive price of transportation and accompanying services, the creation of joint projects and more. Given its favorable geographical location, Ukraine is one of the important transit territories and has considerable transport and logistics potential.

Therefore, the effective use of the existing transport and logistics potential of Ukraine depends on the development of external relations and implementation of effective reforms that will contribute to the full integration of the transport system in the international transport and logistics networks. One of the priority areas for the development of external relations in the field of transport is the inclusion of Ukraine in the European Logistics Networks operating within the framework of the Eastern Partnership in the context of the updated European TEN-T policy. In this context, we consider Vidyakina M.'s opinion "Given the priority of the East-West direction within the framework of the updated TEN-T policy, we can distinguish priority directions of Ukraine's cooperation within the framework of the Eastern Partnership transport panel. These include the development of the transport network in the format of integrated transport corridors; inclusion of inland waterways of Ukraine in the TEN-T regional network; analysis of the bottlenecks of the national transport network, which are combined with the Trans-European one; preparation of infrastructure projects to attract EU grant resources; developing mechanisms for the liberalization of road haulage with the EU and the Member States "[2, p. 33].

According to the Ministry of Infrastructure of Ukraine, the main priority areas of implementation of the Eastern Partnership programs within which joint projects in the field of transport are implemented are:

1) the development of the transport network in the form of integrated transport corridors, as well as the "reconnection" that has actually been lost due to the discontinuation of the Pan-European transport corridors;

2) analysis of the bottlenecks of the national transport network combined with the TEN-T network, preparation and prioritization of infrastructure projects for which EU grant resources will be allocated;

3) inclusion of Ukrainian Inland Waterways (Dnieper River, Southern Bug River and Ukrainian section of the Danube River) in the TEN-T regional network [3].

At the same time, full integration of Ukraine into international transport and logistics corridors and their transformation into effective transit potential requires considerable investments in material infrastructure, formation of efficient logistics centers, reform of customs and transit regimes. This requires a radical improvement of the existing institutional, legal and financial mechanisms for implementing the relevant programs.

Institutional legal prerequisites form a set of interconnected "rules of the game" governing the relations of entities in the field of transport and logistics services and, depending on the effectiveness of the created institutional legal mechanisms, create additional opportunities or barriers to the development of the relevant risk. In developed countries, institutional factors and related regulatory support are aimed at effectively regulating the transportation market and aiming at reducing transaction costs.

L. Chobal distinguishes the following components of the institutional environment of the transport complex:

– formal institutions (officially established by the authorities the rules and regulations that are binding on all participants of the transport complex);

– informal institutions (unwritten rules and traditions that are unofficial but have an impact on the functioning of many participants);

– mechanisms for identifying violations of rules and regulations by which offenders are identified;

– mechanisms for applying sanctions to violators "[4, p. 313].

As international experience shows, one of the priorities of institutional support for the development of transport and logistics systems is the introduction of public-private partnership mechanisms in this field. An effective public-private partnership system should provide a set of mutual benefits for both state and regional authorities and the private sector, in particular:

For the state these are additional possibilities:

– attracting private investment in the development of transport and logistics infrastructure and modernization of activities traditionally within the competence of public administration and financing (construction of transport and logistics complexes, terminals, ports, arrangement of water facilities, etc.);

– concentrating efforts on the most important economic and social security aspects of transport through outsourcing part of market services;

– attracting the best management, technology and technology from the private sector;

– cost and risk sharing;

– unloading of state bodies and differentiation of functions on management of infrastructure and transport services;

– reduction of the state monopoly influence on the development of transport, reduction of the administrative apparatus and promotion of the development of competitive relations;

– improving efficiency, reducing project implementation times and improving the quality of service to end consumers.

In turn, private equity can receive the following benefits:

– expanding market share by entering the public services market, where traditionally there is steady demand;

– priority state assistance in the implementation of joint investment projects, reduction of administrative barriers;

– sharing risks and costs with the state;

– providing state guarantees of minimum profitability of the project, partial refund of funds in case of unsuccessful implementation of the project due to the fault of the state partner.

In Ukraine, the mechanism of public-private partnership implementation is governed by the law of Ukraine "On Public-Private Partnership", which defines the basic conditions for the implementation of joint projects in this field. The law defines the basic principles on which relations between the state and business should be built:

– equality before the law of public and private partners;

– prohibition of any discrimination against the rights of public or private partners;

– aligning the interests of public and private partners for mutual benefit;

– ensuring higher efficiency of activity than in the case of such activity by a public partner without involvement of a private partner;

– invariance throughout the term of the contract concluded within the framework of public-private partnership, purpose and form of ownership of objects that are state or communal property or belong to the Autonomous Republic of Crimea, transferred to a private partner;

– recognition by public and private partners of the rights and obligations stipulated by the legislation of Ukraine and defined by the terms of the contract concluded within the framework of the public-private partnership;

– fair sharing between the public and private partners of the risks associated with the implementation of public-private partnership contracts;

– definition of a private partner on a competitive basis, except in cases established by the law [5].

At the same time, according to the experts of the Institute for Strategic Studies under the President of Ukraine, the current legislation on public-private partnership in Ukraine has several disadvantages:

– First, there is no minimum share of participation in the private partner project (in particular, in developed countries, the minimum share of private funding is 25%). In this regard, even a minimal proportion of private funding in a joint project allows it to be classified as a public-private partnership, transferring most of the responsibility to the state.

– Second, there are no well-defined mechanisms for practical implementation (defining the stages of implementation of public-private partnership projects, creating motivation for foreign investors, etc.).

– Third, according to Art. 7 public-private partnership extends to entities that are state-owned or communal-owned or owned by the Autonomous Republic of Crimea; this makes it impossible to implement projects such as the construction of facilities by a private partner and then transfer them to a state (municipal) partner.

– Fourth, the role of the State Regional Development Fund in financing public-private partnership projects "and the peculiarities of using public-private partnership as a mechanism for implementing a new regional policy" [6].

Therefore, despite some changes in this area, the use of public-private partnership mechanisms in the transport sector has not become widespread due to the poorly developed regulatory and legal mechanisms of public-private partnerships in the transport and logistics sector, lack of rights and guarantees for investors, corruption and lack of trust between the state and the private sector.

Resource support for the development of transport and logistics systems directly affects the quality and tariff policy in the field of transport services. An important factor in the provision of resources is the development of the personnel capacity of the transport and logistics system. The availability of qualified personnel is one of the main prerequisites for improving the level of services provided by logistics providers, the productivity of trade and logistics companies.

Despite the high level of teaching and professional skills in some sub-sectors of the transport system (aviation and rail technology, mechanical engineering, road construction), there is a shortage of specialists in the field of supply chain management, inter-branch logistics, traffic information management. One of the obstacles for Ukrainian logistics providers, transport officials and

management staff is their lack of proficiency in English. In view of this, important directions for improving the personnel support for the development of national transport and logistics systems are the development of targeted sectoral training programs and training for employees of the transport and logistics sector, which should be aimed at:

– professional training of personnel;

– improvement of educational programs for higher education institutions in the field of logistics in accordance with current world trends and needs;

– development of voluntary schemes with (international) qualification standards;

– ensuring the participation of national scientists in international projects in the field of STI;

– introduction of English and other foreign language courses, which should become a prerequisite for career advancement.

One of the most problematic and at the same time decisive tasks of providing resources for the development of national transport and logistics systems and infrastructure is financial support. An analysis of the state funding of projects and programs in the industry has shown that, with limited state and regional funds, there is a significant under-financing of the construction and rehabilitation of strategically important infrastructure, such as roads, ports, railway stations and rolling stock.

In the face of scarcity of public financial resources, a large part of the projects in the industry are financed with the involvement of international financial assistance, which eventually leads to the accumulation of debt.

According to O. Ovsyannikova, the main directions of improving the financing system of the transport sector of Ukraine are:

– "to develop a long-term financing plan for the transport sector with a view to developing infrastructure, in particular with careful planning in line with strategic priorities, timing and asset lifecycle, as well as on the return on investment to ensure efficient spending;

– to ensure that the State Road Fund fulfills its goals in 2019;

– create favorable conditions for attracting private equity investments in the development of the transport sector with obviously viable public-private transport partnership projects;

– ensure a transparent system of public procurement, communication and disclosure of budget planning and spending to demonstrate financial discipline to the public;

– encourage MFO investment in the development of the transport sector;

– develop and apply innovative financial instruments and mechanisms in the long run to unlock private capital flows into the transport sector (green investments, mezzanine financing, project financing, including bonds and risk-sharing instruments) with state or MFO support "[7, p. 35-36].

In our opinion, in reforming the financial support system for the development of national transport logistics systems, it would be useful to take advantage of Poland's experience in this field, especially given the European vector of Ukraine's development. This is due to the fact that Poland can be compared to Ukraine in terms of a large number of indicators and structural parameters of the economy. At the same time, despite the lack of access to international maritime routes and more limited transport and logistics, transit and infrastructure potential in comparison with Ukraine, Poland has today reached the leadership among the post-socialist countries in most parameters of the transport and logistics system development and achieved a high level of logistic efficiency.

In particular, on the basis of the conducted research, Borschevsky V. notes the following reforms applied by Poland, which contributed to the achievement of stable financial condition of the transport and logistics industry and ensured the efficient functioning of transport systems:

1) liberalization of economy and foreign economic activity, which stimulated the development of entrepreneurship and significantly improved business conditions. The broad involvement of private investment on the basis of public-private partnerships, the reduction of state monopolies and the corporatization of the transport and logistics business had a positive impact on the financing of infrastructure and the transport sector. These measures stimulated the inflow of investments into the industry and gave impetus to the development of competition in the market of transport services;

2) change of administrative-territorial structure and deep decentralization of power, which allowed to form an effective system of local self-government on the basis of delegation of a considerable part of financial and administrative-administrative powers, including in the sphere of development of regional transport and logistics systems. This was the impetus for deep modernization and improvement of the road economy, reconstruction of roads of local importance and creation of objects of transport and logistical infrastructure at the expense of local budgets and territorial communities. The synergies in the field have also been facilitated by the joint efforts of local communities and businesses through joint implementation of investment projects of regional and interregional transport infrastructure development.

3) adapting to the requirements and standards of the EU in building civil society institutions. First of all, it concerned the formation of a network of NGOs and other non-governmental institutions whose activities ensured the effective use of EU financial support instruments for the candidate countries. These programs, as noted earlier, have attracted significant sums of money from Poland for the development of various links in the transport infrastructure [8].

Despite some efforts and developments in the areas under consideration in Ukraine, some issues regarding the implementation of decentralization reforms, the development of public-private partnerships and the formation of effective mechanisms for involving the private sector in the development and modernization of regional transport and logistics infrastructure remain unresolved. Solving these goals will reduce the financial burden on the state budget and promote the targeted use of financial resources, increase transparency of procedures and help reduce regional disparities in the development of transport infrastructure.

According to a considerable part of national scientists, the solution of problems concerning the improvement of the organizational support system and improvement of the quality of transport and logistics services is the formation of cross-sectoral territorial, interregional and intermodal organizational structures, in particular transport and logistics clusters, nodes, specialized platforms, etc. In particular, scientists Irtyshcheva I., Minakova O., and Khristenko O. emphasize that "the organizational structure of the transport and logistics system of Ukraine should consist of five levels of logistical interaction:

– interaction of objects of transport and logistics infrastructure (terminal and cargo complexes, warehouses, enterprises of various types of transport and transport and logistics service, etc.);
– logistic transport centers of local, regional and international destination;
– regional logistics transport systems;
– logistics transport clusters;
– integrated transport and logistics system of Ukraine (subsystem of the economic system of the country and international transport and logistics systems) [9, p. 148]. Such a structure will ensure the creation of a wide range of high-quality, secure and low-cost transport and logistics services that meet the expectations and requirements of stakeholders (consumers, carriers, state-holders).

The cluster approach to the formation of transport and logistics systems has been widely used in the economies of developed countries, in particular the USA, Japan, China, India, and is a priority organizational direction for the development of transport systems within the EU. The organizational structure of transport and logistics systems involves the formation of support logistics centers and cooperating regional transport and logistics clusters, which allows to optimize the systems of cargo flows between countries. "The European network of transport and logistics clusters comprises 25 primary and about 60 secondary transport and logistics clusters, which fall into one of three categories:

1) port transport and logistics clusters (Valencia Cluster, Spain);
2) border transport and logistics clusters;
3) regional transport and logistics clusters "[10, p. 70].

According to O. Polyakova and O. Shramenko, "the impact of transport and logistics infrastructure on long-term economic growth is carried out in five main directions:

1) as a direct factor of production;
2) as an element of other factors of production;

3) as an incentive to increase aggregate demand;
4) as an incentive to accumulate factors of production;
5) as an instrument of industrial policy" [11, p. 132].

Therefore, the use of a cluster approach to the organization of transport and logistics services in Ukraine can be an important factor in improving the quality of basic (passenger and freight transportation) and accompanying (information support, service, cargo insurance, customs procedures, etc.) services and improving the business climate in the regions. Promising directions of cluster formation are their placement in Ukraine near large industrial and agricultural centers along the directions of international transport corridors.

According to O. Karpenko and E. Osipova, the creation of logistics and outsourcing platforms is an important area of organizational support for the development of transport and logistics systems and their coordination at the macro level. Under the logistics-outsourcing platform, the authors propose to understand "a coordinating and integrated mechanism for managing and transforming material, information and other flows, which integrates elements of the transport and logistics system at the macro level and ensures high efficiency of the goals of these elements. The logistics and outsourcing platform should be considered as an infrastructure unit of the region's economic system. The main tasks of the logistics and outsourcing platform are to provide transport and logistics services at minimal costs for logistics services and logistics infrastructure through the cooperation of transport and logistics companies providing specialized logistics services "[12].

3. CONCLUSIONS

Building an effective national transport and logistics potential and its rational use in today's changing environment requires a comprehensive systematic approach and the creation of an effective strategic management system that takes into account its existing and potential technical, organizational, resource and functional properties.

The formation of logistics and outsourcing platforms will help to integrate and balance processes, management, service, optimization of freight flows of various types, which will lead to a shortening of the delivery time of goods and improve the quality of customer service. Logistics-outsourcing platforms will also create the conditions for the introduction of new IT technologies and the expansion of information support, control and administration of freight traffic, which at the same time will help to accelerate the payback period of projects. Also, the implementation of transport-logistic platforms and clusters will have a positive impact on the socio-economic development of the regions where they are located through: increasing jobs and improving infrastructure, creating a favorable business environment, developing small and medium-sized businesses.

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Іртищева Інна, Іщенко Олена, Барабанова Юлія. Організаційно-економічні механізми розвитку транспортної системи на основі логістики. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 37–45.

Визначено, що наявність розвинутої транспортно-логістичної інфраструктури є однією з визначальних домінант ефективного функціонування транспортно-логістичної системи регіонального, національного та міжнародного рівня, забезпечує ефективні постачальницько-збутові, науково-виробничі та соціальні комунікації між суб'єктами економічної діяльності.

Доведено, що основними напрямками реалізації державної політики у транспортно-логістичній галузі є: інноваційний розвиток транспортних і логістичних технологій на енергоощадних та екологічно безпечних засадах; побудова ефективних економічних систем із врахуванням принципів логістики і маркетингу; розвиток стратегічного планування; удосконалення регуляторної політики.

Досліджено та систематизовано інституційні, організаційні та економічні механізми забезпечення ефективного розвитку національної транспортно-логістичної системи, серед яких у якості пріоритетних визначено: розвиток державно-приватного партнерства та реформи децентралізації, що дозволить вирішити проблеми з фінансування розвитку інфраструктури, формування інтеграційних багатогалузевих структур (транспортно-логістичних кластерів, транспортних вузлів та логістично-аутсорсингових платформ), що сприятиме підвищенню якості транспортно-логістичних послуг, активізація інтеграційних процесів транспортно-логістичної системи в міжнародні транспорті мережі, що забезпечить підвищення конкурентоспроможності національної економіки, зростання продуктивності транзитного потенціалу та залучення іноземних інвестицій у розвиток галузі.

Ключові слова: транспортно-логістичні системи, логістика, національна економіка, інфраструктура, транспорт, стратегічний розвиток.

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SUBSTANTIATION OF EFFECTIVE INSTRUMENTS OF REGULATION OF FINANCIAL IMBALANCES OF ENDOGENOUS-ORIENTED DEVELOPMENT OF THE REGIONS OF UKRAINE

TARAS KLOBA, SOLOMIIA KLOBA

Abstract. The article deals with instruments recommended for regulating financial imbalances of endogenous-oriented development of the regions of Ukraine as an integral part of the regional economy management mechanism, and also explored the ways of regulating regional socioeconomic processes in crisis conditions. The basic principles of selection of instruments for the regulation of financial imbalances of endogenous-oriented development of regions are determined. The classification of instruments of regulation of financial imbalances of endogenous-oriented development is considered. The basic tools used to support the development of regions and municipalities are analyzed: legal; related to the development of appropriate strategies and programs; based on the implementation of inter-municipal cooperation; financial. The three main directions of financial imbalance regulation tools for endogenous-oriented development of the regions are investigated, which are used to analyze the impact on the effectiveness of regional development at different stages of the economic cycle. The system of specially organized measures of regulation of financial imbalances of endogenously oriented development of regions is substantiated. In modern conditions, great attention is paid to the problems of regulation of financial imbalances of endogenously oriented development of regions of Ukraine, the implementation of which requires special instruments. A holistic presentation of the systemic mechanism of regulation of financial imbalances of endogenously oriented development of regions is offered. After all, ensuring endogenous-oriented development of regions in the current conditions of functioning of the economy of Ukraine requires the implementation of strategies of socioeconomic transformation, which will be aimed at changing the financial imbalances of development of regions and mechanisms for their implementation. Endogenously oriented regional development means increasing the level of overcoming adverse social, economic and environmental risks and trends, with the ability of regions to provide financial imbalances, self-regulation, self-improvement with maximum use of internal as well as external borrowing resources to meet the needs of the population of the regions. The endogenous-oriented development of the regions is conditioned by the identification of instruments for regulating the financial imbalances of the regions and the identification of conditions for their achievement, which are derivatives for ensuring the endogenously-oriented development of the regions as a whole.

Keywords: basic principles of selection of regulatory instruments, financial imbalance regulation instruments, classification of regulatory instruments, basic directions of regulatory instruments.

1. INTRODUCTION

Regulation of financial imbalances of endogenous-oriented regional development is an integral part of the overall process of reforming Ukraine's economy, which necessitates the necessity to justify the proportions of rational participation of the regions in financial support and development of the regional economy.

For Ukraine in the context of large-scale transformations of the domestic economy, modernization of endogenous-oriented development of regions is a key task of development. Deep differentiation of macroeconomic parameters of the regions of modern Ukraine has become one of the main characteristics of its economy, which inevitably leads to an increase in the number of problem areas. The task of reducing the level of negative consequences of the lag in socioeconomic development necessitates the improvement of regulation of financial imbalances of endogenous-oriented development of the regions of Ukraine.

Currently, there is a change in the paradigm of regional economic development and regional policy, the search for ways to improve the effectiveness of territorial development, management, new forms, methods and mechanisms of participation of regional authorities in managing the territory [1].

Research on the problems of regulation tools of financial imbalances of endogenous-oriented development of regions such Ukrainian scientists as O. Anchishkin, P. Belyenki, Z. Vernal, I. Vakhovich, V. Geets, Z. Gerasymchuk, A. Golykova, B. Danylyshyn, M. Dolyshny, S. Doroguntsov, P. Zhuk, S. Zludko, L. Kowalska, V. Kravtsiv, I. Lukinov, V. Mamonova, I. Mikhasyuk, V. Rudenko, M. I. Skripnichenko, D. Stechenko, I. Storonyanskaya, M. Chumachenko, V. Shevchuk and others. However, comprehensive research in this area is under-researched and needs further study.

The policy of regulation of financial imbalances of endogenously oriented development of regions is realized with the help of a certain set of tools. Proper selection and successful application of methods and tools of the mechanism of regulation of endogenously-oriented development of the regions of Ukraine in practice will allow to reach a high level of their sustainable development. A rational approach in the construction of incentive instruments will lead to the maximum socioeconomic effect.

2. RESULTS

The intensity of the use of certain regulatory instruments applied in the framework of the policy of regulation of financial imbalances of endogenously oriented development of the regions depends on the extent to which the spheres of life of the regions are developed and their relations are coordinated. Thus, in order to achieve a high level of balance in the sustainable development of the regions, IE to support the interconnection, integrity and dynamic balance of social, economic and environmental components, it is necessary to use tax and transfer incentive instruments. First of all, this is due to the fact that budgets and fiscal stimulus instruments are closely interconnected and actively applied in all areas of activity of the region. In addition, their use involves the redistribution of funds through the budgets of different levels, which helps to achieve social justice, economic growth and environmental equilibrium, thus contributing to the harmony, balance and equilibrium of the sustainable development of the region.

Thus, instruments of regulation of financial imbalances of endogenously-oriented development of regions mean a set of forms, methods and methods of influence on processes of development of territories by the state bodies for the achievement of certain goals. In this case, the regulatory instruments are the specification of the rules and regulations that form the institutions of regulation (management).

The tools for regulating the financial imbalances of endogenously oriented regional development must be based on certain grounds, namely the selection of incentive measures, that is, the principles of selection of incentive instruments.

The basic principles of selection of instruments for the regulation of financial imbalances of endogenously oriented development of regions are the following, which are shown in Figure 1.

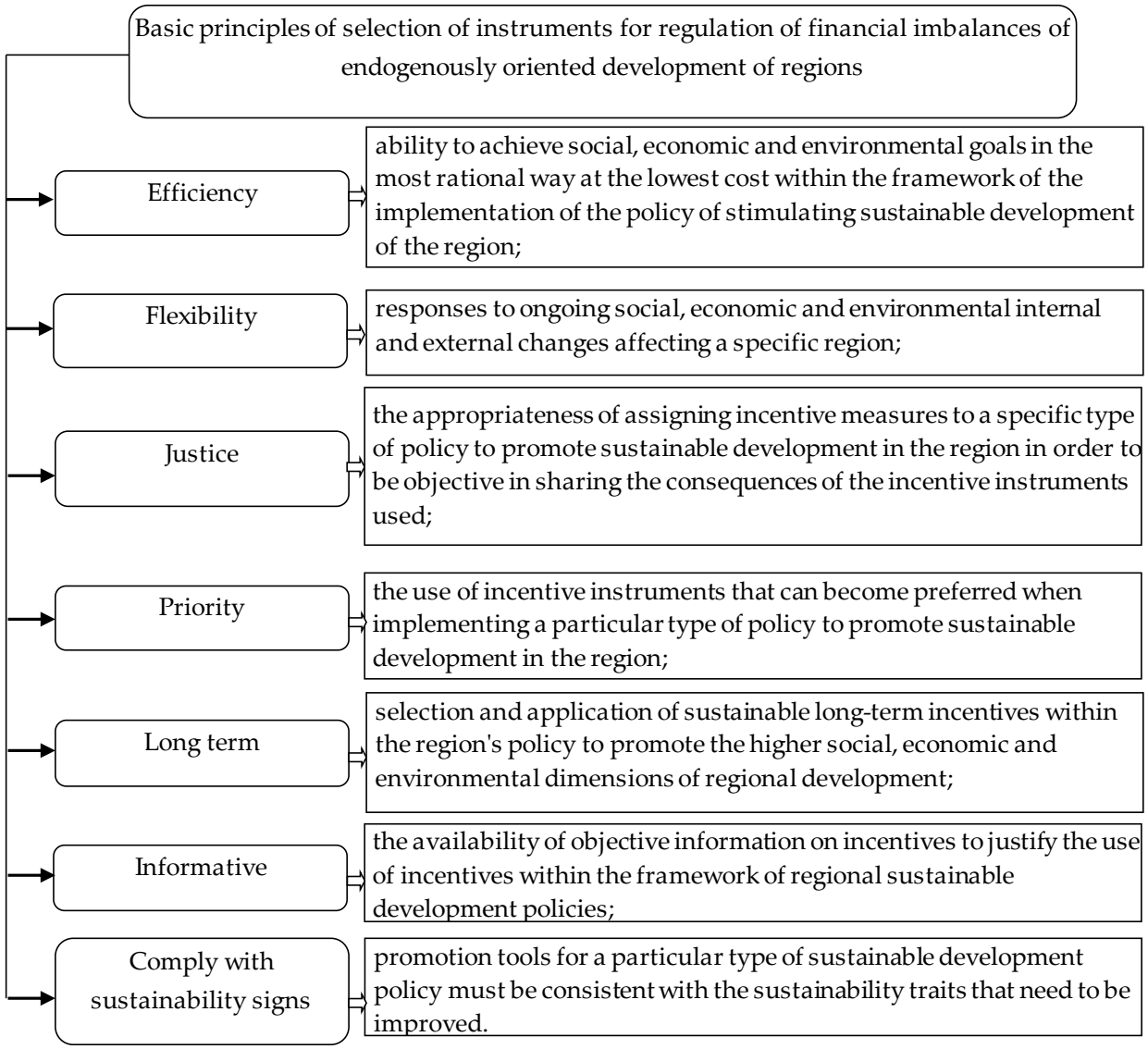

Fig. 1. Basic principles of selection of instruments for the regulation of financial imbalances of endogenously oriented development of regions. Source: is based on [2; 3]

The tools of regulation of financial imbalances of endogenously oriented development of regions are tools of activating influence on financial imbalances which are aimed at ensuring achievement of endogenous oriented development of the region through active activity of state and regional authorities.

The set of relevant institutions and instruments constitutes an economic mechanism of regulation.

To date, numerous classifications of instruments for regulating financial imbalances in endogenously-oriented development are known (Figure 2).

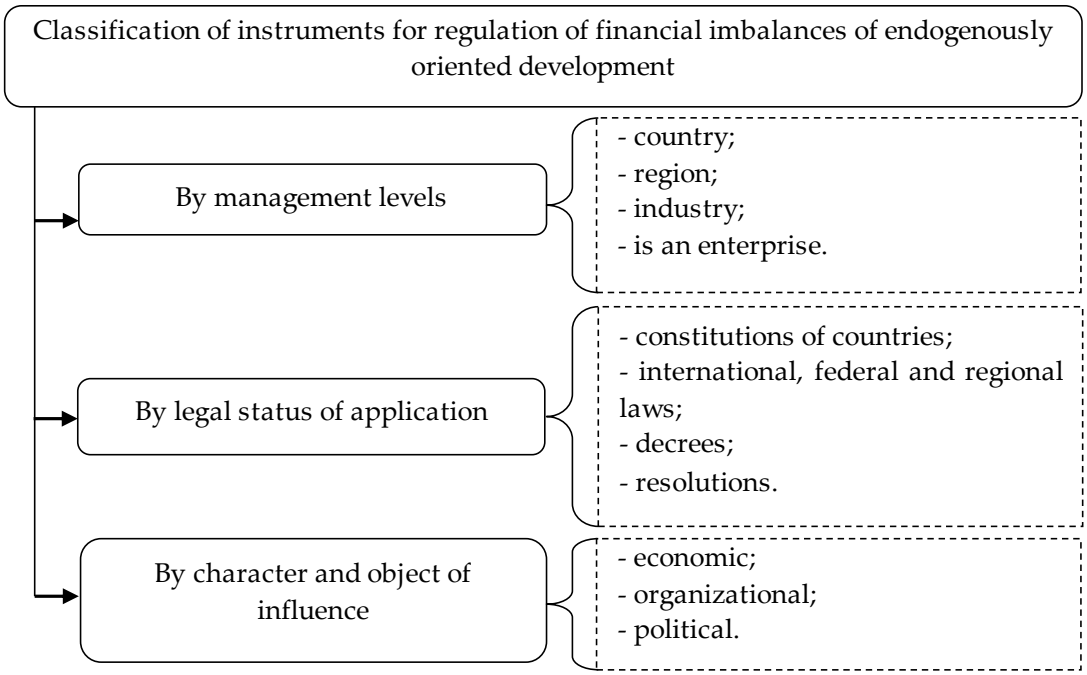

Fig. 2. Classification of instruments for the regulation of financial imbalances of endogenously oriented development. Source: by the author

Classification of instruments for the regulation of financial imbalances of endogenously-oriented development is characterized by the use of a wide range of measures for promoting sustainable development and is presented in Table. 1.

		Type of classification	**Specifics**
Classification features	1) by subject:	tools to promote sustainable development in the region	incentive instruments aimed at the activities of economic entities and regional authorities in all regions to achieve sustainable development used by public authorities;
		tools for motivating the region's sustainable development	measures of internal activation of activity of economic entities in the social, economic and environmental spheres of the region, aimed at achieving sustainable development through the application of a motivational approach to increasing the internal potential reserves of a particular region used by regional authorities;
	2) in the direction of stimulation:	investment and innovation	activation measures based on investment in the development and implementation of new technologies, processes and innovative proposals to achieve sustainable development in the region;
		tax	instruments for promoting the sustainable development of the region, based on the levers of the tax system (taxes, payments, fees, penalties, tax breaks and credits), and aimed at achieving the sustainable development of the region;
		transfer	incentive measures aimed at improving the financial situation in the region and achieving sustainable development through the use of a system of budgetary allocations (grants, subsidies, subsidies);
		institutional	incentive measures implemented by state and regional authorities to improve the financial situation in the region (permits, restrictions, agreements, programs);
	3) the duration of the stimulus event:	long term	tools for promoting the sustainable development of the region, which have been in use for over 5 years;
		medium term	sustainable development measures that last for 3 to 5 years;
		short term	instruments for promoting the sustainable development of the region, whose duration is limited to 1 to 3 years;
	4) by funding source:	state	sustainable development instruments financed by state or local budgets, public funds, and state-owned enterprises;
		private	incentive measures aimed at achieving sustainable development of the region and funded by private entities of various organizational forms and types;
		internal	instruments for stimulating sustainable development of the region, financed by intra-regional sources;

		Type of classification	Specifics
Classification features		external	incentives for sustainable development in the region and funded through national or interregional programs and agreements as well as international organizations.
	5) tax instruments for promoting sustainable development:	tax scientific credit	deducted from the taxable amount of monthly income of legal entities carrying out R&D expenses on research activities. The purpose of the tool is to develop new technologies and translate scientific achievements to achieve sustainable development in the region.
		investment tax credit	deduction from the taxable amount of monthly income of legal entities engaged in innovative investing. The tool is aimed at promoting innovation in the social, environmental and economic spheres to achieve sustainable regional development.
		tax preferences for high-tech and environment-oriented enterprises in the region	on the territory of the region by partial exemption from taxation of legal entities carrying out such activity. The tool will allow to expand ecological products and services, ensure ecological balance, achieve sustainable development of the region.
	6) transfer tool to stimulate sustainable development of the region:	direct subsidy to local budgets for environmental measures and regional resource policy	budgetary allocation from the State Budget of Ukraine for regions with significant environmental problems, as needed. The purpose of the instrument programs is to overcome environmental problems in the regions of Ukraine and to promote the sustainable development of the regions.
		direct subsidy to regions forced to sustain industrial development	program budget allocation from the State Budget of Ukraine to a specific region, where purposefully adheres to industrial development in order to preserve the social and environmental sphere of the region. The main objective of the toolkit programs is to compensate a specific region for slowing down industrial development in order to rebalance the areas of the regional SEE system..
	7) investment-innovative tools for stimulating sustainable development of the region:	innovative investment in regional science and technology	private and public investment in high technology, focused on achieving sustainable development of the regional SEE system. The tool is aimed at restoring ecological balance, achieving social justice and ensuring the economic growth of regions through the implementation of high-tech investment projects.
		innovations to restore the primary qualities of the region's resources used	implementation of high-tech projects implemented by legal entities in the region and related to the natural resources of the region. The purpose of the incentive tool is to restore the natural resource potential of the region, to ensure the suitability of the resources used to achieve sustainable development of the region.
	8) institutional tools for promoting sustainable development of the region:	state procurement of highly efficient regional projects and technologies in environmental and social terms	defining the list of priority social-environmental projects, financing them and implementing them in order to achieve sustainable development of the region. The main purpose of the incentive tool is to develop high-tech, energy-efficient, environmentally friendly and socially-oriented production.
		regional cross-border cooperation in the field of sustainable development	cross-border regional cooperation in social, economic and environmental spheres to achieve sustainable regional development. This tool will enhance the cooperation of the regions of Ukraine with the regions of neighboring countries in the social, economic and environmental spheres of the region, contributing to the sustainable development of the region.

Tab. 1. Classification of instruments for regulation of financial imbalances of endogenously oriented development. Source: is based on [4]

At the same time, the classification of instruments for regulating financial imbalances of endogenously-oriented development is used to achieve sustainable development of the regions within different policies to stimulate sustainable development of the regions, should ensure the competitive development of the economy, revitalization of the social sphere and ensure its environmental safety, as well as ensuring the environmental safety of the regions. At the same time, it is possible to achieve a high level of sustainable development of the regions only when the instruments for promoting sustainable development have a regional socio-ecological-economic effect of their application.

The tools of regulation of financial imbalances of endogenously-oriented development of the regions, which are used to analyse the impact on the efficiency of development of regions at different stages of the economic cycle, can be classified into three main areas: administrative, organizational-economic and financial (Figure 3).

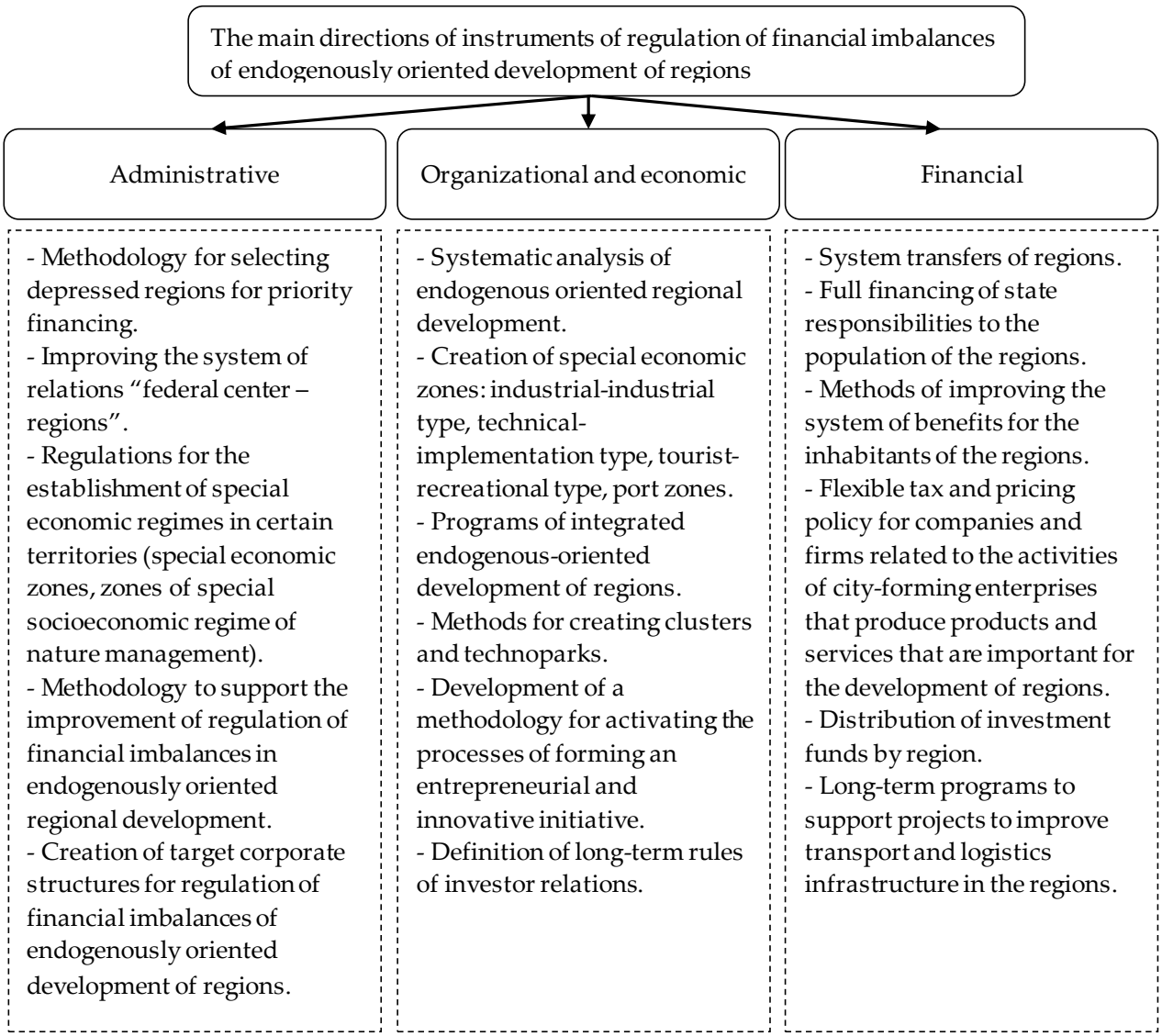

Fig. 3. The main directions of instruments of regulation of financial imbalances of endogenously oriented development of regions Source: by the author

Each direction of regulation of financial imbalances of endogenously oriented development of regions can have many modifications depending on what elements of distributive relations they contain. Each destination is responsible for a specific purpose in the form of assigned functions. The main areas of interaction are through financial instruments, thus influencing the different aspects of endogenously oriented regional development.

In the process of regulating the financial imbalances of endogenously-oriented regional development, it is proposed to concentrate efforts on the creation of special instruments, which include both the development of regulations defining the formation of new organizational forms and the practice of special types of transfers.

After all, regulation of financial imbalances of endogenously-oriented development of regions should be carried out by a system of specially organized measures of political, legal, social, financial, economic character, called (Figure 4).

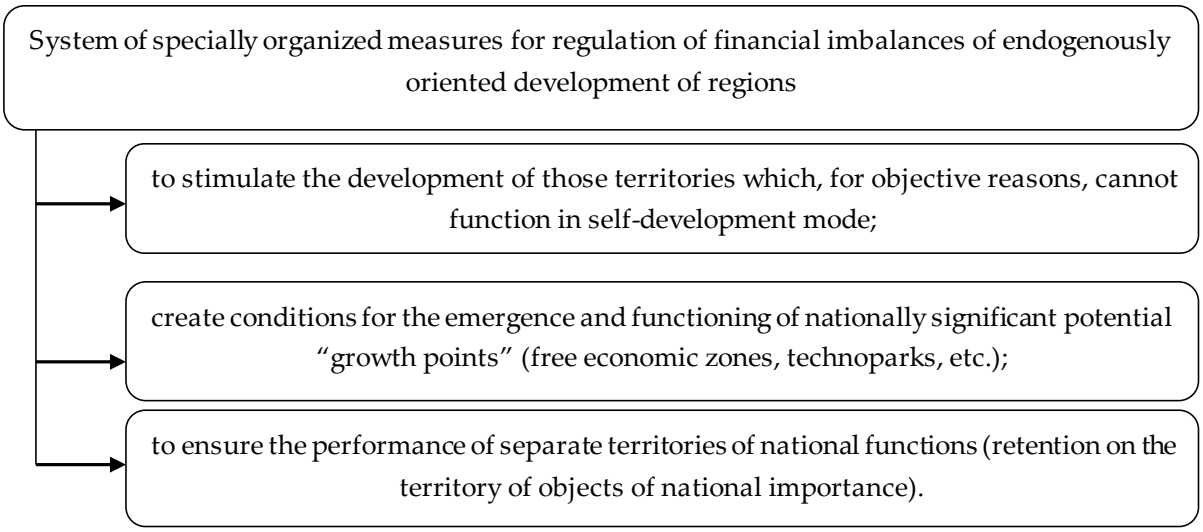

Fig. 4. System of specially organized measures for regulation of financial imbalances of endogenously oriented development of regions. Source: is based on [2]

It is obvious that the use of financial imbalances in the endogenously oriented development of the regions, both equalizes and stimulate subsidies, as well as subsidies and employ a comprehensive approach.

This means overcoming the traditional view of intergovernmental budgetary regulation as an auxiliary process that ensures the transfer of funds between budgets at different levels. It can be concluded that any relationship between state authorities and municipalities arising from the distribution of tax revenues, spending powers, and especially transfers, affects the interests of both parties and presupposes their harmonization [5].

In conditions of economic instability, problems related to ensuring the development of regions were actualized. Practice shows that more attention has traditionally been paid to the development of public policy that regulates the financial imbalances of regional development, as well as the search for legal, organizational and economic mechanisms.

However, the issues of regulating the financial imbalances of endogenously-oriented regional development are most acute at the local level, where a clear lack of tax and non-tax revenues to finance regional development is observed when using the current system of distribution of financial revenues. In such a situation, special importance is given to fiscal mechanisms for regulating municipal development.

3. CONCLUSIONS

The results of the study allow us to formulate the following conclusions:

1. Perspective directions of improvement of the system of regulation of financial imbalances of endogenously-oriented development of regions can be formed and practicing of the practice of providing system transfers to regions lagging behind in socioeconomic development, formation of special instruments of regulation of financial imbalances of regional development - target economic zones. An effective direction for improvement may be the creation of a corporation of regions within the territorial development of zones of special social-ecological regime of nature management. In this case, it is advisable to provide for the possibility of modifying the use of regulatory instruments at the stages of financial and economic crises and depression.

2. At the regional level, it is advisable to concentrate the efforts of the executive and legislative bodies on increasing the decentralized resources for financing the development of the territories. The process of formation of decentralized sources of realization of the perspective directions of development of regions raises efficiency of endogenously-oriented development of regions at once in several directions: first, an environment is created to form a system of investment projects capable of

leading the region out of a state of depression; secondly, the conditions for effective development of significant investment inflows are formed, in particular at the expense of investors of national welfare, the personnel reserve is created through the implementation of global projects, the project basis of strategic development is expanded by increasing the number of developed and passed re-engineering projects of enterprises and structural restructuring, and financial resources are being accumulated to modernize the region's banking system in order to increase the share of long-term loans and to include regional banks in the system of large investment projects that can bring the productive forces of the region to a new level of development.

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Кльоба Тарас, Кльоба Соломія. Обґрунтування дієвих інструментів регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів України. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 46–54.

У статті розглянуті інструменти, які рекомендовані для регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів України як складова частина механізму управління регіональною економікою, а також вивчені шляхи регулювання регіональних соціально-економічних процесів в кризових умовах. Визначено основні принципи відбору інструментів регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів. Розглянуто класифікацію інструментів регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку. Проаналізовано основні інструменти, які використовуються для забезпечення розвитку регіонів і муніципальних утворень: правові; пов'язані з розробкою відповідних стратегій і програм; засновані на реалізації міжмуніципального співробітництва; фінансові.

Досліджено три основні напрямки інструментів регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів, що застосовуються з метою аналізу впливу на ефективність розвитку регіонів на різних етапах економічного циклу. Обґрунтовано систему спеціально організованих заходів регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів.

В сучасних умовах велика увага приділяється проблемам регулювання фінансових дисбалансів ендогенно-орієнтованого розвитку регіонів України, реалізація якого потребує спеціальних інструментів. Запропоновано цілісне уявлення системного механізму регулювання фінансовими дисбалансами ендогенно-орієнтованого розвитку регіонів. Адже, забезпечення ендогенно-орієнтованого розвитку регіонів в сучасних умовах функціонування економіки України вимагає реалізації стратегії соціально-економічних перетворень, які будуть спрямовані на зміну фінансових дисбалансів розвитку регіонів та механізмів їх реалізації. Ендогенно-орієнтований розвиток регіонів означає підвищення рівня подолання несприятливих соціальних, економічних і екологічних ризиків та тенденцій, із спроможністю регіонів забезпечувати фінансові дисбаланси, саморегулювання, самовдосконалення із максимальним використанням внутрішніх, а також зовнішніх позикових ресурсів для задоволення потреб населення регіонів.

Ендогенно-орієнтований розвиток регіонів обумовлюється визначенням інструментів регулювання фінансових дисбалансів регіонів та виявлення умов щодо їх досягнення, які є похідними для забезпечення ендогенно-орієнтованого розвитку регіонів в цілому.

Ключові слова: основні принципи відбору інструментів регулювання, інструменти регулювання фінансових дисбалансів, класифікація інструментів регулювання, основні напрямки інструментів регулювання.

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INFORMATION-ANALYTICAL PROVISION OF FINANCIAL SECURITY OF INDUSTRIAL ENTERPRISES: DETERMINANTS, EVALUATION OF INDICATORS AND MECHANISMS OF STRENGTH

Oksana Vivchar, Justyna Krzywkowska, Liliia Mykhailyshyn, Oksana Kohut-Ferens

Abstract. Conceptual aspects of industrial enterprises financial security are considered, features of industrial enterprises financial security information and analytical support functioning are determined. On the basis of which a structural and logical scheme of information and analytical support of an industrial enterprise financial security in modern transformational conditions is proposed.

The analysis of the current state of major external and internal threats identification is carried out. Based on the results of the analysis, it was found that the most risky components of an industrial enterprise financial security are investment and credit, since these components carry the greatest number of risks.

Also, a comprehensive analytical assessment of the information and analytical support formation of the country's Western region business structures financial security was made. The calculations make it possible to identify the main problematic aspects of the functioning of enterprises and threats to their financial security and to develop measures to strengthen it. The economic efficiency of the information and analytical support system introduction of industrial enterprises financial security with consideration of strategic and tactical vectors of development, and also depends on completeness, reliability, timeliness of the information component. The algorithm of forming information and analytical support of industrial enterprises financial security assessment with consideration of software is investigated. On the basis of which a multi-vector mechanism of information and analytical support of industrial enterprises financial security in modern conditions of turbulence of economic processes is proposed. This will make the decision-makers informed, both strategic and tactical, operational.

Keywords: financial security, information, information and analytical support, threats to financial security, industrial enterprises, multi-vector mechanism of information and analytical security of industrial enterprises financial security.

1. INTRODUCTION

Relevance. In today's post-conflict conditions, the development of business structures of the industry remains unsatisfactory. It cannot be overlooked that industrial enterprises operate in an unstable and dynamic external environment, under the influence of information technologies, which create threats and dangers to the effective functioning of economic entities. It should be noted that in conditions of uncertainty and volatility of the environment, the problem of strengthening the financial security of an industrial enterprise in the context of information and analytical support is of particular relevance. Undoubtedly, in such circumstances, it is a prerequisite for developing advisory aspects to improve the information and analytical support of financial security of industrial enterprises financial security.

The purpose of the study is the development of theoretical and applied aspects to improve the information and analytical support of industrial enterprises financial security in the current conditions of business macrotrends.

In an environment of industrial enterprises instability, when the lack of resources to finance their activities threatens not only the ability to support the process of extended reproduction, but also their viability, the issue of protecting the interests of the enterprise from the negative impact of external and internal threats becomes more relevant. In today's transformational environment, it is a well-known fact that improving the information and analytical support of industrial enterprises financial security is not a single process. Therefore, it should be considered as a set of interrelated mechanisms and methods of the structural and logical aspects of information and analytical support organizing individual elements in the context of strengthening financial security. It should be noted that the study of the industrial enterprises financial security is of particular relevance due to the rise in cost of the resource base, increased energy intensity of production, the economic crisis in the country and the constant fluctuations in pricing policies for industrial products. Significant contribution to the research of scientific problems on the formation of information and analytical support of industrial enterprises financial scurity was considered in the works of such economists as O. Arefiev, B. Andrushkiv, O. Baranovsky, Y. Bilokomirova, O. Vivchar, T. Ganushchak , K. Goryacheva, L. Donets, T. Zavora, D. Kislov, B. Kartich, S. Melnyk, N. Reverchuk, O. Stepanova, S. Tsyuryupa, O. Yaremchuk and others. It should be noted that the issues of the industrial enterprises financial security concept implementation were reflected in the works of some scientists, in particular O. Gryvkivska, N. Davydenko, O. Zakharova, P. Prichunov, M. Yaremova.

2. RESULTS

International experience shows that effective management of information support for industrial enterprises is one of the most important ways of strengthening financial security in the way of overcoming many destructive phenomena in the national economy. Progressive innovative systems and ideological and methodological vision of the conceptual aspects of information support is a recognized tool for industrial enterprises financial security. Based on the literature we have analyzed, we can conclude that economic theory today identifies two main approaches to determining the essence of enterprises financial security. According to the first approach, financial security is considered as one of the most enterprise's economic security important component. The second approach emphasizes the need to distinguish financial security as an independent object of research and management.

According to the dynamic development of scientific opinion, O.I. Baranovsky noted that the enterprise financial security is the degree of financial interests protection at all levels of financial relations or the level of providing the enterprise with financial resources sufficient to meet its needs and fulfill its existing obligations. [1, p.84]. The results of our research, summarizing the views of scientists on financial security, allow us to consider the financial security of an industrial enterprise in several aspects.

Thus, analyzing the main approaches of leading economists to interpret the financial security of an industrial enterprise, we can say that the main characteristics of financial security are: resistance to internal and external dangers and threats; availability of sufficient financial resources; financial equilibrium, stability, liquidity and solvency in the short and long term; meeting the needs of the enterprise for financial resources for sustained expanded reproduction of activities; the ability to respond timely to internal and external hazards that could cause damage to the business or lead to its elimination; sufficient financial independence and protection of the business owners financial interest; sufficient flexibility in making financial decisions.

In the context of the problem under study, it can be noted that ensuring financial security, an important element of which is considered to be its information and analytical component. In our opinion, it is one of the most important tasks of the industrial enterprise management.

A constructive analysis of theoretical developments suggests that there are many interpretations of the term "information". It is a well-known approach, in particular S. Tsyurupa, believes that information is one of the most important resources together with material, energy and human resources. [12, p. 231]. However, it should be noted that B. Kortich states that information is certain information, a set of any data, knowledge [8, c.41]. Please note that the interpretation data have the right to exist, do not negate each other, but only supplement.

It should be noted at the same time that according to O. Susidenko, the information-analytical subsystem of the industrial enterprise financial security should contain the following data: qualitative and quantitative values of financial security indicators, presence or potential of risks and threats, formalized financial interests and status of their realization, strategic plan (strategy) of ensuring of the enterprise financial security, qualitative and quantitative parameters of the financial resources use, the volume of the latter, as well as their sources of income, financial plan (budget).

It should also be noted that external sources of information contain data on: level of the country's macroeconomic development and industry to which the enterprise belongs; financial market conditions; activity of competitors (suppliers, buyers, banks, insurers); industry performance indicators of analogous enterprises; assessment of threats to financial security of entrepreneurial activity by source, by severity of consequences, by probability, by sphere and source of occurrence, by duration of exposure, by degree of development, by degree of tension, etc. [5].

It should be emphasized that complete, timely and reliable information will allow you to make effective decisions to prevent and overcome all kinds of threats to the financial interests of economic entitiesBased on the literature we have worked out, we have formed a structural and logical scheme of information and analytical support for the industrial enterprise financial security (Fig. 1).

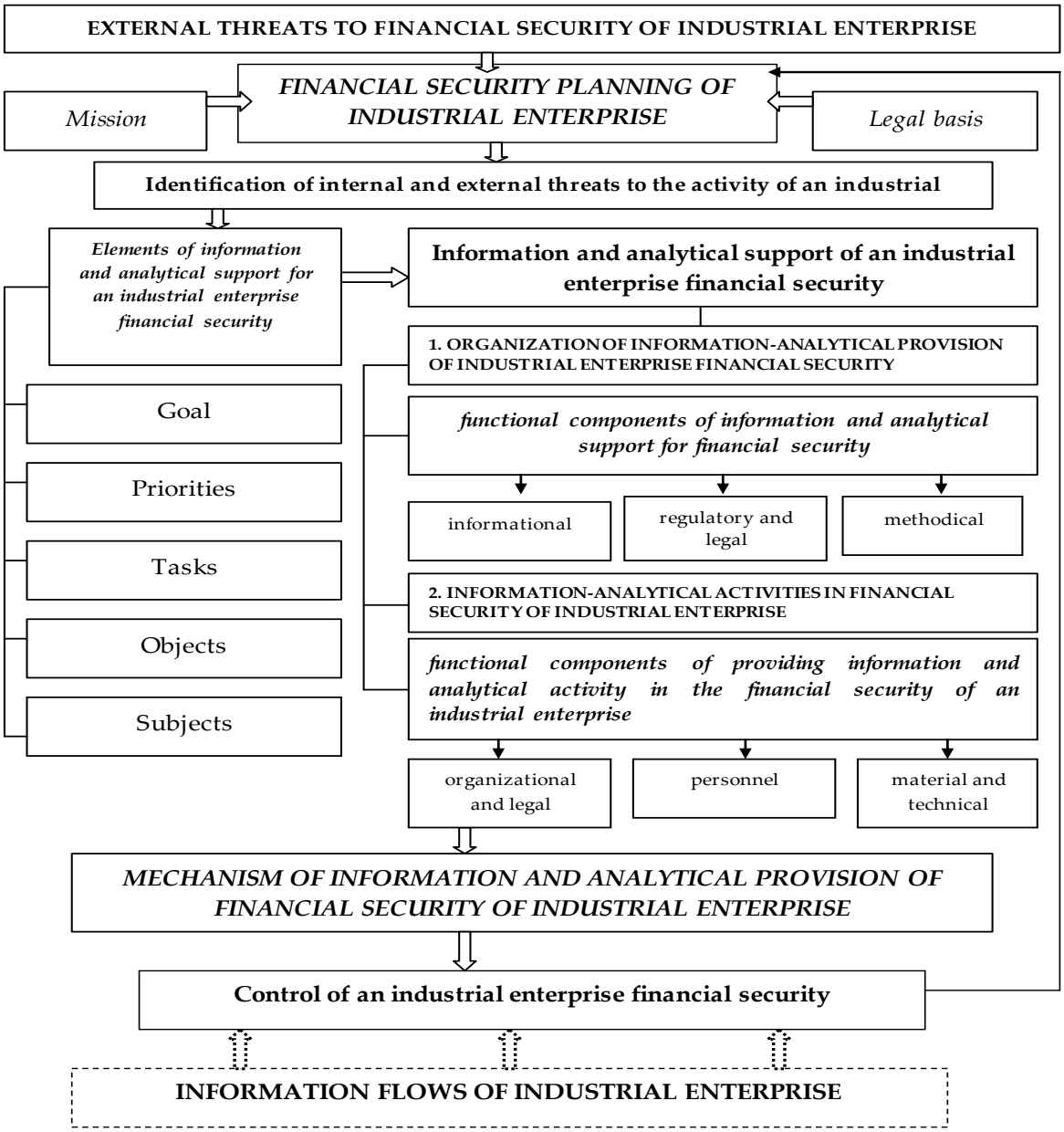

Fig. 1. Structural-logical scheme of information and analytical of an industrial enterprise financial security [author's development]

In the meantime, it should be noted that minimizing the risks of loss of information flows in an industrial enterprise and timely identification of threats that will negatively or likely have an impact on, prevent and counteract the activities of the entity in the future.

In today's turbulence of economic processes, priority should be given to maintaining economic stability and economic growth as a basis for national security, which is determined by the level of security of particular sectors of the economy, including industry.

One of the important components of economic security is financial, without which it is practically impossible to effectively carry out business activities in this field. On the basis of the conducted scientific researches it is noted that according to L. Golovkova, the main goal of the enterprise financial security in the industrial complex is stable maximum effective providing of high potential of market value development and maximisation and growth of the enterprise capitalisation in the future. To achieve this goal, in the author's view, it is necessary to identify the following basic goals: ensuring high technological development potential; ensuring transparency of financial reporting and legal protection; maximizing the market value of industrial enterprises by attracting additional sources of

financing; ensuring the stability of the financial state through financial independence, liquidity, preservation of property values of enterprises [2, 4].

It should also be noted that one of the determining factors influencing the formation of industrial enterprises financial security is the presence of internal and external threats in the financial sphere. In this aspect, O. Gryvkivska notes that the most important is the division of threats into internal and external, since such separation makes it possible to identify the source (place) of the threat, the subject causing it, the development in space, the nature of its occurrence (objective). , subjective), the ability to influence it, the level of controllability [6].

From a practical point of view, if internal threats directly depend on the financial strategy and tactics of the enterprise, the skills of workers and the sectoral strategy, and therefore can be identified and corrected, then external threats reflecting the financial and economic situation in the country, in some of its parts cannot be detected in time and, consequently, localized. It is worth pointing out the researches of O. Gryvkivska, E. Kartuzov, L. Matviychuk and others, who state that in order to ensure the financial security of an industrial enterprise, it is advisable to create a system of threat monitoring and prevent the impact of such risks by methods of insurance, redundancy, diversification and limit.

In the context of post-crisis recovery, the inflation rate, employment rate, international balance of payments, and the stability of the national currency should be constantly evaluated during the external environment analysis. In the framework of analytical research, we propose to classify by the main functional components of financial security of an industrial enterprise and carry out their division into internal and external (Tab. 1).

Classification components of threats	***External threats***	***Internal threats***
Budget and tax	- increasing fiscal pressure on an industrial enterprise; - instability of fiscal legislation.	- low level of payment and settlement discipline; - ineffective management of the accounts receivable and payable of the enterprise on payments with the budget; - inefficient tax management
Insurance	- increase of insurance tariffs; - delays in insurance payments; - insurance fraud; - imperfection of the regulatory framework in the field of insurance.	- choice of financially unstable and unreliable insurance companies; - ineffective management of the accounts payable of the enterprise on insurance payments; - low level of property insurance.
Investment	- imperfection of legislation in the field of investment; - deterioration of the investment climate in the country; - reduction of interest rates on deposits; - the probability of non-return of some or all of the deposit resources; - imperfection of the legislation governing banking activities; - absence of a deposit guarantee fund for legal entities.	- decrease of investment attractiveness of industrial enterprise; - inefficient investment policy of an industrial enterprise; - irrational depreciation policy; - limited diversification of industrial enterprise deposits; - choice of financially unstable and unreliable banking institutions when entering into deposit agreements.

Classification components of threats	*External threats*	*Internal threats*
Stock	- decrease in the market value of securities issued by the enterprise; - low rates of realization of the issued securities.	- sub-optimal distribution of profit between consumption by owners and reinvestment of it in the assets of the enterprise; - inefficient dividend policy of an industrial enterprise.
Cash	- devaluation of the national currency; - NBU's (National bank of Ukraine) imperfect monetary policy; - rising inflation; - crisis of the monetary system of the state; - high level of exchange rate volatility.	- decrease in sales revenue; - lack of own working capital; - violation of the organization of saving money; - breach of payment discipline, ineffective management of accounts receivable and payables.
Credit	- increase in interest rates on loans; - increasing the requirements for creditworthiness of borrowers; - financial market instability; - crisis of the financial and credit system of the state.	- reducing the solvency of an industrial enterprise; - unreasonable increase in the amount of borrowed capital; - slowing down of accounts payable; - ineffective credit policy.

Tab. 1. Systematization of major threats to the financial security of an industrial enterprise

Based on the results of the analysis, we found that the most risky components of an industrial enterprise financial security are investment and credit, since these components carry the greatest number of risks.

Please note that the stage of assessing the major financial threats that have an impact on financial security should be taken into account when developing a comprehensive system for assessing the financial security level of an industrial enterprise. Ensuring an adequate level of financial security for an industrial enterprise depends on its own conception of financial security management, which should be based on the development of financial security management strategy, financial security management policy and mechanism of financial security management of the enterprise, taking into account the information and analytical component. [11].

It should be noted that the effectiveness of any industrial enterprise depends to a large extent on complete, reliable and timely information and analytical support. In such circumstances, with effective management, the information and analytical support system will increase the level of profit management and as a consequence of strengthening the financial security of business structures of industry [10].

According to N. Davydenko's scientific interpretations, the financial security of industrial enterprises is influenced by certain factors, in particular: industry diversification; optimal capital structure; high level of capitalization; taking into account risks of industrial activity, seasonality and minimization of negative consequences [7, p.60]. Note that it is industrial enterprises that are particularly vulnerable to external threats. In view of this, the study of the information and analytical support problem of industrial enterprises financial security is timely and relevant.

The leading industrial enterprises of the Western region of the country have formed separate information-analytical units, which are engaged in collecting, processing and interpretation of the

necessary information on the internal and external environment. Their experience shows that the creation of a system of information and analytical support in an enterprise is accompanied by both a certain increase in its tangible assets (eg, hardware) and, first of all, intangible assets. Analysis of some information activities aspects and analytical units of leading industrial enterprises allows us to establish that one of the determining indicators of financial security of these enterprises is profitability indicators. It should be noted that based on the application of the computer program, using the data of the corresponding table, we have formed the results of information processing based on the use of financial security indicators of industrial enterprises in the Western region by type of economic activity and presented in Fig. 2.

Therefore, on the basis of analytical studies, there is a generally positive trend of activity of industrial enterprises in the Western region, which is confirmed by their profit during 2014-2018., the sum of which in 2018. amounted to UAH 1437000.4 thousand, ie increased by UAH 1265816 thousand compared to 2014. The decrease in the amount of net profit in 2016 compared to 2015 by UAH 237 638 thousand. or 57.13% due to the significant increase in expenses including administrative, sales, financial and other expenses.

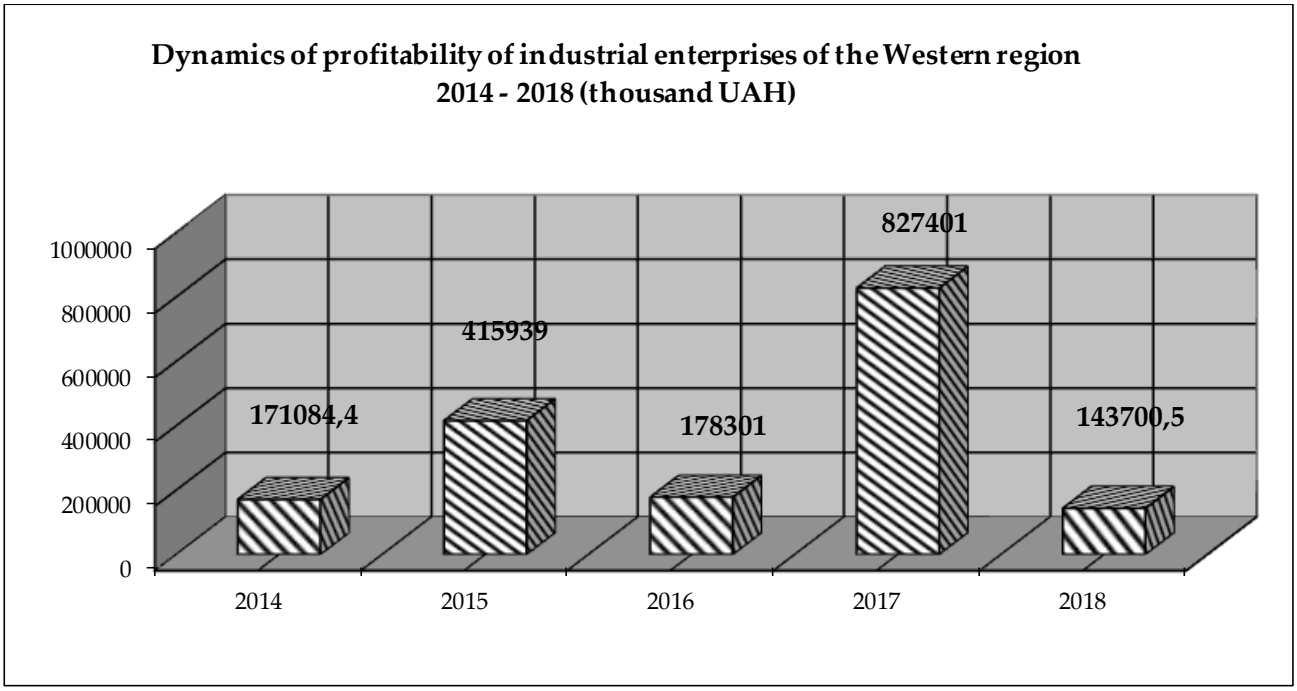

Fig. 2. Analytical evaluation of industrial enterprises financial security indicators of the country's western region, 2014-2018 [calculated by author]

The results of scientific studies confirm the fact that O. Udovenko explains that in contrast to the administrative-command economy, in which the economic security of industrial enterprises in general and financial in particular is provided by vertically constructed methods of total centralized management, the processes of ensuring security in market conditions are dispersed. in many subjects and areas of activity having their own, often opposite interests, not inherent in the previous system. In a new environment, a horizontally dispersed security system begins to prevail [3, p. 127]. All this, in our opinion, requires a rethinking of the traditional methods and means of information and analytical support for the financial security of industrial enterprises. In our opinion, the benefits resulting from the operation of the information and analytical system, and, as a consequence, better management awareness, are most noticeable at the level of industrial enterprises financial security (Fig. 3).

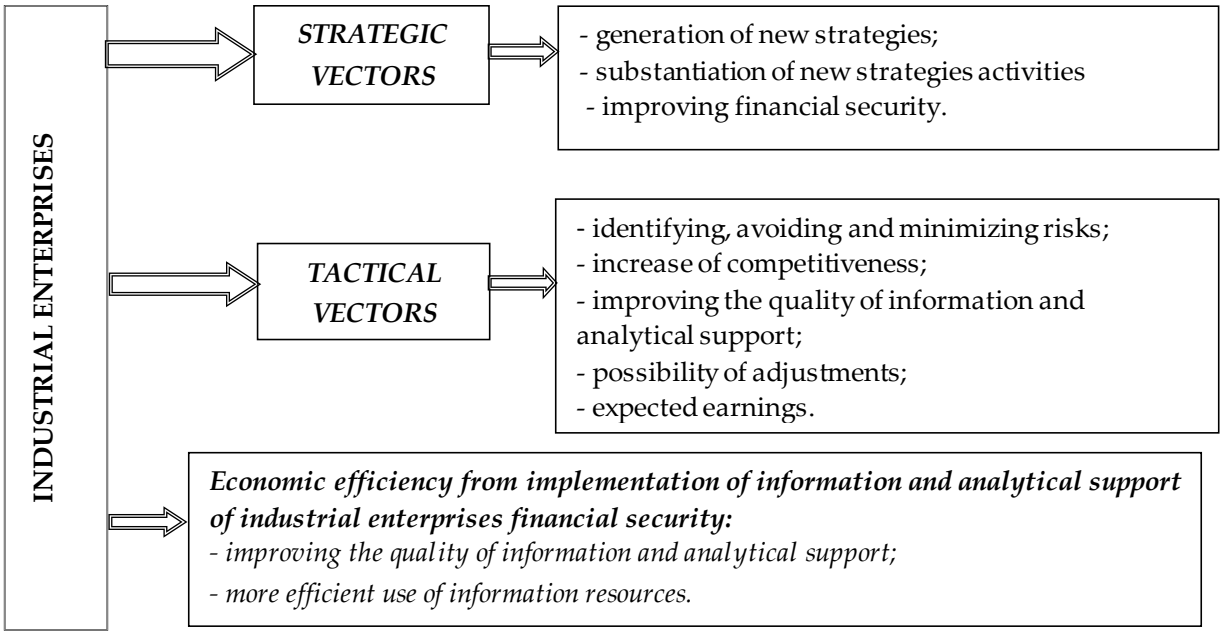

Fig. 3. Economic efficiency from the implementation of the information and analytical support system of industrial enterprises financial security [author's development]

Thus, a properly built information and analytical support system allows to achieve a high level of financial security of industrial enterprises, using innovative technologies and taking into account a number of factors arising from the above mentioned indicators of economic efficiency, and the specifics of an industrial enterprise.

In the conditions of turbulence of economic processes for an effective system of information and analytical security of industrial enterprises financial security, in our opinion, it is necessary that there is an information and analytical unit, which is a component of the security service, whose function is to protect any information of the respective enterprise, to clarify the specifics of functioning inside and outside the enterprise, in a timely manner to receive advance information about vital processes for the enterprise and identify the means of its optimal use Reference.

It should also be emphasized that only computer technology with its high level of operations and software can fulfill these requirements for management information.

We consider it expedient to note that the need for rapid introduction of information and analytical technologies is determined by the following factors: increasing the "intelligence" of management (the rapid availability of large amounts of objective information allows us to make promising project decisions); scheduling optimization (timely access of all interested users to important information contained in one centralized database); improvement of project decision-making processes. Decisions become more grounded if they are backed by reliable and timely information. It also saves time spent on analyzing minor tasks; extension of information competence - the more experts have access to the necessary data, the more effectively the management subsystem as a whole; promotional nature of information about the activity of an industrial enterprise [9].

Common problems with the introduction of information and analytical technologies are that, as a rule, individual tasks of management are automated, resulting in the inability to obtain reliable information on financial and economic indicators in full.

That is why the first and priority principle of building information and analytical systems in industrial enterprises is a systematic approach, according to which the attention should be focused on the whole sphere as a whole, and not on individual spheres, since the specific properties of the object can only be evaluated from the standpoint of the whole systems.

In order to optimize the process of monitoring the financial security of industrial enterprises, we propose to use scientifically designed and tested computer programs, which can be used to quickly assess the level of each component of financial security, determine the impact of the components on its

overall level and the dynamics of the financial security ratio. The calculations made will allow to identify the main problematic aspects of functioning of enterprises and threats to their financial security and to develop measures for its strengthening. Appropriate software allows you to quickly access online information without additional workforce, since only one specialist can perform security assessments with a computer program.

The algorithm of industrial enterprises software forming is shown in Fig. 4.

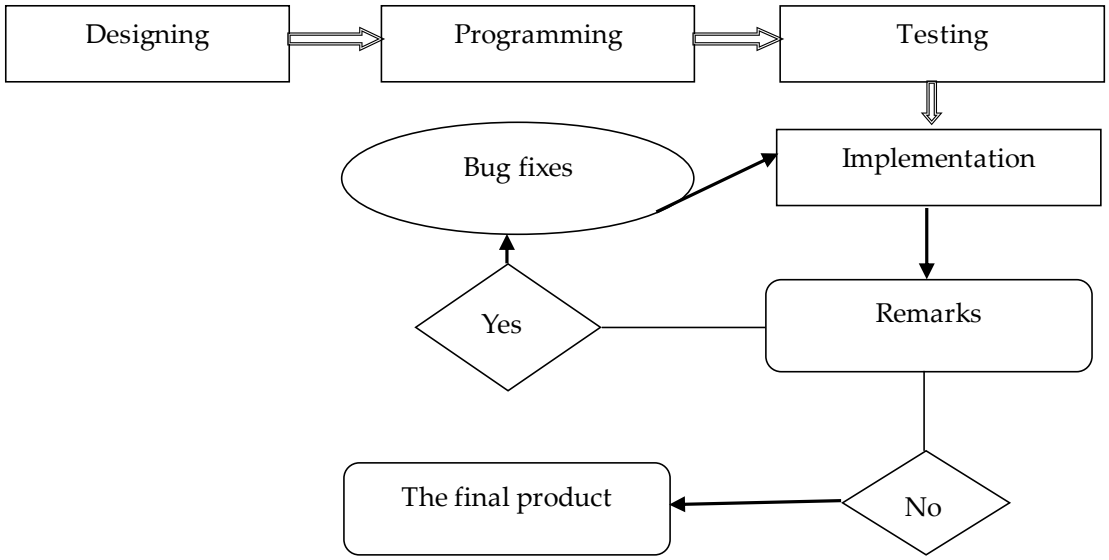

Fig. 4. The algorithm of information and analytical support formation for the assessment of industrial enterprises financial security [37, p.98]

The software greatly facilitates the financial security assessment process, while saving the time and effort of industrial staff. In addition, according to the results of assessing the level of security in the program environment, reports are prepared that are convenient for perception and analysis, which make it possible to assess the level of financial security, the degree and nature of the impact of its individual components and their factors at a particular point in time. Also, data of reports, their graphic representation create conditions for diagnostics and evaluation of financial security, its factors in dynamics. All this together creates the basis for the formation of management vectors for strengthening the industrial enterprise financial security.

The results of this scientific work give us the opportunity to create a multi-vector mechanism for improving the information and analytical support of an industrial enterprise financial security on the basis of which it is necessary: control the likely channels of information leakage at an industrial enterprise; monitor employee access to corporate information resources; to keep archive of operations with documents; detect in the original http-data stream that may threaten the leakage of confidential informatio; control the use of mobile storage devices, information devices and communication ports; archive mail correspondence; monitor file operations level; correct selection of personnel, application of material and moral incentives, creation of favorable social and psychological climate within the organization, creation of opportunities for professional growth, reduction of staff turnover, formation of "firm patriotism" (Fig. 5). However, only timely and comprehensive completion of all these tasks can lead to the desired result. Therefore, the above proposals are the basis for further formation of the information and analytical security system of industrial enterprises financial security.

3. CONCLUSIONS

Summarizing the above, it should be noted that information and analytical support is considered as a system that includes a set of methods, tools and methods aimed at collecting, analyzing, protecting information, as well as forecasting, continuous advisory support and making recommendations for

effective management decisions of operational and strategic. One of the main places in the financial security system is the information and analytical support, since information, its timeliness, reliability, completeness, correct interpretation depends on the efficiency of the industrial enterprise, its safety, competitiveness, and sometimes the fact of functioning on the market. The following subsystems have been interpreted to solve the problems posed by the information and analytical support system: economic intelligence, information security and analytical consulting.

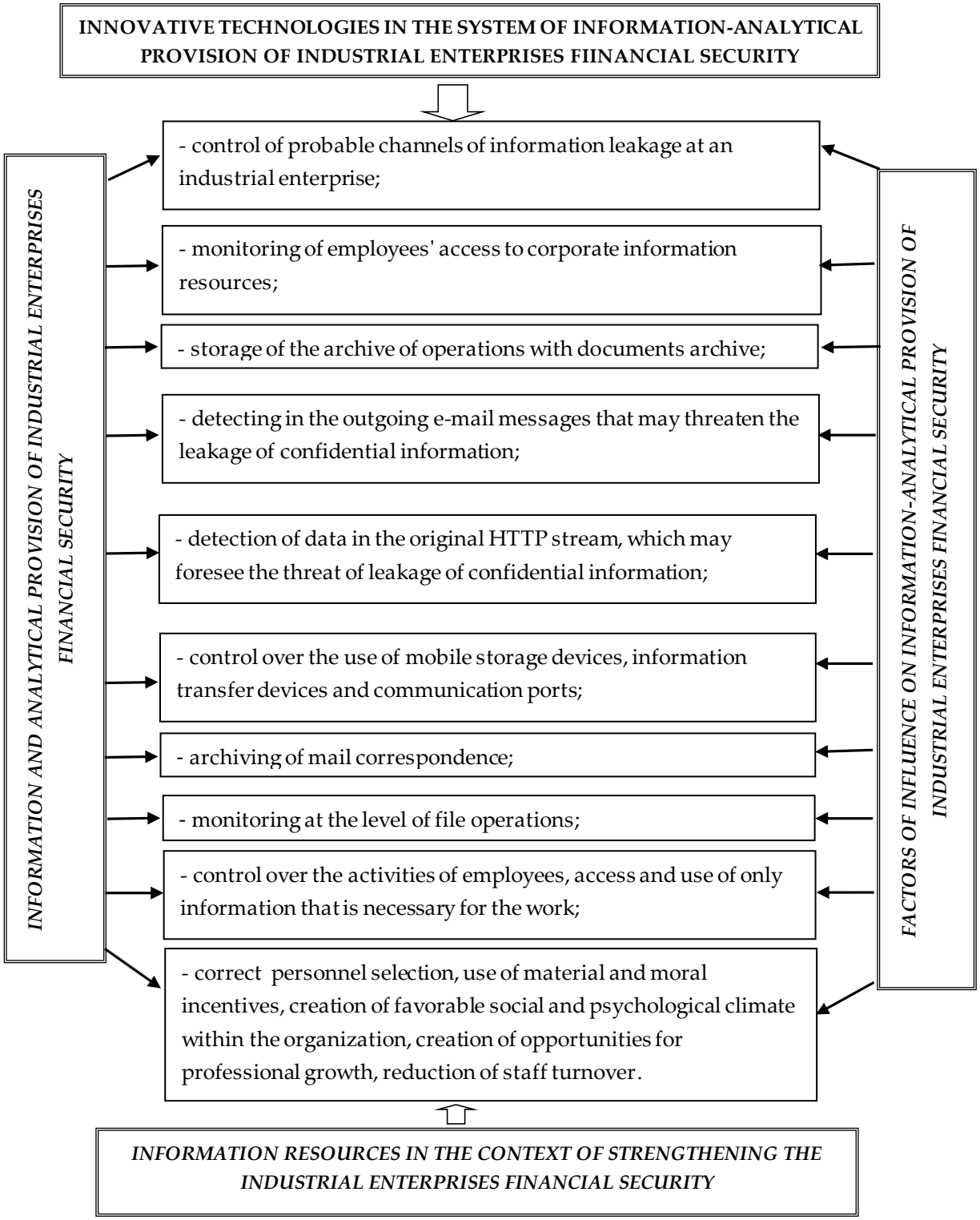

Fig. 5. Multi-vector mechanism of industrial enterprises financial activity information and analytical support [development]

It should be noted that the results of economic efficiency from the functioning of the information and analytical support system in an industrial enterprise is sufficiently broad and depends on the industry, the specifics of the enterprise. It can be manifested in a better awareness of decision makers, both strategic and tactical, operational. This leads to increased competitiveness of both the industrial enterprise in particular and the level of its financial security. From a practical point of view, we have proposed a multi-vector mechanism for improving the information and analytical support for the financial security of an industrial enterprise based on the use of innovative technologies in modern conditions of turbulence of economic processes.

Therefore, strengthening the financial security of an industrial enterprise is not possible without public policy, since the integrated actions of business entities and the state aimed at maintaining financial security by creating conditions and taking measures to obtain the required level will provide the desired result.

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Вівчар Оксана, Кшиковська Юстина, Михайлишин Лілія, Когут Оксана. Інформаційно-аналітичне забезпечення фінансової безпеки промислових підприємств: детермінанти, оцінка індикаторів та механізми зміцнення. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 55–66.

Розглянуто концептуальні аспекти фінансової безпеки промислових підприємств, визначено особливості функціонування інформаційно-аналітичного забезпечення фінансової безпеки промислових підприємств. На основі чого запропоновано структурно-логічну схему інформаційно-аналітичного забезпечення фінансової безпеки промислового підприємства в сучасних трансформаційних умовах.

Проведено аналіз сучасного стану щодо ідентифікації основних зовнішніх та внутрішніх загроз. Виходячи із результатів проведеного аналізу, встановлено, що найбільш ризикованими складовими фінансової безпеки промислового підприємства є інвестиційна та кредитна, оскільки дані складові містять у собі найбільшу кількість ризиків.

Також, здійснено комплексну аналітичну оцінку формування інформаційно-аналітичного забезпечення фінансової безпеки підприємницьких структур Західного регіону країни. Проведені розрахунки дають можливість ідентифікувати основні проблемні аспекти функціонування підприємств та загрози їх фінансовій безпеці та розробити заходи щодо її зміцнення. Обґрунтовано економічну ефективність від впровадження системи інформаційно-аналітичного забезпечення фінансової безпеки промислових підприємств з урахуванням стратегічних та тактичних векторів розвитку, а також залежність від повноти, достовірності, своєчасності інформаційної компоненти.

Досліджено алгоритм формування інформаційно-аналітичного забезпечення оцінки фінансової безпеки промислових підприємств з урахуванням програмного забезпечення. На основі чого запропоновано багатовекторний механізм інформаційно-аналітичного забезпечення фінансової безпеки промислових підприємств в сучасних умовах турбулентності економічних процесів. Це дасть можливість здійснювати проінформованість осіб, що відповідають за прийняття управлінських рішень, як стратегічних, так і тактичних, операційних.

Ключові слова: фінансова безпека, інформація, інформаційно-аналітичне забезпечення, загрози фінансової безпеки, промислові підприємства, багатовекторний механізм інформаційно-аналітичного забезпечення фінансової безпеки промислових підприємств.

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INNOVATIVE TEXTILES INDUSTRY AND ITS FUTURE WITHIN THE CONCEPT OF CIRCULAR ECONOMY – FROM THE GLOBAL TO REGIONAL PERSPECTIVE

ZOFIA WYSOKIŃSKA

Abstract. The paper deals with the complex analyses of production, export and import of products in the textile industry in different countries of the world. The largest manufacturers and exporters of textile products are identified. Trends in production capacity changes in the industry over the past years are analysed. The place and role of textile industry development in the context of the implementation of the circular economy principle in line with the EU priorities are substantiated. The main directions of perspective development of the textile industry are identified. Two main national documents that have been developed in Poland which set out the current development directions of the country in the field of sustainable development and environmental protection: Strategy for Responsible Development until the year 2020 (with the perspective until the year 2030) and National Waste Management Plan elaborated in the year 2014. The article provides a detailed analysis of the development of regional industry, including the textile industry based on the city of Lodz (Poland). The identified areas of smart specialisations of the Region of Lodz include the following sectors of economic activity: modern textile and fashion industry; advanced building materials; medicine, pharmacy, and cosmetic industry; power generation (including Renewable Energy Sources); innovative agriculture and agricultural and food processing; computer science and telecommunication. The paper proposes the main directions of the textile industry development in the example of Poland: 1) generation of minimal waste in the production process (1R - with application of the most innovative technology), 2) its maximum re-use (2R), 3) application of the third method within the three R formula (reduce, reuse, recycle) which is recycling (3R), the awareness of the importance of which among producers and citizens in many countries is systematically growing.

Keywords: textile industry, Circular Economy, global economy, recycling, waste, production process.

1. INTRODUCTION

Textile industry belongs to the sectors that are systematically and steadily growing in the world market[1] [1, p. 18]. This applies to both textiles and knitted fabrics, for which demand in the global and

[1] Globally, the USD 1.3 trillion clothing industry employs more than 300 million people along the value chain; the production of cotton alone accounts for almost 7% of all employment in some low-income countries.

European markets as well as in developing markets is growing steadily, not only with increasing population, but also with growing prosperity in many countries and good announcements concerning the development of the global economy and in majority of its regions. The following are the developmental trends of the situation in the markets of various countries and regions of the world, which clearly confirm these observations. There are also trends leading to the modernization of this sector and the increase of its innovativeness and orientation to pro-ecological textiles, which are aimed at reducing the scale of waste growth and/or re-using them.

2. RESULTS

Cotton Fabrics SITC 652

In 2015, the value (in current US$) of exports of "cotton and woven fabrics (not including narrow or special fabrics)" (SITC group 652) decreased by 7.7 percent (compared to -3.1 percent average growth rate in the period 2011- 2015) to reach 29.6 bn US$, while imports decreased by 5.1 percent to reach 22.9 bn US$. Exports of this commodity accounted for 1.4 percent of world exports of SITC section 6, and 0.2 percent of total world merchandise exports.

China, Pakistan and India were the top exporters in 2015. They accounted for 48.4, 7.8 and 6.0 percent of world exports, respectively. Bangladesh, Viet Nam and China were the top destinations, with 17.2, 7.5 and 5.4 percent of world imports, respectively.

The top 15 countries/areas accounted for 88.2 and 63.9 percent of total world exports and imports, respectively. In 2015, China was the country/area with the highest value of net exports (+13.1 bn US$), followed by Pakistan (+2.3 bn US$). By MDG (Most Developed Group[2]),the largest surpluses in this product group were recorded by Eastern Asia (+13.4 bn US$), Developed Europe (+531.4 mil US$) and Western Asia (+276.2 mil US$). The largest trade deficits were recorded by South-eastern Asia (-2.7 bn US$), Latin America and the Caribbean (-1.3 bn USS) and Northern Africa (-1.0 bn US$) [2, p. 296].

Fabrics woven of man-made textile materials (not narrow or special fabrics) – SITC 653

In 2015, the value (in current US$) of exports of "fabrics, woven fabrics, man-made textile materials (not narrow or special fabrics)" (SITC group 653) decreased by 5.9 percent (compared to 0.4 percent average growth rate in 20112015) to reach 44.6 bn US$ while imports decreased by 4.6 percent to reach 35.2 bn US$. Exports of this commodity accounted for 2.2 percent of world exports of SITC section 6, and 0.3 percent of total world merchandise exports. China, Rep. of Korea and India were the top exporters in 2015. They accounted for 48.1, 5.4 and 4.7 percent of world exports, respectively. Viet Nam, China and USA were the top destinations, with 10.8, 6.3 and 4.4 percent of world imports, respectively.

The top 15 countries/areas accounted for 89.2 and 53.4 percent of total world exports and imports, respectively. In 2015, China was the country/area with the highest value of net exports (+19.3 bn US$), followed by Rep. of Korea (+2.0 bn US$).

By MDG regions, the largest surpluses in this product group were recorded by Eastern Asia (+23.0 bn US$), Developed Asia-Pacific (+805.1 min US$) and Developed Europe (+356.9 min US$). The largest trade deficits were recorded by South-eastern Asia (-4.8 bn US$), Latin America and the Caribbean (-3.2 bn US$) and Northern Africa (-1.7 bn US$) [2, p. 297].

Other textile fabrics- woven SITC 654

In 2015, the value (in current US$) of exports of "other textile fabrics – woven" (SITC group 654) decreased by 9.8 percent (compared to -3.7 percent average growth rate in 20112015) to reach 9.7 bn US$, while imports decreased by 10.9 percent to reach 8.3 bn US$. Exports of this commodity accounted for 0.5 percent of world exports of SITC section 6, and 0.1 percent of total world merchandise exports. China, Italy and Germany were the top exporters in 2015. They accounted for 29.9, 19.2 and 4.8 percent

[2] MDG regional groupings are based on UN geographical divisions, with some modifications necessary to create - to the extent possible - groups of countries for which a meaningful analysis can be carried out. MDG regional groupings: Developed regions; Developing regions: Northern Africa, Sub-Saharan Africa, Latin America and the Caribbean; Caucasus and Central Asia; Eastern Asia; Southern Asia; South-eastern Asia; Western Asia; Oceania[1].

of world exports, respectively. China, USA and Germany were the top destinations, with 9.3, 7.7 and 6.0 percent of world imports, respectively.

The top 15 countries/areas accounted for 86.5 and 62.7 percent of total world exports and imports, respectively. In 2015, China was the country/area with the highest value of net exports (+2.1 bn US$), followed by Italy (+1.4 bn US$). By MDG regions, the largest surpluses in this product group were recorded by Eastern Asia (+2.1 bn US$) and Developed Europe (+1.5 bn US$). The largest trade deficits were recorded by Developed North America (-448.3 min US$), South-eastern Asia (-426.4 mil US$) and South-eastern Europe (-333.3 mil US$) [2, p.298].

Knitted or Crocheted Fabrics ness, SITC 655

In 2015, the value (in current US$) of exports of "knitted or crocheted fabrics", ness (SITC group 655) decreased by 2.6 percent (compared to 1.9 percent average growth rate in 2011-2015 to reach 33.2 bn US$), while imports decreased by 3.4 percent to reach 26.2 bn US$. Exports of this commodity accounted for 1.6 percent of world exports of SITC section 6, and 0.2 percent of total world merchandise exports. China, Rep. of Korea and Other Asia ness were the top exporters in 2015. They accounted for 44.1, 10.6 and 8.5 percent of world exports, respectively. Viet Nam, China – Hong Kong SAR and Cambodia were the top destinations, with 13.4, 8.1 and 7.6 percent of world imports, respectively.

The top 15 countries/areas accounted for 91.0 and 66.3 percent of total world exports and imports, respectively. In 2015, China was the country/area with the highest value of net exports (+12.8 bn US$), followed by Rep. of Korea (+3.4 bn US$). By MDG regions. the largest surpluses in this product group were recorded by Eastern Asia (+19.1 bn US$), Developed Europe (+607.3 mil US$) and Developed Asia-Pacific (+353.4 min US$). The largest trade deficits were recorded by South-eastern Asia (-6.7 bn US$), Southern Asia (-2.3 bn US$) and Latin America and the Caribbean (-2.1 bn US$) [2, p. 299].

Position of Poland and the Region of Lodz

According to the results of the International Ranking, Poland is currently placed 39th in the world with respect to competitiveness, according to the indicators [3, p. 13]. In the European Innovation Scoreboard 2017 Poland is placed on the 25th position among 28 EU Member States [4]. A change in this situation requires growth of innovativeness, as a basic factor of the improvement of competitiveness. It can be achieved only by increasing funding for R&D (research and development) and for the commercialization of technologies developed.

Throughout the last 15 years, global trends in the trade of textiles and clothing products have been clearly growing, which proves the growing demand for these goods in various regions of the world [5].

In an updated Review of the European Commission concerning the importance of European industry in the changing world, a diagnosis of the situation in 32 sectors of European industry and service sectors is presented. The fashion and design industries provide, admittedly, about 8% of the European added value in industrial processing, but they are still characterized by a relatively low pace of economic growth. Among the sectors of industry mentioned, in the diagnosis of the state and external competitive position of the sectors examined with respect to partners and competitors from the Non-EU countries, the importance of Poland was recorded, inter alia, in the sector of the production of textiles and clothing, in which Poland occupies a considerable and growing position in Europe, next to Bulgaria, Greece, Austria and Italy, while the position of France, UK and Ireland is diminishing [5].

In the context of predictions resulting from research performed within the *National Foresight Program – Poland 2020*, it should be emphasized that the textile industry, based on innovative material technologies, belongs to the main developmental engines of the Polish economy. In the research performed with the Delphi method within the Project *Foresight 'Modern technologies for the textile industry. A chance for Poland'* it was assumed that the basic criteria for evaluation of hypotheses concerning the technologies examined would be the chance for obtaining a significant competitive position on the international market in the near or distant future. It is, therefore, justified to invest in those technologies that can become competitive not only in the national market but mainly in the international market in the age of the globalization of the economy and significant lowering of customs

and external-customs barriers in international trade, and especially with their complete abolition on the European market for member countries of the EU [6].

Challenges in the Textile Industry –regional aspects

In the textile-clothing industry, we have observed in recent times deep technological changes that have revolutionized its outlook. This industry is gradually becoming a world leader in utilizing technologies, technical-technological, product and organizational innovations, especially in the area of technical fabrics, thanks to which it is entering areas that have been so far reserved for high-technology industries. These changes are also taken into consideration in the strategies for the development of light industry, showing crucial areas for the competitiveness of companies, but also showing problems that remain to be solved in them.

The goal of the aforementioned Foresight project was, inter alia, the rational planning of actions aimed at solving those problems in Poland. This article presents the results of research of one of the stages of that project, namely the Delphi Rounds. The method of Delphi Rounds enables to create long-term visions of the future and constitutes a form of long-distance group discussion. It is based on asking selected experts about their opinions on a given topic several times. In the project described two Delphi Rounds were performed, which enabled to organize the data selected and to process the opinions of the experts according to the designated aim of the research [7].

The Region of Lodz is situated in the centre of Poland and characterised by a long and strong **industrial traditions**. The region stands out for a high level of urbanisation and its main economic centre is Lodz, which is the third largest city in Poland with 696,5 thousands inhabitants.

The Regional Innovation Scoreboard [8] covers 220 regions in 22 EU Member States, Norway, Serbia and Switzerland at different NUTS levels. Most of the Innovation Leaders and Strong Innovators are located in the former EU15 countries in North-West Europe. Most of the Moderate Innovators and Modest Innovators are located in newer Member States and former EU15 countries in the South of Europe. The group of Moderate Innovators includes 85 regions with performance between 50% and 90% of the EU average.

According to the *Regional Scorebord* 2017 the Region of Lodz is ranked as a moderate innovator. It changed recently, previously the region was ranked as modest innovator [8].

		RS2009	**RS 2011**	**RS 2013**	**RS2016**	**RS 2017**
PL11	Region of Lodz	46,0	47,0	47,3	50,9	51,7

Tab. 1. EU Regional Innovation Scoreboard 2017- Relative Performance to 2009

"There is a strong and positive link between regional innovation performance and regional competitiveness" (Regional Innovation Scorebord 2017)

In this context the most important policy efforts were in the recent time concentrated on the updating of the existing regional innovation strategy (LORIS2030) with the emphasis placed on the smart specialisation issue and development of monitoring instruments with the aim to reinforce targeted innovation policy interventions. The process was finished in May 2013, when the Strategy was officially adopted. The identified areas of smart specialisations of the Region of Lodz include the following sectors of economic activity:

1. Modern textile and fashion industry;
2. Advanced building materials;
3. Medicine, pharmacy, and cosmetic industry;
4. Power generation (including Renewable Energy Sources);
5. Innovative agriculture and agricultural and food processing;
6. Computer science and telecommunication.

This strategy was divided into three priorities, where the first one is dedicated to development of the areas defined as the smart specialisations. In this context, it has to be highlighted that such areas of

the smart specialisations as modern textile industry, building materials, cosmetics and agricultural and food processing are strongly focused on manufacturing activities. Consequently, development of the activities planned in the Strategy can be seen as the inclusion of the advanced manufacturing approach in the practices of the Region of Lodz. These activities include:

– Launching the 'programmes of exchanges of personnel from the sectors of science and business';
– Implementation of research and development projects in the field of regional specialisations.

Textile and clothing industry geared towards the production of high quality and unique clothing, overcoats and outer garments, cotton, wool and synthetic fabrics, hosiery, towels, velvet, and underwear. This traditional industry has recently seized yet another opportunity to develop and match the international competition.

This has happened largely due to its existing potential, including:

– high-tech textile sector (Pro Humano-Tex)
– highly qualified staff with ample experience and professional expertise
– strong scientific and academic base, including the following universities, institutes and research centres: The Technical University of Lodz - The Faculty of Textile Engineering and Marketing, well known in Europe for its achievements in the field of academic research; University of Lodz; The Academy of Fine Art; The Textile Research Institute; The Institute of Biopolymers and Chemical Fibres; The MORATEX Institute of Security Technologies; The Textile Machine Research and Development Centre at the Institute of Machine Design and Operation; The Central Institute for Labour Protection in Lodz; The Institute of Dyes and Organic Products in Zgierz; The Leather Industry Institute; The Cluster for the Advanced Technologies in the Textile and Clothing Industry, which houses the Polish Technological Platform for Textile Industry.

Circular Economy approach as the solution for the Textile Industry sector in the Future?

The Circular Economy is an approach that would transform the function of resources in the economy. Waste from factories would become a valuable input to another process – and products could be repaired, reused or upgraded instead of thrown away. Therefore it is why we all should be responsible and innovative from the beginning to the end / from the producer to the user and user to the producer.

The contemporary economic model based on continuous growth may lead to the exhaustion of resources available at acceptable prices and destroy the biological foundations of life to an extent that the mankind will fight over drinking water and food and will suffer from unpredictable, rapid climate changes. Many communities, enterprises and local governments have launched actions designed to limit the consequences of such developments, which pose a threat to life and health on the Earth. The time has come to: seek products and services which are, beginning in the design stage, intended for the longest possible life-cycle; to engage in transformations and the recycling of natural resources; and to exclude toxic materials and processes generating harmful emissions.

This entails striving to build a circular economy founded on: the consumption of resources reduced to the necessary minimum; the use of renewable resources in a way that ensures their regeneration; eco-design and clean production; consumption of renewable energy; instituting consumption patterns that respect the environment; using wastes as raw materials and processing them without negative external effects. All this means deep systemic changes - not only technological, organizational and social innovation, but changes in financing and new policy instruments.

The idea of a circular economy, which can also be called a 'closed-loop economy', i.e. one that produces minimum waste and in which wastes, if they are generated, become raw materials. The amount of real waste is constantly shrinking. Wastes on our planet can be minimized by the implementation of responsible research to further the innovation principle, i.e., "reduce, reuse, and recycle". This means that each individual must reduce waste and, if he or she has have generated any, reuse it or recycle it.

The circular economy is thus an economy in which production and consumption are organized in such a way that the value of products, components, materials, and resources is maintained within the

value chain and products' life-cycles. Resource efficiency is maximized while the extraction of raw materials and production of wastes are minimized.

The primary issue is that if we do indeed want to rise to the challenge of an enormous growth of scientific research and innovation than the relationship between science and society has to be interactive. This will not be possible if the public sector – local, regional and national authorities won't be able to give a concrete support – to develop policies or to establish a friendly ecosystem to support this challenge-driven concept. Simultaneously RRI relates to and has an impact on business. The crucial question is IF and HOW governance should respond to the RRI challenges to impose its implementation and to build trust between not only Triple but Quarter Helix Actors: Stakeholders-Academia (research and education communities)-Industry and Business-Government (policy makers) at different levels (national, regional and local).

One of the most useful and effective methodological frameworks to accelerate the transition from the traditional economy to the Circular economy seems to be MISC (Mapping Innovations on the Sustainability Curve), presented by Dr. Anne Snick [9].

Her proposal of "MISC" is not limited to the 'social symptoms' of the present crisis, but addresses its 'social causes', viz. socioeconomic practices as social constructions that are the root cause of both social (inequality, poverty, migration...) and ecological (depletion, pollution, climate change...) crises. The economic transition is a 'social' one in the sense that it rests upon the development of a new paradigm and of new systems to 'allocate scarce resources to the needs of all people - including future generations - while sustaining the ecological conditions of life. "The MISC-methodology concerns the economy in general as a 'social construction' that needs redefining with a view to avoiding both social (exclusion, poverty) and ecological (pollution, depletion) damage. 'Social economy' here refers to economics that is (again) recognized as a human, ethical enterprise that serves needs of all people, including their need for a healthy environment [9].

In the Report presented by the European Commission to the European Parliament the Circular Economy is presented from a product perspective, applying a systemic approach and transition theory [10]. Drivers of product design and usage are discussed in the context of emerging consumption trends and business models. For governance to be effective, it has to address the product life-cycle and the societal context determining it. Indicators and assessment tools are proposed that can help fill the current data and knowledge gaps [10; 11]

We can observe the gap in the implementation of the idea of the Circular Economy between the theory and practice in Western European Universities and Universities in Poland in the context of the EU requirements.

Two main national documents have been developed in Poland which set out the current development directions of the country in the field of sustainable development and environmental protection:

1. Strategy for Responsible Development until the year 2020 (with the perspective until the year 2030)
2. National Waste Management Plan elaborated in the year 2014

The Strategy for Responsible Development sets out one of the directions of Poland's development for the coming years, that is actions contributing to the sustainable development of the country, based on the individual endogenous potential of individual territories as well as actions promoting Polish green technology sector and supporting foreign expansion of Polish entrepreneurs in this sector with the use of new forms of climate finance (Green Climate Fund and Adaptation Fund).

The National Waste Management Plan covers the whole scope of tasks required to provide integrated waste management nationally in a manner securing protection of the environment, with regard to both the present and future economic opportunities and circumstances and technology level of existing infrastructure. The Plan considers tendencies in the present economy worldwide as well as the national circumstances of economic development and includes both the waste prevention scheme in relation to specific types of waste and the strategy for reduction of biodegradable waste landfilling. The Waste Management Plan covers waste originated domestically, including in particular municipal

waste, hazardous waste, packaging waste and sludges from urban waste water treatment plants, and also waste imported in the national territory. The objectives and tasks presented in the Plan concern years 2011-2014 and the 2015-2022 outlook thereof [12]. The possibility to repair or recycle a product and reuse its components and materials depends largely on the initial design of the product. Following political discussions on eco-design in April and October 2016, the Commission confirmed the importance of smart product design and decided to focus efforts on the product groups with the highest potential in terms of energy and resource savings and further reinforce the evidence base for regulatory action. This resulted in the adoption on 30 November 2016 of the Eco-design Working Plan 2016-2019 as part of the Clean Energy for All Europeans package [13].

In the Region of Lodz during the period from 2016 until 2018 the amount of 5,580 billion PLN from the Structural Funds of the EU was spend for waste management, environmental protection and low-emission economy. Funds may be used, among others, for thermo-modernization of buildings, renewable energy sources, waste management. From this point of view the Region of Lodz took the 4th position in Poland [14].

Circular Economy in the Textile Industry – reducing textile waste

The EU textile industry generates waste estimated at 16 million tons per year. Much of this waste is thrown in landfills or incinerated, with a high environmental impact and at great cost. Valuable resources held within the waste are also lost [15]. One of the most innovative pilot projects, which aims to change this situation in textile industry by focusing on a textile recycling plant is RESYNTEX - which recycles 500 tons of waste per year. This Project strives to implement a circular redesign in the textiles sector. RESYNTEX will transform textile waste into secondary raw materials, creating circularity and reducing environmental impact. Within RESYNTEX the authors have conducted stakeholder consultations in four geographically distinct regions throughout Europe, which utilize different approaches to the collection of textile waste, sourced from consumers, industry and institutions. The project also aims to extract resources and chemicals from the textile waste and recycle them. It proposes innovative technologies covering the whole textile value chain, where the sorted textile waste is chemically treated to extract resources such as protein-based fibres to be used for producing wood panel adhesives; and cellulosic fibres for the production of bioethanol. Polyamide (PA) and polyester (PET) recovery is also carried out to produce new chemicals and plastic bottles [16].

Barriers to circular economy textile solutions are presented in the form of outdated waste legislation and under-provision of commercially viable recycling technologies for low-grade textiles. Collectors are keen to focus solely on 're-wearable' textiles for reuse, neglecting streams for more costly recovery solutions. Continuous management of the transitional economic risks will therefore be imperative for textile collectors to support the circular economy, ranging from certified standards, support for R&D, access to finance, collaborative innovation mechanisms as well as guarantees on resource supply and price stability. Key drivers for promoting a wider range of recovery streams include policy incentives (such as Extended Producer Responsibility) and economic and environmental strategies such as the diversion of textiles from landfill and Energy from Waste (EfW). Through stakeholder engagement, the researchers within RESYNTEX aimed to propose how conditions for collectors' adoption of circular practices can be improved, while avoiding sectoral disruption and ensuring maximum effectiveness of the redesigned chain of secondary textiles [17].

Germany as the leading country on the list of World's Top Recyclers

According to the Organization for Economic Cooperation and Development, Germans happily sort 65 percent of their waste into an array of color-coded bins to be collected for reuse or incineration. South Koreans come in second, recycling 59 percent of their refuse. The United States recycles 35 percent; that's only slightly above the average for the developed countries that belong to the OECD but it is miles ahead of Turkey, where 99 percent of all trash ends up in a landfill [18]. Landfill remains the major disposal method for municipal waste. A person living in the OECD area generates on average 520 kg of waste per year; this is 30 kg less than in 2000, though still 20 kg more than in 1990 (see results presented in two figures below).

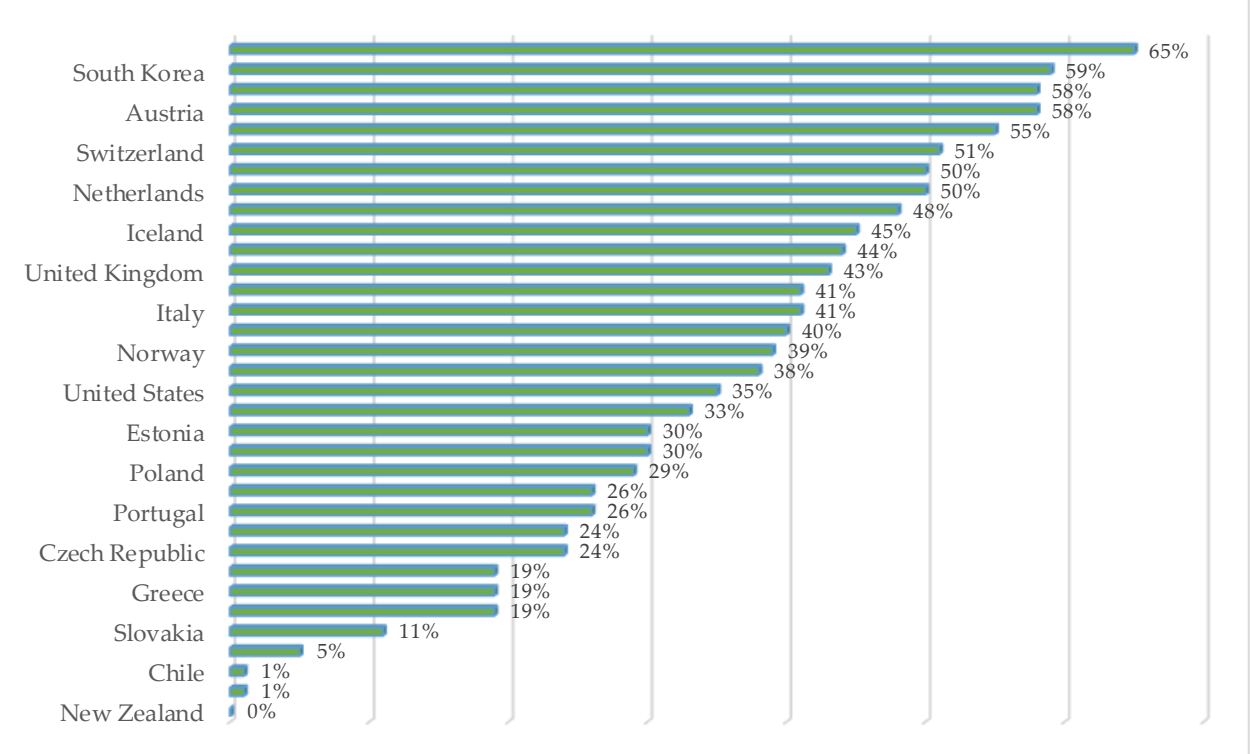

Fig. 1. Name Countries winning the recycling race. Recycled and composted waste as a share of total municipal waste in OECD countries (2013) [19]

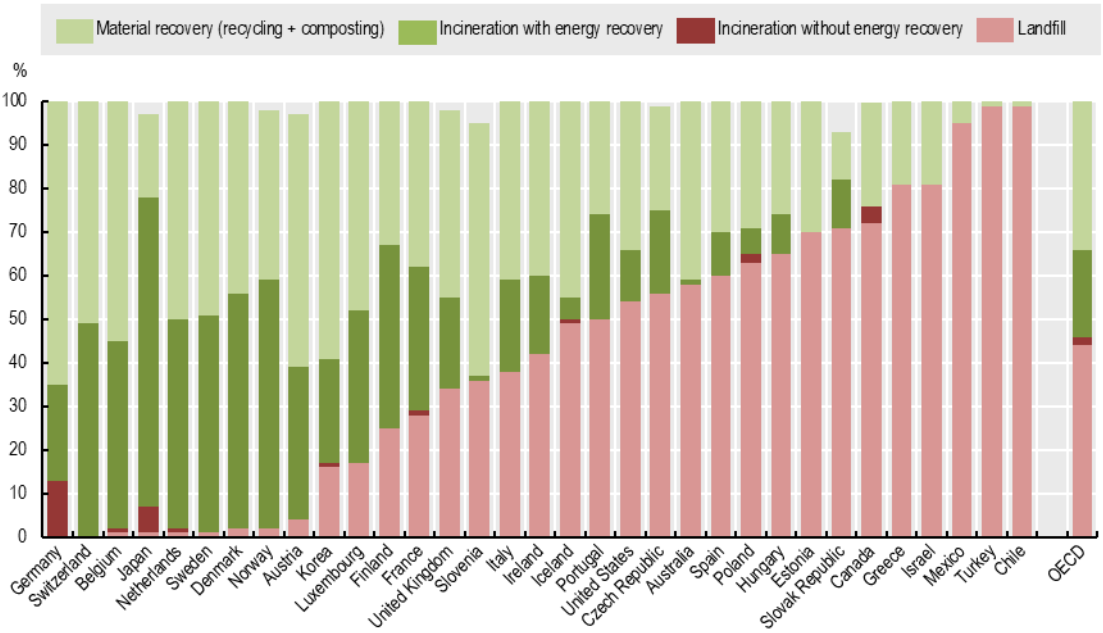

Fig. 2. Municipal waste disposal an recovery: recycling, incineration, landfilling [20]

3. CONCLUSIONS

Textile industry belonging to rapidly developing sectors of the global economy is gradually changing its current character. On the one hand, the demand for textiles, knitwear and textiles continues to grow as the world population increases. On the other hand, there is also a gradual increase in awareness that this is an industry generating a huge amount of waste, especially when production is not based on sustainable production and consumption patterns and when it is massive and to a small extent takes into account the needs of individual customers.

This approach causes growing problems related to environmental pollution and contributes to the increase of adverse climate change impacts.

Striving for the development of sustainable production and consumption in accordance with the circular economy trends creates a framework for switching production to its innovative types, which will be based on:

– generation of minimal waste in the production process (1R – with application of the most innovative technology),

– its maximum re-use (2R),

– application of the third method within the three R formula (reduce, reuse, recycle) which is recycling (3R), the awareness of the importance of which among producers and citizens in many countries is systematically growing – as presented on Fig. 1.

The new approach obviously requires adjusting production not only to new ecological and quality standards, but making an efforts to awaken the international community's need for greater care for the natural environment, especially by countries taking distant positions in world recycling development rankings. It also requires greater solidarity of countries on a global scale.

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Високінська Зофія. Інновації текстильної промисловості та її перспективи в концепції кругової економіки – від глобальної до регіональної перспективи. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 67–76.

У статті проведено комплексний аналіз виробництва, експорту та імпорту продуктів у текстильній промисловості у різних країнах світу. Визначено найбільших виробників та експортерів текстильної продукції. Проаналізовано тенденції зміни виробничих потужностей у даній галузі впродовж останніх років. Обґрунтовано місце і роль розвитку текстильної промисловості в контексті реалізації принципу Кругової економіки відповідно до пріоритетів ЄС. Визначено основні напрямки перспективного розвитку текстильної галузі в контексті реалізації двох основних національних документів, що розроблені в Польщі, які визначають поточні напрямки розвитку країни у сфері сталого розвитку та охорони навколишнього середовища: Стратегія відповідального розвитку до 2020 року (з перспективою до 2030 року) та Національний план управління відходами розроблений у 2014 році. У статті подано детальний аналіз розвитку регіональної промисловості, включаючи текстильну промисловість на базі міста Лодзь (Польща). Визначені сфери розумних спеціалізацій регіону Лодзь, які включають такі галузі економічної діяльності: сучасна текстильна та модна промисловість; сучасні будівельні матеріали; медицина, фармація та косметична промисловість; виробництво енергії (включаючи поновлювані джерела енергії); інноваційне сільське господарство та переробка сільського господарства та продовольства; інформатика та телекомунікації. У статті запропоновано основні напрямки розвитку текстильної галузі на прикладі Польщі: 1) утворення мінімальних відходів у виробничому процесі (1R - із застосуванням найбільш інноваційної технології), 2) максимальне повторне використання (2R), 3) застосування третього методу в межах трьох формул R (зменшення, повторне використання, переробка), що переробляє (3R), усвідомлення важливості цього серед виробників та громадян систематично зростає.

Ключові слова: текстильна промисловість, кругова економіка, глобальна економіка, переробка, відходи, виробничий процес.

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DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN THE CONTEXT OF ENERGY MANAGEMENT

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Abstract. The paper deals with global trends in energy consumption and renewable energy generation. Worldwide practices in financing of renewable energy production are analysed according to the following dimensions: sources of financing, types of used policy instruments, types of recipients (public or private) and types of financed technologies. The key factors that influence the investment attractiveness of renewable energy sources in the world are presented. Main obstacles impeding the utilisation of potential of renewable energy generation in Ukraine are pointed out from the standpoint of the global development trends, as the experience of economically developed countries are advised to be used for Ukraine. Conditions for investment activity in this field should be created (involving both domestic and foreign investments), stimulating state policy should be implemented, and an energy management based on the international experience should be developed. The problems of renewable energy sources in Ukraine are described, in particular, the presence of investment risk in terms of its components as general economic, legal and financial. In the most developed countries in terms of RES consumption direct public investment is a small proportion of total renewable energy financing, whereas private investment has the major share. A significant obstacle to the possibility of realizing such experience in Ukraine is the presence of investment risk, mainly caused by unstable political conditions (both internal and external). Energy management and monitoring activities of enterprises of various forms of ownership and branch affiliation should be introduced along with the necessity of attracting investments in renewable energy. It is expected that the results presented in this article may be useful for improving the renewable energy development policy both at the country level and at the level of a particular economic entity.

Keywords: energy management, investment risk, energy security, government policies, renewable energy, investments in renewable energy sources, bioenergy.

1. INTRODUCTION

The current stage of socio-economic development is characterized by reduction of available nonrenewable resources, deterioration of environmental conditions and growth of population, production volumes and humanity's energy needs on the global scale. The level of energy resources supply considerably influences social and economic development of a country and therefore defines the quality of life. The growing number of conflicts worldwide is partially caused by competition for

natural resources, primarily the energy ones. Ensuring energy, ecological and food security are the key global issues of modern world. Therefore the development of renewable energy sources is the issue of utmost importance for each and every country globally.

Renewable energy resources are much more evenly distributed across our planet compared to nonrenewable ones. That is why the development of renewable energy can contribute to solution of the range of modern global problems: to improve the state of energy supply, to decrease the level of anthropogenic burden on environment (both due to the relatively high environmental friendliness of renewable energy in relation to nonrenewable ones and as a result of energy „decentralization"), to strengthen energy security of particular countries and liberalize international relations in the energy sector and, as a result, to optimize the geopolitical impact of the monopoly supply of non-renewable energy resources.

Renewable energy development requires a solution of a number of theoretical and practical tasks, among which is the choice of methodical approaches to assess the feasibility of renewable energy resources' utilisation and replacing them with non-renewable, selection of approaches to assess the value of economically feasible potential of these resources, and choice of allocation of capacities for their use, substantiation of construction of mutually beneficial (in economic and ecological aspects) relations with leading countries in the field of renewable energy sources, choice of behavior models of authority at different levels in the context of stimulating producers and consumers of renewable energy, justification of the need for implementation of energy management and monitoring in the activities of enterprises of all forms of ownership and types of economic activities.

Leading governmental and intergovernmental organizations, scientists in various branches of research pay considerable attention to different aspects of renewable energy sources. The International Renewable Energy Agency plays an important role in the process of data aggregation concerning the renewable energy sources in the global context [1; 2]. Research conducted by this intergovernmental organization is aimed at proving the necessity of investing in renewable energy sources and contributing to broad sustainable use of all renewable energy types (bioenergy, geothermal energy, hydroenergy, solar and wind energy) in the interests of energy safety and countries' economic growth globally.

Analysis of scientific literature shows that renewable energy in the context of its components is represented in the works of economic scientists from different parts of the world. It is related to the fact that the investment issues of this sector are undergoing research. Elaboration of renewable energy sources and minimization of expenditures in the process of projects implementation are under considerable attention.

2. RESULTS

The process of defining strategic benchmarks for renewable energy in Ukraine consists of the complex of interrelated stages: analysis of global tendencies in energy consumption and renewable energy development; strategic analysis of renewable energy capacity in Ukraine; research of conceptual basis of strategic development of energy sector; justification of strategic vectors of renewable energy development in the countries of the world and Ukraine using the opportunities of economic and legal instruments to influence this process.

The following methods were applied in the course of the research, such as calculation and construction method, grouping, comparison, modeling, prognosis and algorithm method.

Input data for analysis includes statistical data [3; 4; 5], documents on strategic development in various countries [6; 7; 8; 9; 10; 11; 12], scientific literature on the methods to evaluate investment feasibility of new production development [13; 14; 15].

The problem of efficient use of renewable energy sources is urgent and important from the viewpoint of harmonious economic and social development and environment protection. Nowadays development concepts in most countries stipulate considerable increase of the renewable energy share in the energy balance. Such alternate energy sources as solar thermal and power systems, wind

generators, energy systems for biomass exploitation (wood and agricultural residues as raw materials for solid biofuel production), biogas production from the domestic and industrial wastes dumpsites, geothermal plants, etc.

During the last century global consumption of energy has increased rapidly (Figure 1), along with overall growth of GDP and population. Most rapid growth of energy consumption of the last 15 years has been observed in the Asian countries due to swift development of industrial production and economic development of the region. At the same time, there is a slight decrease in energy consumption in the countries of the European Union (-1% 2017-2018), caused by mild weather conditions in winter and significant stimulating effects aimed at maintaining energy conservation by governments of most countries [5].

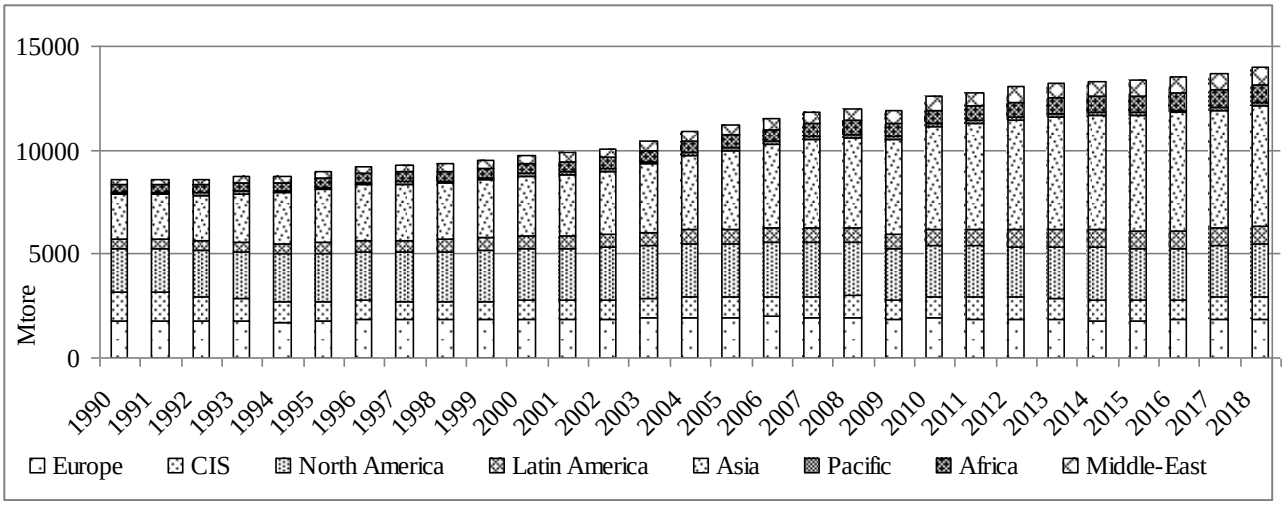

Fig. 1. Global energy consumption (generated from all energy sources) in the period from 1990 to 2018. Source: [5]

At the same time, in Ukraine the overall energy consumption (from all sources) has decreased more than twice during the last 25 years (Figure 2). The decrease is due to both the reduction of industrial production and to modernisation of production capacities, renovation of energy networks and growing understanding of the necessity to efficiently use the energy resources by state and economic entities. Currently key types of energy consumed by Ukrainians are generated from coal, gas and electricity (Figure 3).

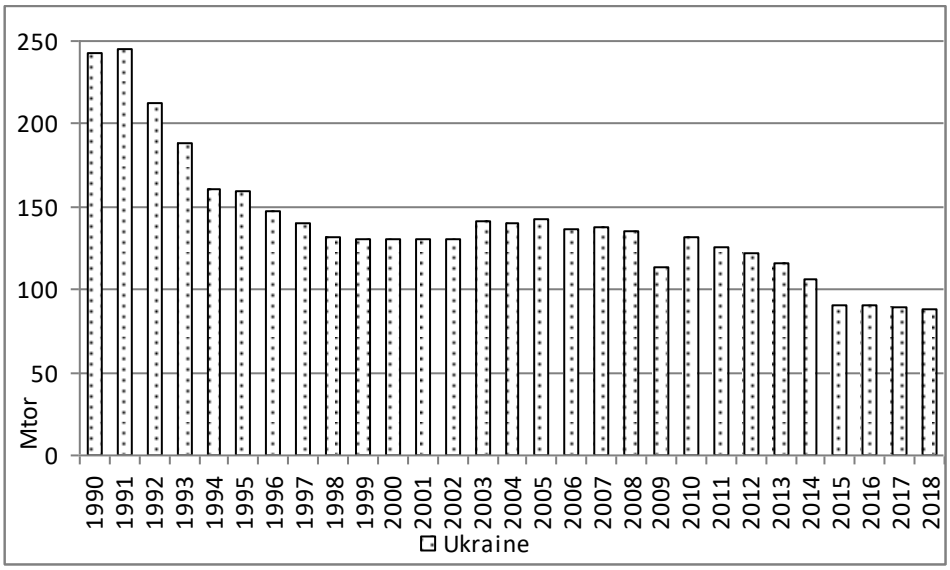

Fig. 2. Volumes of energy consumption in Ukraine from 1990 to 2018. Source: [5]

Typological structure of consumed energy shows that oil, coal and gas show major share in consumption in the world and in Ukraine (Figure 3). But the share of biomass in the structure of energy consumption in the world is 9%, and in Ukraine it is 3%.

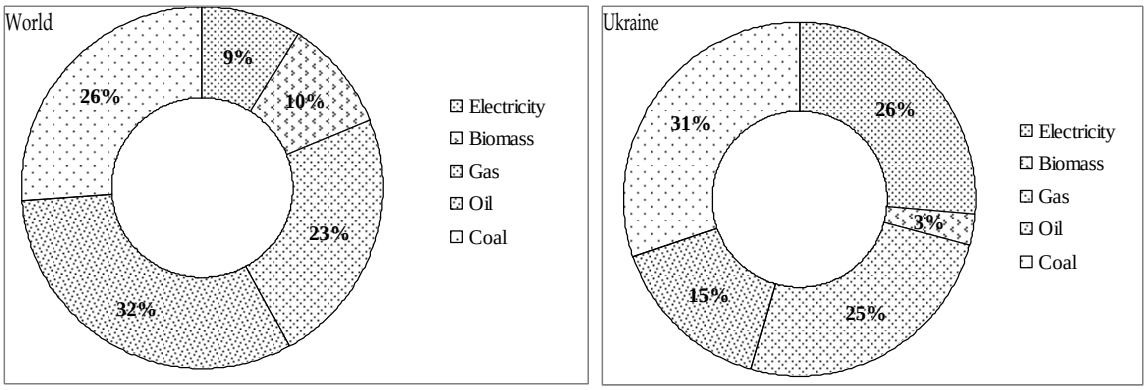

Fig. 3. Relative weight of global energy consumption according to generation sources in 2018 (World and Ukraine).Source: [4]

The above structure of energy consumption requires correction towards increasing the share of renewable energy sources. The potential reserves of the most deficit energy resources – oil and gas – are limited: according to expert assessments "the deposits available for development are expected to be exhausted in 50-60 years at the present level of their extraction; somewhat better situation is with coal reserves: at the present level of extraction coal reserves will will be enough for 450-500 years" [13]. Such tendencies stimulate countries to intensify generation of energy from renewable sources, with another major reason being the climate change and need for mitigation of greenhouse gas emissions, of which the energy sector is the primary emmitant.

This need is especially acute for Ukraine in the context of the fight for energy security from the Russian Federation. Therefore, renewable energy sources development is the decisive matter in the context of overcoming the risks faced by Ukraine country in current conditions [14] and achieving national security.

Ukraine should implement the experience of five world leaders in production of energy from renewable sources such as China, USA, Germany, Japan and India. These countries have taken into account swift paces of exploitation of renewable energy sources and now consistently accomplish the planned tasks on diversification of energy balances towards increasing the share of renewable energy sources.

The share of renewable energy in the global context is increasing in the past several decades. Thus, in 2018 the share of renewable energy in the global production of electrical energy amounted to 26%, and non-renewable respectively 74%, and in Ukraine the share of renewables is only 9% (Figure 4)

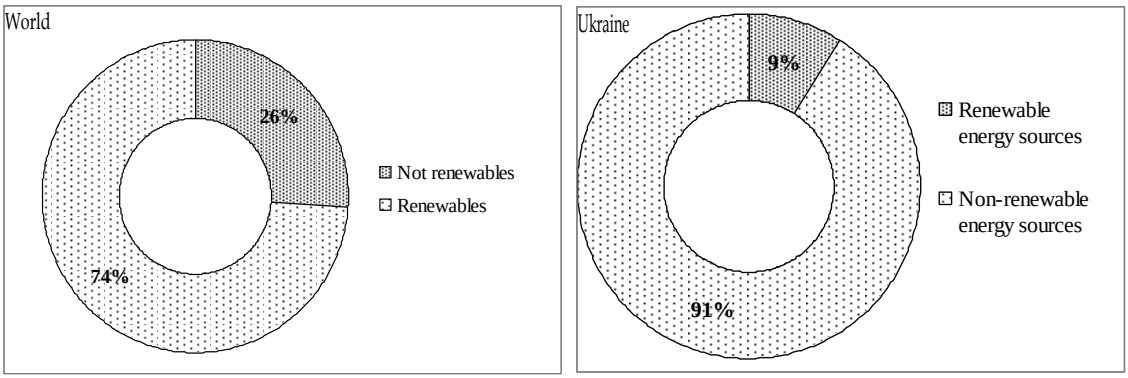

Fig. 4. The share of renewable energy in the global production of electrical energy in 2018 (World and Ukraine). Source: [4]

Global trends show that "Reducing the costs of renewable energy sources and the policy of their support led to an increase in the share of renewable energy in the global energy balance (+0.8 points)" [5]. Despite the political assistance and awareness of society, the level of exploitation of renewable energy sources in Ukraine is at a low level compared to global trends (Figure 5). At the same time Ukraine has a potential for increase of the share of renewable energy sources, which is proven by calculations of relevant governmental entities and scientific research.

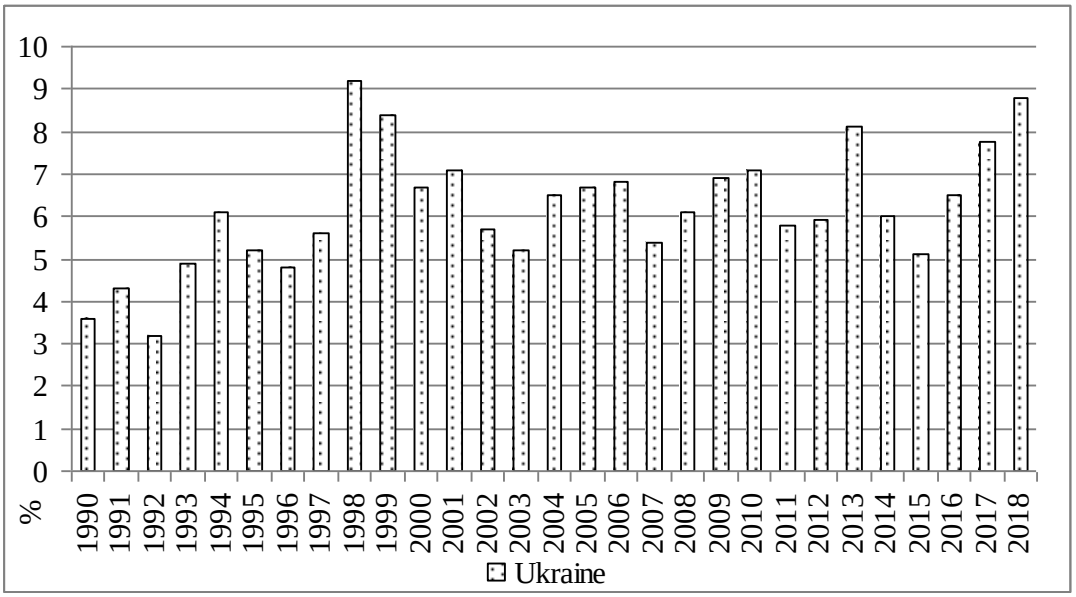

Fig. 5. Generation of electrical energy from renewable sources in Ukraine in 2000-2018. Source: [5]

According to calculations of State Agency for Energy Efficiency and Energy Saving of Ukraine, country has a considerable technically achievable capacity of energy supply generation from renewable sources and alternative types of fuel, which annualy equal ca. 98 mln tonnes of fuel [16]. But dynamics of alternative energy development in Ukraine is not sufficient to meet the planned targets of 2035 Energy Strategy of Ukraine "Safety, energy efficiency, competitive ability" [6], however there are certain aspirations towards that end.

Prospects for renewable energy development in Ukraine and its scientific and industrial capacity contribute to significant increase of growth paces of renewable energy exploitation volumes in the country. However, in order to achieve this goal the conditions for stimulation of investment activity in the sphere have to be created, as well as the energy management has to be implemented. This will attract both domestic and foreign investment, enhance stimulating state policy, and develop energy management based on the use of international experience.

The role of various types of stimuli in the global scale can be observed on the basis of global tendency of renewable energy sources development. Global annual investment in renewable energy rose steadily in 2013-2015, peaking at USD 330 billion in 2015 before falling to USD 263 billion in 2016. While annual investment declined in 2016, capacity additions in the same year were up from 2015, which is stipulated by the gap between the date of funding and launching of renewable energy projects (e.g. 1 year and seven months for bioenergy). This is partially due to declining costs and partially to the time lag between financial closure (i.e., the time of investment) and the completion of construction, after which an installation becomes operational. Policy changes contributed significantly to global investment trends. The peak in 2015 was partially driven by a rush to complete projects before an expected fall in policy support in key markets [5; 3].

The number of countries promoting renewable energy through direct policy support has tripled from at least 48 in 2004 to at least 147 today, and more and more developing and emerging countries are adopting new targets and policies for renewables (Figure 6).

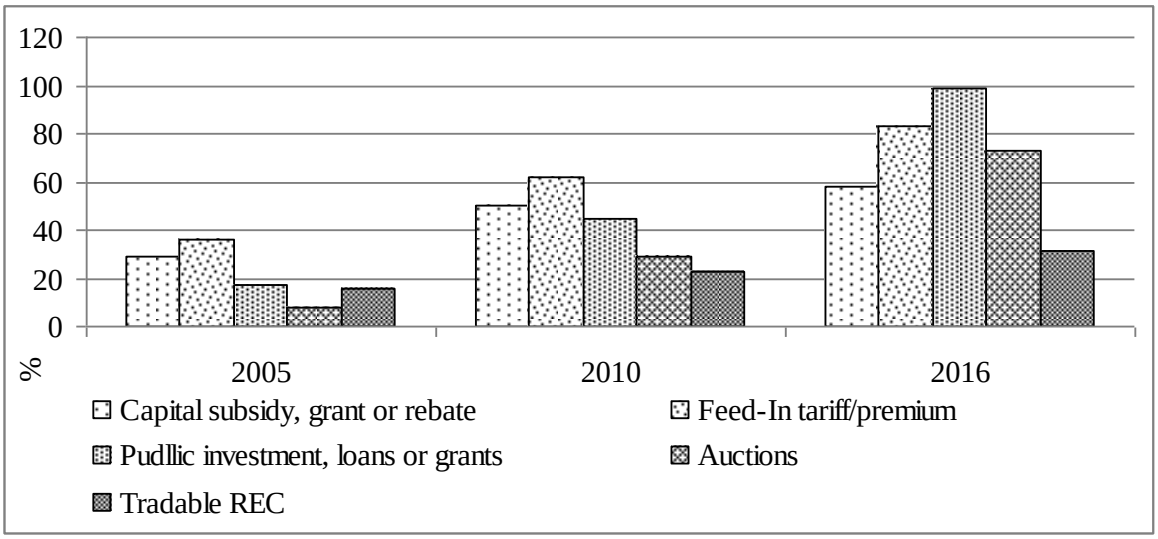

Fig. 6. Number of countries adopting renewable energy policies, by policy type during 2005-2016. Source: [1]

Direct public investments has typically constituted a small share of total renewable energy finance, the bulk of renewable energy investment – more than 90 is financed from private sources [1]. And to attract private investment in the RES sector in Ukraine it is necessary to minimize investment risks.

Figure 7 shows global flows of renewable energy funding along the investment cycle in 2015 and 2016 taking into account the certain spectrum of sources, instruments, regions and technologies as well as differences between the sources of public and private funding.

International Renewable Energy Agency deems the following matters as the key factors of competitive ability and investment attractiveness of renewable energy as a branch: favourable regulatory and institutional framework; low offtake and country risks; a strong, local civil engineering base; favourable taxation regimes; low project development costs; and excellent resources [1; 2].

These key factors promote renewable energy development in the developed countries of the world, however existing investment risk is a huge problem in Ukraine. Therefore, we deem it necessary to introduce energy management and monitoring into the activity of enterprises of various ownership types and nature of industry along with the necessity to attract investment into the renewable energy. As far as energy management and monitoring are directed at maintenance of efficient use of fuel and energy resources and at ongoing process of energy supplies consumption supervision, their introduction reduces the need for additional investment in nonrenewable energy sources and rather attracts investors to develop renewable energy sources. In Ukraine, however, the big objective problem is the presence of investment risk in terms of its components as general economic, legal and financial. Given the impossibility of overcoming them in the short term, the relevant authorities and business entities should look for ways to develop renewable energy and energy saving as an alternative to additional investment in the form of investment. Therefore, along with the need to attract investments in renewable energy, we consider it expedient to introduce energy management and monitoring in the activities of enterprises of various forms of ownership and industry affiliation. Energy management and monitoring are aimed at ensuring the rational use of fuel and energy resources and the continuous process of tracking their consumption in order to make decisions economically and environmentally friendly solutions.

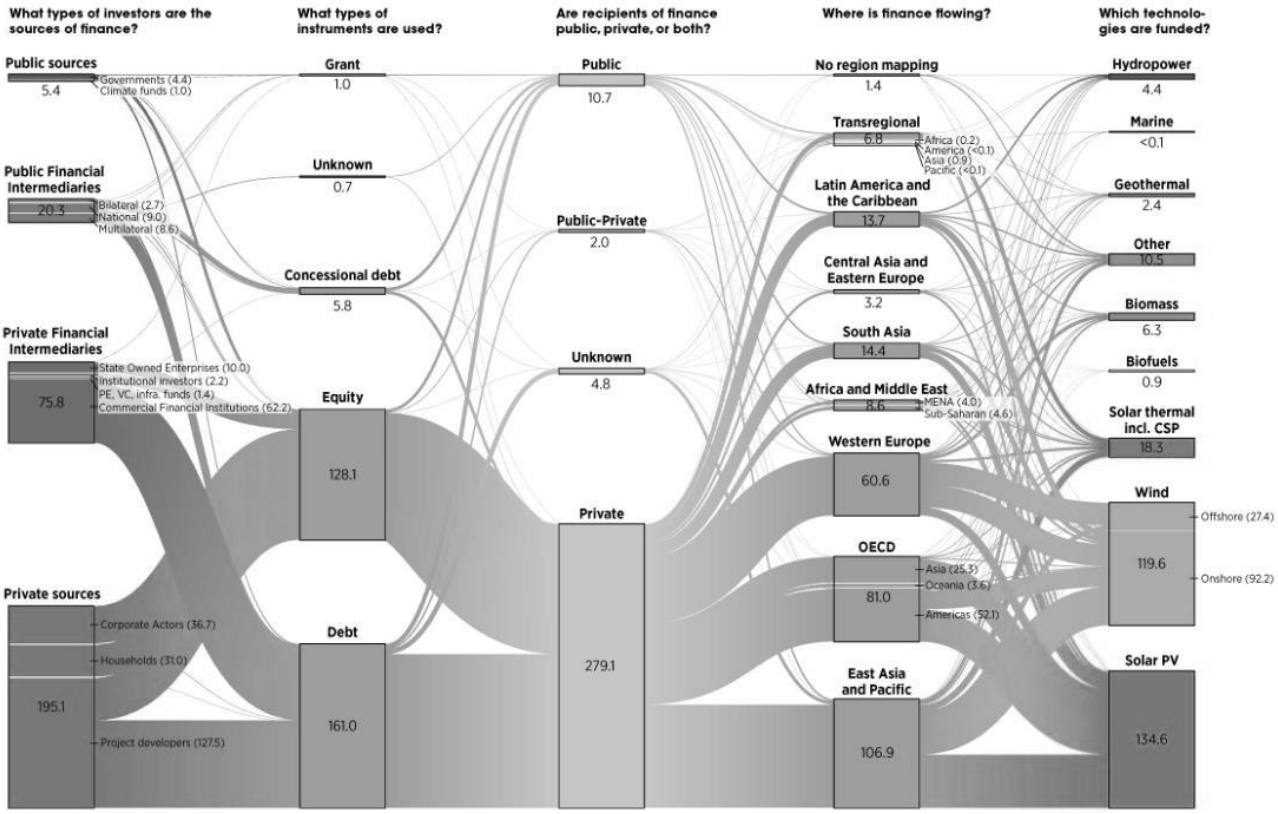

Fig. 7. Global landscape of renewable energy finance 2015/2016, USD billion. Source: [1]

According to the data of State Agency for Energy Efficiency and Energy Saving of Ukraine [17], introduction of energy management will enable achievement of the following rates without additional investment in the activity of budget institutions: from 5 to 8 of energy resources saving due to energy efficient behaviour of consumers; up till 20 of energy consumption reduction due to establishment of efficient objects' exploitation.

Ukrainian liabilities under the Paris Agreement, EU-Ukraine Association Agreement and the Energy Community Treaty stipulate conducting of the activity directed at the most rapid launching of instruments that significantly influence the rational consumption of energy resources in Ukraine. Taking into account the experience of developed countries, there is no alternative for creation and development of energy management systems for improvement of economy energy efficiency.

2012/27/EC Directive provides that: "Energy audits should take into account relevant European or International Standards, such as EN ISO 50001 (Energy Management Systems), or EN 16247-1 (Energy Audits), or, if including an energy audit, EN ISO 14000 (Environmental Management Systems) and thus be also in line with the provisions of Annex VI to this Directive as such provisions do not go beyond the requirements of these relevant standards" [11].

There is the State Standard ISO 50001:2014 "Energy management systems – Requirements with guid anceforuse" in Ukraine, which is the written translation of international standard ISO 50001:2011. Saving of finances due to reduction of energy consumption and promotion of renewable energy exploitation is an essential effect of this standard introduction [10]. On the basis of ISO 50001 standard the instruments of evaluation, analysis and verification of management activity results' verification in energy consumption emerge. The standard is based on methodology known as the cycle of continuous improvement "Plan – Do – Check – Act" and introduces energy management into everyday activity (practice) of organizations (Figure 8).

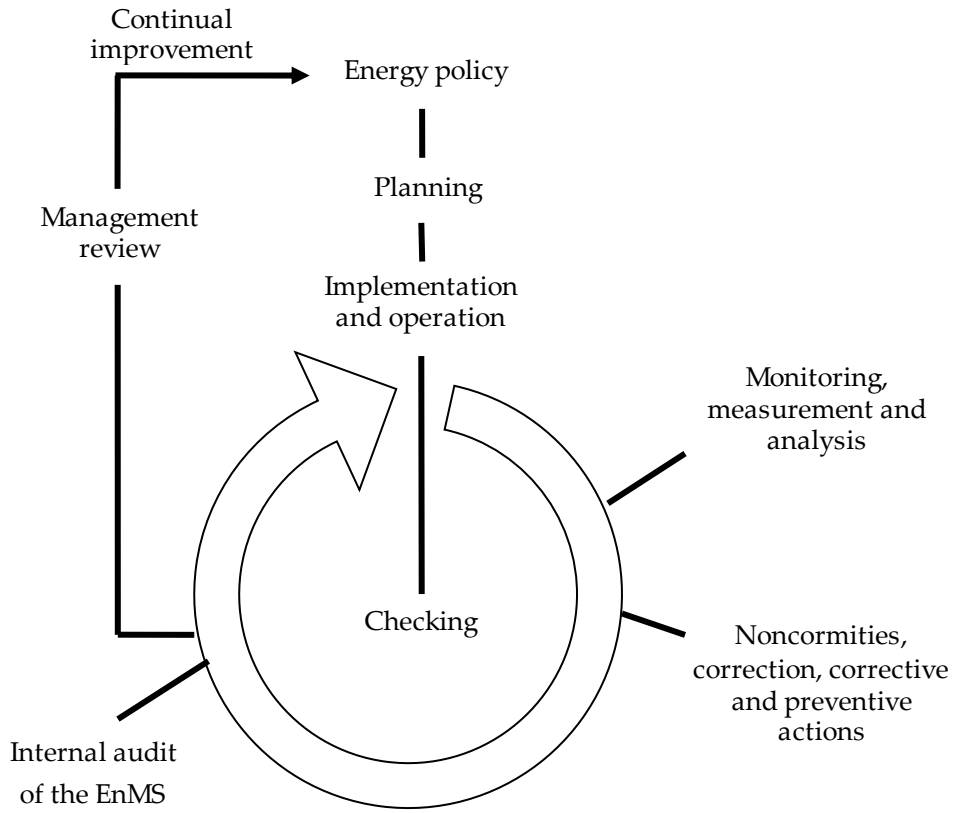

Fig. 8. International standard "Energy management systems" ISO 50001. Source: [11]

An approach on the basis of PDCA cycle can be described as following:

– plan – analyze the energy parameters and define the basic level of energy characteristics and energy efficiency indicators; set goals and tasks and develop the measures necessary for achievement of results to improve energy characteristics in accordance with the energy policy of an organization;

– do – introduce the plan of activities in the sphere of energy management;

– check – conduct monitoring and measuring of key activity characteristics that define energy characteristics on energy policy, goals and documented results;

– act – take measures to constantly improve the energy characteristics and parameters of energy efficiency.

Application of the standard on the global scale contributes to more efficient use of available energy resources, promotion of competitive ability and reduction of greenhouse gas emissions and other influences on environment due to the use of renewable energy. Therefore this standard can be applied regardless of the type of used energy.

Major idea of ISO 50001: 2011 introduction is not to establish the plan of actions but rather the management system with the mechanisms of monitoring, analysis and corrective actions. As the result, major function of energy management system (energy consumption management towards improvement of its efficiency) is realized.

For different businesses, this can be manifested differently: someone is making efforts to save on non-renewable energy sources; someone, based on available biomass resources, diversifies the energy supply, and so on.

Implementation of fully functioning energy management systems is impossible without modern technologies of data collection, information processing and consumption management. These will be issues for our further research.

3. CONCLUSIONS

Renewable energy can strengthen the energy security of many countries, and the efforts of most of them give positive results. An analysis of global trends in energy consumption and renewable energy development showed that those countries in which the state support for the renewable energy sector shows the dynamics of increasing their share in the structure of the energy balance.

The main prerequisites for the use of renewable energy resources are their lower impact on the natural environment compared to non-renewable, the relative unlimited reserves of these resources and the potential for boosting business activity and economic growth in countries where renewable energy are to develop.

It was found out that in the most developed countries in terms of RES consumption direct public investment is a small proportion of total renewable energy financing, whereas private investment has the major share. A significant obstacle to the possibility of realizing such experience in Ukraine is the presence of investment risk, mainly caused by unstable political conditions (both internal and external).

The process of developing renewable energy in Ukraine, as announced in the energy strategy and a number of regulatory acts, is an urgent problem. The economic and political situation that arose in Ukraine caused a dynamic change in the country, which had a particular impact on its energy security. In order to strengthen the country's energy independence from imported non-renewable energy sources and energy security of a separate enterprise (including economic and environmental), development of renewable energy sources is necessary. In this case, special attention should be paid to such an instrument as energy management, the ultimate goal of which is to form a behavior model that aims at increasing the efficiency and environmental friendliness of energy use.

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Якубів Валентина, Максимів Юлія, Попадинець Назарій, Григорук Ірина, П'ятничук Ірина. Розвиток відновлюваних джерел енергії в контексті енергетичного менеджменту. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 77–87.

У статті розглядаються світові тенденції споживання енергії та виробництва відновлюваної енергії. Світові практики фінансування виробництва відновлюваної енергії проаналізовано відповідно до таких категорій: джерела фінансування, види політичних інструментів, типи реципієнтів (державні чи приватні) та види технологій, що отримують фінансування. Представлені ключові фактори, які впливають на інвестиційну привабливість відновлюваних джерел енергії у світі. Основні перешкоди, що затримують використання потенціалу відновлюваної енергії в Україні, вказано з позицій світових тенденцій розвитку, оскільки досвід економічно розвинених країн рекомендується використовувати для України. Особливо важливим є створення умов для інвестиційної привабливості у цій галузі (із залученням як внутрішніх, так і закордонних інвестицій), також слід здійснювати стимуляційну державну політику та розвивати енергетичний менеджмент на основі міжнародного досвіду. Охарактеризовано проблеми відновлюваних джерел енергії в Україні, зокрема, наявність інвестиційного ризику з точки зору його складових як загальноекономічних, правових та фінансових. Прямі державні інвестиції у більшості розвинутих з точки зору споживання ВДЕ країн, становлять

незначну частку від загального обсягу фінансування відновлюваної енергії, а основну питому вагу становлять приватні інвестиції. Суттєвою перешкодою для можливості реалізації такого досвіду в Україні є наявність інвестиційного ризику що насамперед пов'язаний з нестабільними політичними умовами (як внутрішнього, так і зовнішнього характеру).

Діяльність з управління енергетикою та моніторингу підприємств різних форм власності та галузевої приналежності повинна бути запроваджена разом з необхідністю залучення інвестицій у відновлювані джерела енергії. Очікується, що результати, представлені в цій статті, можуть бути корисними для вдосконалення політики розвитку відновлювальної енергетики як на рівні країни, так і на рівні конкретного суб'єкта господарювання.

Ключові слова: енергетичний менеджмент, інвестиційний ризик, енергетична безпека, державна політика, відновлювані джерела енергії, інвестиції у відновлювані джерела енергії, біоенергетика.

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SYSTEM OF ORGANIZATIONAL AND ECONOMIC SUPPORT OF HUMAN RESOURCES MANAGEMENT AT ENTERPRISES

VALENTYNA YAKUBIV, ROMAN YAKUBIV

Abstract. The paper analyses various scientific approaches to the interpretation of the essence of the concept of "personnel management", defines the specific characteristics and principles of this process. For a detailed study of the essence and content of the concept of the personnel management, theoretical approaches to this definition and substantiation of its content in the context of various scientific schools and management theories are analysed. Scientific approaches to understanding the functional role and essence of the personnel management in various scientific schools are analysed, namely: schools of scientific management, classical (administrative) school of management, theory of perfect bureaucracy, school of human relations, empirical school of management, school of social systems, and "new school".

The main differences in understanding the process of the personnel management in different theories of management are investigated, the main of which are: situational management theory; system theory of management; theory of organizational culture; theory of human resources management; theory of management culture. The relationship scheme and the place of the personnel management system in the enterprise management in general are substantiated. A three-level personnel management system for tactical, operational and ongoing tasks is proposed. The mechanism of organizational and economic support of the personnel management as a system of synergistically interconnected organizational and economic factors for establishing high-performance HR-management in the enterprise is substantiated. The main elements of organizational and economic support for improving the personnel management system of enterprises are scientific and theoretical approaches to the forming of this system; principles of personnel management; methods of labour management; functions of HR-management; economic levers; methodological support; information support; monitoring of personnel management.

Keywords: renewable energetics, strategic analysis, PEST-analysis, external factors, renewable sources of energy.

1. INTRODUCTION

European integration processes taking place in Ukraine presuppose the necessity of In the current conditions of socio-economic relations, the formation of management system plays an important role for entrepreneurship development. Personnel management deserves special attention because human resources are a determining factor in the success of an enterprise's activity. The fastest development of the personnel management system takes place in the financial-credit and IT business, and the most

slowly - in the agricultural and other industrial sphere. Analyzing the causes of these trends, it becomes clear that innovative methods of personnel management are spreading more quickly in the industries, enterprises or organizations involved in external investment. Therefore, usage of modern management theory becomes more and more frequent in our country. However, given the specifics of the enterprises in Ukraine and slow development of some of them, the personnel management in this field still needs to be improved.

2. RESULTS

Exploring the essence of the concept "management" in various scholars, we conclude that this term is used as a synonym for the definition of "administration". Therefore, these two terms are analyzed together in the paper.

One of the founders of management theory was A. Fayol, who developed a coherent theory of management. According to the scientist, to manage means "to anticipate and study the future and to plan an action program" [1, p. 30].

English scientist S. Bir believes that the management system is the brain center of the enterprise [2, p. 5]. Obviously, it is quite difficult to disagree with the scientist, since in fact all the employees of the enterprise are executing the orders of the administration, who is responsible for development.

A well-known successful manager Lee Iacocca, who contributed to the rapid, profitable development of Ford, under management understands the ability to recruit others, motivate them and create a sense of involvement of the employees to solve the problem of organizational development [3, p. 290]. Lee Iacocca links the overall process of enterprise management to personnel management.

J. Gereth and J. George interpret management as the organization, administration, and control of resources for their rational and effective use [4, p. 14].

N. Tarnavska considers the concept "management" as more general, namely, "the most important resource of the enterprise, the ability to produce the purpose of the activity, to measure performance, to fulfill the set functions, to influence people with different level of education, experience, and qualification [5, p. 152].

Similar to Lee Iacocca, management is identified with personnel management by A. Kuzmin and O. Melnyk. In particular, by management they mean "purposeful influence on employees or individual executors aimed at realization of the set tasks" [6, p. 77—83]. This approach is noteworthy because the process of managing enterprise activity, innovation development, and operational activity involves influencing people's behavior.

However, some authors differentiate the essence of the concept of "personnel management". Thus, M. Vinogradsky, S. Belyaeva, A. Vinogradska, and O. Shkanova by this category understand the activity of an organization aimed at the effective use of people (personnel) to achieve the goals, both organization and individual (personal) [7, p. 34—37].

Similar generalized definition is given by G. Bennett, who by the personnel management understands the part of the management process related to the work of employees in the enterprise and the relationships between them [8, p. 12—14].

G. Osovska and O. Osovska give a similar definition to the previous authors, which does not specify the purpose, methods, etc. These authors by the personnel management mean "the impact on the staff for a specific purpose through the necessary interconnected activities" [9, p. 16].

The definitions of the "personnel management" discussed above are rather generalized and do not clearly define the nature of this category. In contrast to the previous interpretations, more complete and thorough one is given by V. Lukianykhin, who under the investigated category understands "the process of systematic, organized, through interdependent organizational-economic and socio-psychological management mechanisms, influence on employees of the organization to ensure the effective functioning of the organization as a whole and to meet the needs of each employee in their professional and personal development" [10, p. 34].

Some scholars use the term "personnel management" alongside the term "cadre management". Thus, S. Mochernyi in the economic encyclopedia substantiates that it is a complex of measures of cadre activities, purposeful active influence of executives (personnel managers) of the enterprise (firm, company) by means of interrelated organizational-economic and social measures on increase of production and creative activity of employees and development of perspective personnel policy [11, p. 295].

Generalizing the above interpretations of the "personnel management" by different scholars and considering the lack of a unified approach to its justification, we see it necessary to supplement and clarify such definitions. In our opinion, personnel management as a component of the overall enterprise management system is a process of systematically organized, purposeful influence of managers at different levels on the personnel of the enterprise by ensuring their rational formation, use and reproduction in order to increase the productivity of the business entity.

Our definition differs from the others by the following statements: firstly, personnel management is an integral part of the overall enterprise management system; secondly, it is a process of deliberately influencing of the executives on competitive entities, which implies the existence of clearly defined links between elements of the general system; thirdly, personnel management has a specific purpose - increasing the profitability of labor and a more general purpose - to promote the efficiency of the activity as a whole.

For a detailed study of the essence and content of the concept of personnel management, theoretical approaches to this definition and substantiation of its content in various scientific schools and management theories are analyzed.

It is well known that management as a science was developed by American scientists in the 19th century. To date, the following major management schools are known:

- School of Scientific Management (1885-1920);
- Classical (Administrative) School of Management (1920-1950);
- the theory of ideal bureaucracy (since 1920);
- School of Human Relations (since 1930);
- Empirical School of Management (since 1940);
- School of Social Systems (since 1970);
- "New School" (since 1960).

The School of Scientific Management (1885-1920) paid considerable attention to the scientific study of the time and efforts of employees in the production process. The founder of this school was Frederick Taylor, well-known followers were G. Hunt, G. Ford, G. Emerson, L. Gilbert. In the scientific works of representatives of the School of Scientific Management, much attention is paid to leadership theory, principles of personnel management, the organization of work in enterprises.

The Classical or Administrative School of Management (1920-1950) is focused on conducting administrative studies of management effectiveness. The founder of this school was A. Fayol, and his followers were: L. Urvik, J. Mooney, A. Raleigh and others. In their works, scientists have developed the principles and functions of management, formed by A. Fayol.

The School of Ideal Bureaucracy Theory (since 1920) is based on the idea about the bureaucratic structure of society as a determining factor in the development of formal rules of government. The main representative of this theory is Max Weber (1864-1920). The scientific developments of the school's representatives relate to the study of the division of labor, the hierarchy of management, the issues of hiring employees, and career advancement.

The School of Human Relations (since 1930) has paid considerable attention to the issues of establishing positive interpersonal relationships between employees and managers. The founder of this school was E. Mayo, and well-known followers were M. Follett, F. Herzberg, D. McGregor, R. Blake. The scientists investigate the problems of work efficiency, staff motivation, team relationships

The Empirical School of Management (since 1940) has explored management in the context of combining the ideas of the classical school and the school of human relations. The founder of the school was P. Drucker, the followers were A. Sloan, R. Davis, A. Chandler, D. Miller. The scientists paid

attention to strategic goals in the management system, involvement of employees in making strategic decisions and assessing the effectiveness of management.

The School of Social Systems (since 1970) explores organizational and managerial aspects of enterprise activity. The founders were C. Barnard, D. March, and G. Simon. The school introduced the latest approach to management - situational, the application of which avoided the possibility of recurring problematic situations in the organization.

The New School (since 1960) is characterized by the efforts of its representatives to build a system of management based on mathematical sciences. The main representatives of this school are S. Beer, R. Luce, R. Acoff. Scientists apply mathematical, cybernetics, physics laws in management.

Basic world schools of management have formed the complex management theories, the main of which are:

- situational theory of management;
- system theory of management;
- theory of organizational culture;
- theory of human resources management;
- theory of management culture.

Modern scientists, considering the theoretical foundations of the personnel management system, are working on improving their directions taking into account the existing tendencies and peculiarities of human resources development for different countries, industries, enterprises [12, 13, 14, 15, 16].

As far as personnel management is one of the important organizational and managerial processes of an enterprise it is not possible to analyze it separately from the general management system of the enterprise (Fig. 1).

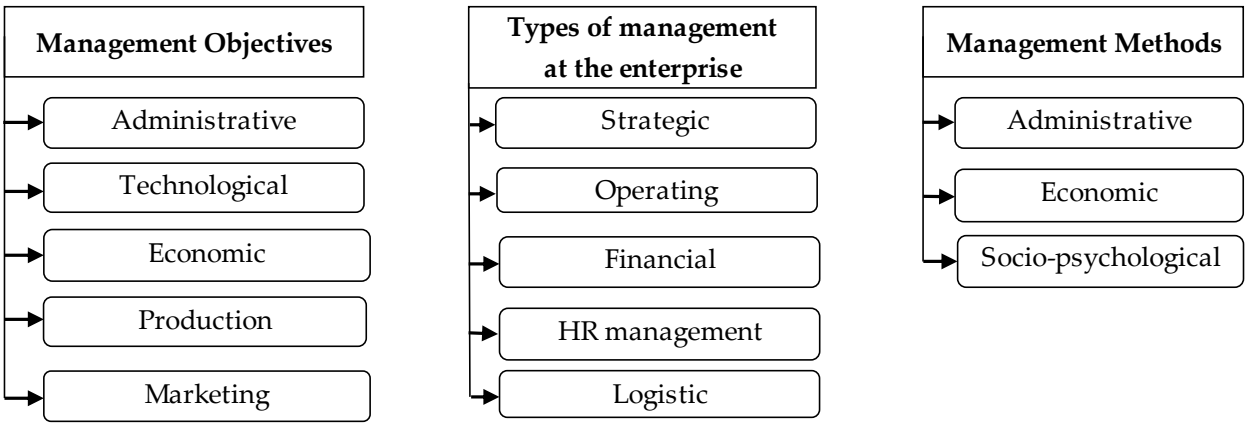

Fig. 1. Personnel management in the enterprise management system
** Source: Developed by the author*

All management systems, including personnel management, are multilevel. This is due to the organizational structure of the organization or enterprise. In management theory, various models of organizational structure of management are known. The most famous are American and Japanese models. The American model considers a clear hierarchy in management based on three levels: Level I - the highest administrative level, Level II – the middle level executives, and Level III – the lower level executives. Management decisions are made from top to bottom of the hierarchy. A typical Japanese management model also involves three-level management, but with some branching of middle-level executives. At this middle level, there is no clear hierarchy of top-down management decisions, and parallel relationships are observed. The Japanese model is the most mobile and flexible and prevents bureaucracy.

Based on the analysis of the advantages and disadvantages of different management models, as well as taking into account the existing baseline conditions observed at Ukrainian enterprises, we have generalized and proposed to apply a three-level personnel management system (Fig. 2).

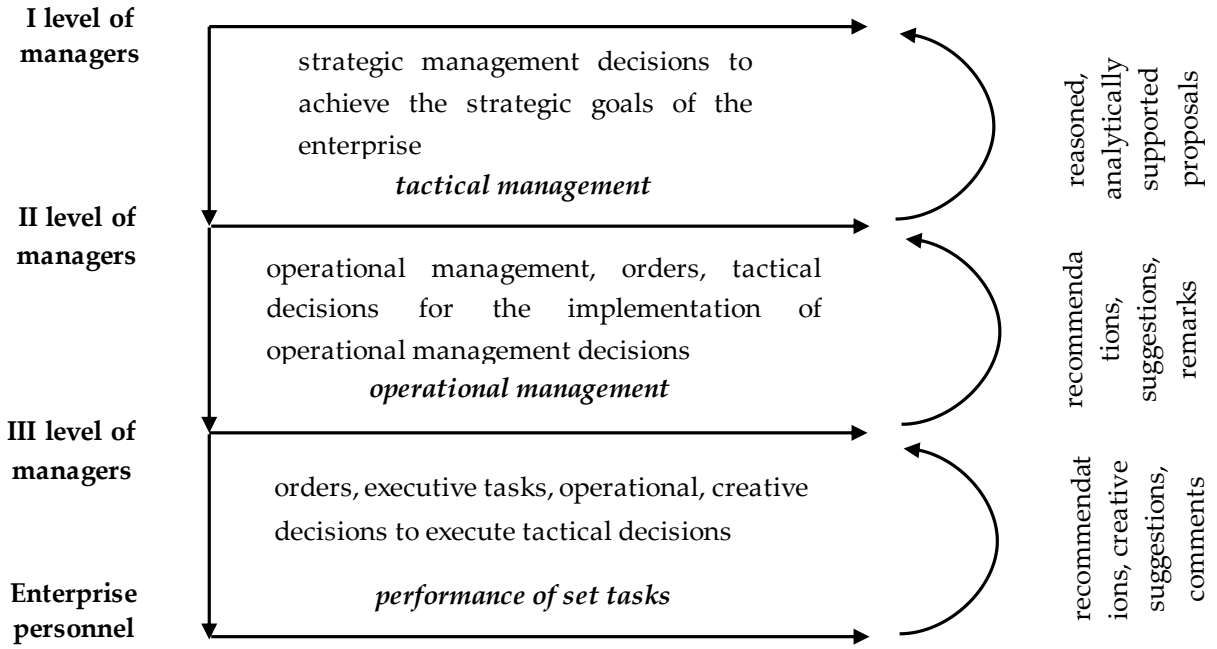

Fig. 2. Multilevel management system of enterprise personnel
** Source: Developed by the author*

Fig. 2 shows the organizational structure of personnel management, which implies the influence from the highest - I level to the lowest III level of managers. Accordingly, managers of the I level have the broadest powers in the enterprise and first of all determine the strategy of development of the enterprise and basic ideas of management. The level II executives are responsible for tactical management, that is, they are required, on the basis of a well-grounded development strategy, to determine the directions and actions for their achievement that must be implemented in the short term. The level III executives assign so-called operational management, that is, by executing orders of top-level managers, they make operational management decisions. These managers are the link between the top-management of the enterprise and its employees.

In the proposed structure of the personnel management system, it is important to have a hierarchy of connections and relationships between managers at different levels, as well as to establish feedback from the enterprise employees to the managers.

In today's market environment, problems of the organization and functioning of the management system are underestimated in terms of their importance and the ability to achieve the expected results. Modern entrepreneurs believe that they have current financial, technical and other production and economic problems, and the issues of improving management aspects are not so important. This is where all the problems of functioning of enterprises begin, because the organization of all the activity of the enterprise depends on the rationality of management decisions. Particularly insufficient attention is paid to personnel management. However, given that the main components of production potential are land, logistical resources and personnel, only the improved management of manpower can increase its efficiency.

Therefore, in the overall management system at the enterprise, the defining element is personnel management. Through the organization of labor management, it is possible to achieve an increase in labor productivity and production efficiency in general, since a person works with all material, technical and land resources, ensuring the organization of the production process and affecting its productivity.

Implementation of an effective personnel management system at enterprises should be preceded by the development of organizational and economic support for this process.

By the organizational and economic support of human resources management we understand the system of synergistically interconnected organizational and economic factors for establishing high-

performance HR-management in the enterprise. The phenomenon is specific in its applied sense, since the object and the subject is a person. Therefore, in order to achieve this goal, it is necessary to develop and implement a comprehensive organizational and economic support of the personnel management system.

In substantiating such a mechanism of organizational and economic support, principles, approaches, and tools should be taken into account not just as organizational and economic factors, but in their close interaction and complementarity (Fig. 3).

Fig. 1.3 shows that the main elements of organizational and economic support for improving the enterprise personnel management system are:

- scientific and theoretical approaches to the construction of personnel management system;
- principles of personnel management;
- manpower management methods;
- HR management functions;
- economic levers;
- methodological support;
- information support;
- monitoring of personnel management.

The proposed system of organizational and economic support for improving the personnel management of enterprises is based on the generalization of basic scientific approaches and the complement of components related to the peculiarities of the functioning of different enterprises.

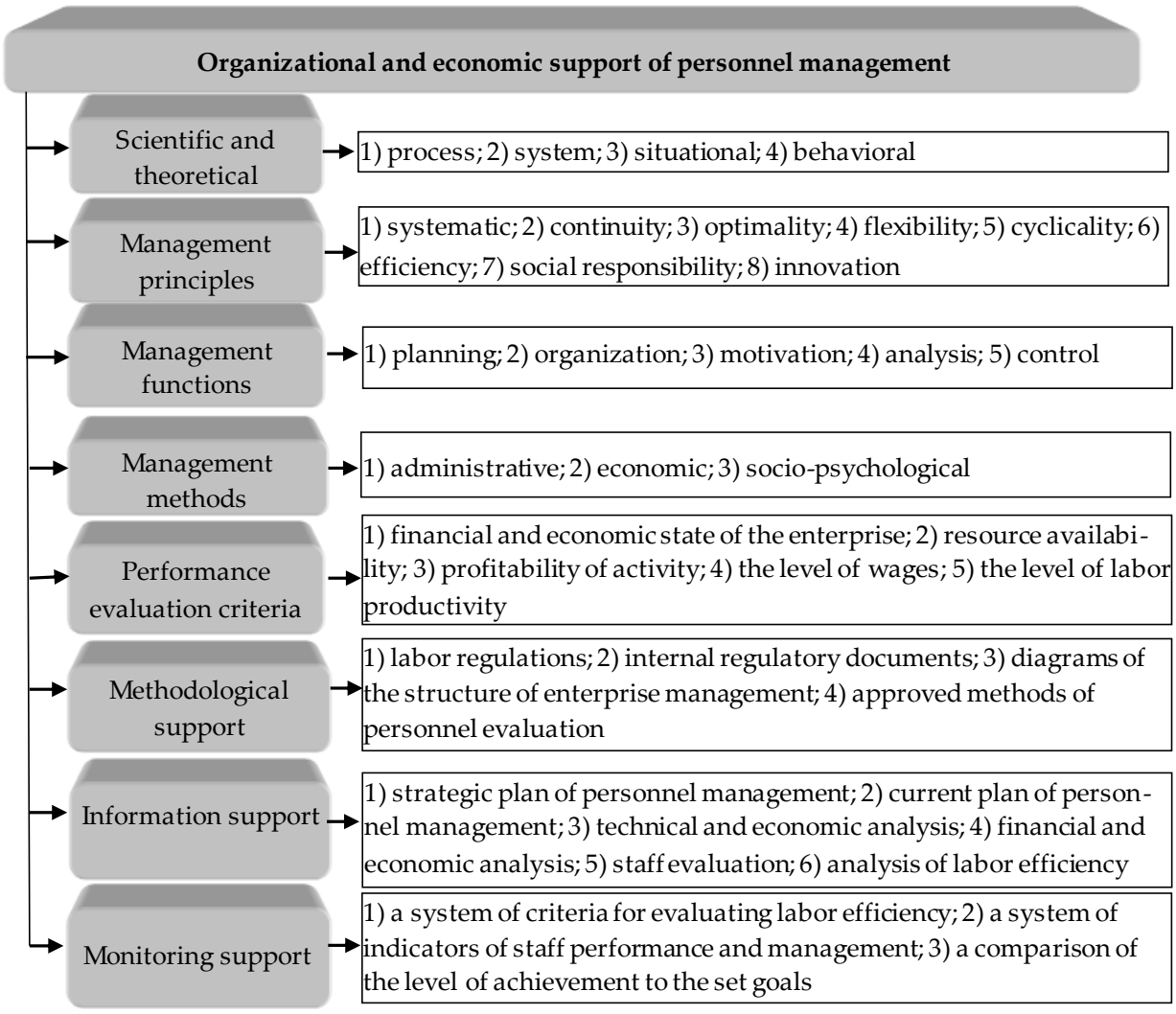

Fig. 3. System of organizational and economic support of personnel management of enterprises
** Source: Developed by the author*

3. CONCLUSIONS

The analysis of different scientific approaches to understanding the essence and functional purpose enables to substantiate the role and place of personnel management in the system of enterprise development, as well as to classify its levels. In order to identify promising areas of the personnel management at the enterprises, an organizational and economic mechanism of improvement of the human resource management system is proposed, which includes scientific and practical approaches, principles, functions, methods of personnel management, evaluation criteria, methodological support, information and monitoring support.

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Якубів Валентина, Якубів Роман. Організаційно-економічний механізм управління персоналом на підприємствах. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 88–95.

У статті проаналізовано різні наукові підходи до тлумачення сутності поняття "управління персоналом", визначено специфічні характеристики та принципи цього процесу. Для детального дослідження сутності і змісту поняття менеджменту персоналу проаналізовано теоретичні підходи до даної дефініції і обґрунтування її змісту в розрізі різних наукових шкіл і теорій управління. Проаналізовано наукові підходи до розуміння функціональної ролі та суті управління персоналом у різних наукових школах, а саме: школі наукового управління, класичній (адміністративній) школі управління, теорії ідеальної бюрократії, школі людських стосунків, емпіричній школі управління, школі соціальних систем, "новій школі". Досліджено сутнісні відмінності щодо розуміння процесу управління персоналом у різних теоріях менеджменту, основними з яких є: ситуаційна теорія менеджменту; системна теорія менеджменту; теорія організаційної культури; теорія менеджменту людських ресурсів; теорія культури управління. Обґрунтовано схему взаємозв'язків та місця системи менеджменту персоналу в управлінні підприємством загалом. Запропоновано трирівневу систему менеджменту персоналу на тактичному, оперативному та виконання поточних завдань. Обґрунтовано механізм організаційно-економічного забезпечення управління персоналом як систему синергійно взаємопов'язаних організаційних та економічних забезпечуючих факторів для налагодження високорезультативного HR-менеджменту на підприємстві. Основними елементами організаційно-економічного забезпечення удосконалення системи управління персоналом підприємств є: науково-теоретичні підходи до побудови системи управління персоналом; принципи менеджменту персоналу; методи управління трудовими ресурсами; функції HR-менеджменту; економічні важелі; методичне забезпечення; інформаційне забезпечення; моніторингове забезпечення управління персоналом.

Ключові слова: управління персоналом, менеджмент, організаційно-економічний механізм, теорії менеджменту, управління підприємством.

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TAX PLANNING IN THE ENTERPRISE MANAGEMENT SYSTEM

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Abstract. The differences between the concepts of "tax planning", "tax minimization" and "tax optimization" are investigated and it is established that tax minimization is the maximum reduction of all taxes, tax optimization is the achievement of a proportion between all aspects of an entity's activity; tax planning The system of measures of the enterprise is directed to the maximum use of the current legislation for the purpose of legal optimization of payments. It has been determined that the ways to reduce the tax burden include tax benefits, preferential taxation and the possibility of choosing a simplified system of taxation by small business entities. The levels and requirements to be followed in tax planning are identified and substantiated: organization of accounting and tax accounting, examine tax law, determine the list of benefits, correct accrual and timely payment, using legal methods to reduce the tax burden.

The methods which are applied in tax planning are substantiated: current internal control, preliminary tax examination, comparative analysis.

It is determined that tax planning is influenced by certain factors: the sphere of the activity in which the entity operates, the types of activity it is engaged in; status of belonging to a legal or natural person; the purpose of tax planning and the possibility of applying tax benefits. The tax planning system should be formed in accordance with principles: compliance with tax law; justification of the feasibility of applying the tax system; prompt response to changes in tax law; use of tax planning methods; use favorable tax regimes. Tax planning spends efforts on the following functions: analytical, accumulation, distribution, control.

It is established that the assessment of the effectiveness of the enterprise tax policy should be made through a system of indicators: the level of tax burden on the enterprise; the level of influence of tax planning on the magnitude of the enterprise's tax liabilities and the effectiveness of the enterprise's tax planning and tax policy in general. Effectively organized tax policy at the enterprise will help improve the results of the enterprise. Tax planning should be an integral part of the overall planning of the enterprise.

Keywords: tax planning, tax minimization, tax optimization, tax evasion.

1. INTRODUCTION

In today's business environment, businesses need to develop a tax policy that takes into account the features of the business entity, its development trends and the impact of each tax on the indicators of the financial condition of the enterprise.

Nowadays, taxes are a significant factor in influencing the financial and economic activity of an enterprise. Therefore, to ensure the proper functioning of business structures in an unstable socio-

economic environment, and quality management of financial resources, managers and accountants can only in the presence of their developed concept of tax management. Effectively organized tax policy and tax planning at the enterprise will contribute to the stable financial condition of the enterprise, as well as timely fulfillment of their obligations to the budget. Enterprise-level tax planning is the choice between various financial and economic activities and the placement of an asset in order to achieve the lowest possible level of tax liabilities that arise.

Some questions of tax planning were investigated by the following scholars: Bilyk M., Vasilik O., Vilkova O., Danilov O., Eliseyeva A., Zagorodnyi A., Zolotko I., Kovalchuk K., Melnyk D., Onishchuk Yu, Podluzhny M., Pogorletsky A., Romanovsky M., Usenko L. and others. However, at present there is no single approach to determining tax planning, implementing the tax optimization scheme, principles and methods of organizing tax planning at the enterprise, which led to the choice of research direction.

The main purpose of the research is to determine the essence of tax planning, determine the principles, levels and need for tax planning at the enterprise

2. RESULTS

The prerequisites for the emergence and development of tax planning are: the objective nature of the existence of taxes and the tax system; orientation of enterprises on increase of profit; the objective need to adapt to the volatility of the environment and the conditions of market competition.

In defining the concept of tax planning, A. Porsnev asserts that it is a process of preliminary review and evaluation of decisions in the field of financial activity of the organization, taking into account the magnitude of possible tax payments and ensuring the choice of the best decisions from the point of view of the general target units of the organization [1].

M. Romanovskiy cites a close definition of tax planning. He believes that tax planning at the level of the entity is an integral part of managing its financial activities within a single strategy for its economic development, which is a process of systematic use of optimal legal tax methods and methods to determine the desired future financial status of an object in conditions of limited resources and the possibility of their alternative use" [2].

Considering the targeting of tax planning and its impact on the optimization of tax payments, let us consider the position of A. Yeliseyev and A. Zagorodnyi that the first conceptual approach defines the concept of tax planning, and the second - tax planning. The first should be understood as the budgeting of taxes, and accordingly under tax planning optimization of tax payments [3].

It should be noted that L. Usenko under tax planning at the micro level understands the purposeful activity of the business entity, which is carried out by means of aggregate planning actions, united in a single system and involves the choice of optimal options for financial economic activity [4].

In foreign publications, under tax planning, a special organization of taxpayer activity is considered in order to optimize its tax liabilities for a long time in ways that are not related to violation of current legislation [5, 6].

The interpretation of tax planning cited by Yu. Onishchuk is worth too. He believes that the tax planning organization is the most optimal from a tax point of view in a way that allows you to optimize the tax obligations of the company in the right ways and means.

Yu. Onishchuk distinguishes between the components of tax planning. At the same time, he considers tax optimization as the main component of tax planning, and minimization of payments as one of the options of tax optimization, the application of which is possible only within certain limits and subject to compulsory observance of other conditions [7].

It follows that tax minimization and optimization are not the same thing.

Tax minimization is the maximum reduction of all taxes, and tax optimization is a process that is related to the achievement of certain proportions of all aspects of business entities in general.

The above analysis makes it universal that tax planning consistents with various forms of enterprise tax policy implementation. In this case, tax planning should be considered as tax budgeting, and tax

planning at the micro level can be defined as a system of measures of the enterprise, which is aimed at maximizing the use of existing legislation to optimize tax payments.

The tax legislation does not specify which actions are lawful and which are illegal, so the taxpayer must adhere to the rules and principles of the tax legislation independently, avoiding fraudulent transactions, so that they can not be interpreted as "tax evasion". Full or partial non-payment of taxes can be done both legally and it means using the features of the current legislation, and illegally, so it means in violation of the law [8]. There is no clear definition of economic concepts in the economic literature so far. If the tax authorities use the term "evasion" for both legal and illegal tax cuts or non-payment, economists propose to call the legal reduction of taxes the term "tax planning", and illegal - the term "evasion".

Some experts equate legal optimization of tax payments to tax evasion. In our view, this identification of the conceptual apparatus is incorrect. The concepts of tax planning and tax evasion should be clearly distinguished by the criterion of legality.

In taxation theory, there are three ways to avoid paying taxes.

1. Tax evasion, which means unlawful use by a business or individual of tax breaks, late payment of taxes, concealment of income, failure to submit or late submission of documents necessary for timely calculation and payment of taxes
2. By passing taxes for which the enterprise or individual is not a payer, or its activities are not taxable, or its income is not taxed. The enterprise may also use illegal methods, such as the lack of registration, accounting for tax objects.
3. Tax planning, in which legal and natural persons are active tax policy, aimed at minimizing the negative impact of taxation by methods that are not contrary to the law.

In our view, the purpose of tax planning is to choose the way in which tax payments would be minimal.

Because tax payments are an expense item, tax planning can be considered as an element of an overall cost optimization strategy. However, the accrual and payment of taxes are functionally unrelated to production, and taxes are in any case a simple deduction from the income of an entrepreneur, whom he naturally wants to avoid. There are two ways to achieve this:

- use all legal possibilities to reduce their tax payments and transform their activities so that the resulting tax liabilities are minimal;
- use illegal ways to reduce tax liabilities while trying to conceal their activities from tax authorities by misrepresenting tax reporting and misrepresenting their actions and income.

In summary, we believe that the essence of tax planning is to formulate an enterprise tax policy that would provide the most optimal option for financial activities and placement of their assets to achieve the lowest level of tax payments.

In our opinion, compliance with the law should be based on an understanding of the ambiguity of interpretations of the main provisions of the legislative acts.

Taxes are inherently compulsory and irrevocable recovery in favor of the state of part of the assets (cash) of the taxpayer governed by tax laws. They are one of the cost items that reduce the net profit of the enterprise [2]. Therefore, any action by the taxpayer to use all legitimate methods of reducing costs, including tax payments, to increase their profits is legitimate.

The main features of tax evasion: concealment of revenue, formal increase in the number of employees; illegal creation of new organizations; conducting business without registration of the subject of economic activity; increase of expenses in economic activity is not confirmed; abuse of self-interest.

Tax Planning is the planning of optimizing tax payments and fees through legitimate means. Tax planning does not go beyond the limits of the law, everything is done within the law. Creating a system of efficient and secure tax planning becomes possible provided that the rules of tax legislation and the lawfulness of their disclosure are taken into account [9, p. 350]. In developed countries, tax planning

ranks first in the financial planning of an enterprise. Tax planning should be an integral part of the overall planning of the enterprise.

Because tax law provides different types of tax regimes, the company can reduce the tax burden and systematize the procedure for tax collection.

Tax legislation, laying the foundations for granting tax benefits, identifies categories of taxpayers as privileged entities, rather than individual legal entities or individuals, that is, allocates a certain homogeneous group of taxpayers, characterized by a specific feature, on the basis of which the tax regime. All other taxpayers determine the subject of taxation, calculate the tax base and the amount of allowances in full in accordance with the general rules established by law.

The grounds for granting tax benefits are the characteristics that characterize a particular group of taxpayers, the type of their activity and the object of taxation.

The tax burden can be reduced by applying:

– preferential taxation of agricultural producers - for agricultural enterprises - provides for a fixed agricultural tax;
– simplified tax system for small business entities;
– tax privileges - exemption of the taxpayer from the obligation to charge and pay tax and levy, pay it tax and levy in a smaller amount if there are grounds.

The tax benefit is provided by:

1) tax deduction (discounts), which reduces the tax base before tax and collection;
2) reduction of tax liability after tax and collection;
3) setting a reduced rate of tax and levy;
4) tax exemption and levy [10, p. 37].

Thus, entities can apply a simplified system of accounting and reporting taxation, which involves the replacement of a number of taxes and fees established by law by payment of a single tax.

Carrying out tax planning at the enterprise should start with the choice of the scheme under which the enterprise will operate or a separate business operation will be conducted. Tax optimization schemes are a tool that can overcome the negative tax consequences and make them profitable for both taxpayers and the budget [11]. An entity must have a choice of tax planning schemes to understand which one to apply depending on the situation.

Global schemes can optimize most long-term tax payments.

Local schemes allow you to optimize multiple taxes for a limited time.

Dynamic local schemes allow to maneuver the amount of savings when changing the object of taxation [11].

Tax planning provides for different tax conditions depending on:

– the branch (spheres of activity) in which the economic activity is carried out;
– the size of the economic entity (small or large);
– kind of activity;
– status of belonging to a legal or natural person;
– why you need tax planning (to optimize a particular transaction or all business activities);
– the existence of tax benefits.

Tax planning involves several levels, each with specific requirements:

1. Organization of accounting and tax accounting – will allow timely and full receipt of reliable information for tax planning;

2. Examine tax law - Knowledge of tax law will determine the impact of the tax system on the economic activity of enterprises, as well as each tax in particular;

3. Determine the list of benefits that can be applied by the business entity.

4. Correct accrual and timely payment of tax payments – correct accrual and timely payment of tax payments will avoid application of financial penalties and accrual penalties for late and incomplete payment of payments;

5. Optimal tax payments - is planning the optimal ratio of income and expenses in one tax period;

6. Pay minimally, using legal methods to reduce the tax burden.

When planning, first of all, it is necessary to examine what impact on the financial result of the enterprise has a tax and for what purpose and for what period tax planning is carried out.

The tax planning can be carried out using the following methods:

1. Current internal control (short-term operational tax planning) is a periodic control over taxes and payments, comparing actual tax payments with short-term projections. Analyze and identify the causes of discrepancies between estimates and actual payments and develop proposals to address them.

2. Previous tax expertise (mid-term forward-looking tax planning) involves the examination of new projects and major management decisions. This method assumes that the enterprise has an information-analytical base on taxes.

3. Benchmarking (long-term strategic tax planning) involves analyzing new enterprise activity projects as a whole. In accordance with this method, a comparison of different options for the activity of the enterprise to determine their tax efficiency: for a short period and for long periods of activity.

The tax planning system at the enterprise should be formed and refined in the light of the following basic principles **:**

1. Knowledge and compliance with tax laws;
2. The feasibility of applying the selected tax system;
3. Rapid response of taxpayer to changes in tax legislation;
4. Using different methods of tax planning, taking into account the particular activities of a particular taxpayer.
5. Use of favorable tax regimes.

Tax planning spends efforts on the following functions:

– analytical - economic analysis of the use of financial resources for previous periods, the definition and mobilization of internal financial capabilities;

– accumulation - providing the enterprise with the necessary financial resources;

– distribution - optimal distribution of income and accumulation;

– control - managing over economic and financial activities.

The underestimation of the role of planning in Ukraine explains the lack of knowledge by many managers of modern terms and new approaches to managing the financial resources of enterprises. A tax system is effectively organized to optimize tax payments. Coherence of activities and optimization of this system in the direction of minimizing taxes legally reduces the financial expenses and strengthens the financial condition of the enterprise as a whole.

Increasing importance of economic levers of enterprise management implies the use of optimal approaches to tax planning and evaluation of its effectiveness.

The quantitative assessment of the effectiveness of the tax policy implemented by the company should be done through a system of well-known indicators, which determine:

– the level of tax burden on the enterprise;

– the level of influence of individual tax planning measures on the size of the enterprise's tax liabilities;

– efficiency of enterprise tax planning and tax policy in general.

Tax planning, in conjunction with management functions, is one of the main tools for generating performance indicators for the enterprise, since the calculation of the latter without regard to tax consequences is reckless and irrational. Thus, tax planning should become a mandatory tool in the set of management of a domestic enterprise when making a management decision.

Smart tax planning allows you to legally optimize your tax payments based on a thorough study of tax law and business organization to meet the requirements of tax optimization.

3. CONCLUSIONS

Nowadays, taxes represent a significant share in the costs of an enterprise, and thus have a significant impact on the enterprise. Under such conditions, only a well-organized tax policy at the enterprise will help to increase the results of the enterprise's activity, its stable development and fulfill its obligations to the budget for taxes and payments. Properly organized enterprise tax planning will allow the taxpayer to minimize tax liabilities, increase profits and avoid penalties.

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Жук Ольга, Томашевська Антоніна. Податкове планування у системі управління підприємством. *Журнал Прикарпатського університету імені Василя Стефаника*, **6** (3-4) (2019), 96–102.

Досліджено відмінності між поняттями "податкове планування", "податкова мінімізація" та "оптимізація оподаткування" й встановлено, що податкова мінімізація це максимальне зниження всіх податків, податкова оптимізація – досягнення пропорції між усіма аспектами діяльності суб'єкта господарювання; податкове планування система заходів підприємства спрямована на максимальне використання чинного законодавства з метою законної оптимізації платежів. Визначено, що до

шляхів зменшення податкового навантаження відносяться податкові пільги, пільгове оподаткування та можливість вибору спрощеної системи оподаткування суб'єктами малого підприємництва. Визначено та обґрунтовано рівні та вимоги, яких потрібно дотримуватися при здійсненні податкового планування: організація бухгалтерського та податкового обліку, вивчення податкового законодавства, визначення пільг, правильне нараховування та своєчасна сплата податків, застосовування законних методів зменшення податкового навантаження.

Обґрунтовано методи, які потрібно застосовувати при податковому плануванні: поточний внутрішній контроль, попередня податкова експертиза, порівняльний аналіз.

Визначено, що на податкове планування впливають певні фактори: сфера діяльності, у якій функціонує суб'єкт господарювання, види діяльності, якими замається; статус приналежності до юридичної чи фізичної особи; мета податкового планування та можливість застосування податкових пільг.

Система податкового планування повинна формуватися з урахуванням принципів: дотримання податкового законодавства; обґрунтування доцільності застосування системи оподаткування; оперативне реагування на зміни у податковому законодавстві; використання методів податкового планування; використання сприятливих податкових режимів.

Податкове планування спрямовує зусилля на виконання таких функцій: аналітичної, нагромадження, розподілення, контрольної.

Встановлено, що оцінку ефективності податкової політики підприємства потрібно проводити через систему показників: рівень податкового навантаження на підприємство; рівень впливу податкового планування на величину податкових зобов'язань підприємства та ефективність податкового планування та податкової політики підприємства загалом. Ефективно організована податкова політика на підприємстві сприятиме підвищенню результатів діяльності підприємства. Податкове планування повинно бути невід'ємною частиною загального планування діяльності підприємства.

Ключові слова: податкове планування, мінімізація податків, оптимізація податкових платежів, ухилення від сплати податків.

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