Formation and Implementation of Eco-Oriented Innovation Strategies for Enterprises

Mykola Odrekhivskyi[1], Uliana Kohut[1] , Roman Kochan[1,2] and Ulyana Kostyuk[3]

[1] *Lviv Polytechnic National University, 12 Bandery str., Lviv 79013, Ukraine*
[2] *University of Bielsko-Biala, 2 Willowa str., Bielsko-Biala, 43-309, Poland*
[3] *Ivano-Frankivsk National Technical University of Oil and Gas, 15 Karpatska str, Ivano-Frankivsk, 76000, Ukraine*

Abstract

The paper studies approaches to the formation and implementation of eco-oriented innovation strategies, types and main properties of eco-innovations. Eco-oriented innovative strategies combine the ideas of eco-innovations being the determinant factor of the eco-oriented innovation development of enterprises. The formation model of eco-oriented innovation strategies within the system of strategic development management at macro-, meso-, micro- and nano-levels in interaction with foreign countries was developed. The formation process of innovation strategies to develop an eco-oriented enterprise was structured. The model of homeostatic management of eco-oriented enterprises is formed with contradictions between the requirements for environmental friendliness of eco-oriented enterprises and their operational and economic effects, makes it possible to develop a management strategy for sustainable development of eco-oriented enterprise. The mathematical tools to assess the levels of environmental pollution by eco-oriented enterprises based on the Markov chain theory using the system of Kolmogorov differential equations was proposed. It will help to assess the implementation results of eco-oriented innovation strategies, make decisions regarding the states of business processes at eco-oriented enterprises, choose the guidelines on business processes of eco-oriented enterprises and introduce appropriate adjustments to eco-oriented innovation strategies.

Keywords

Eco-Oriented Innovation, Eco-Oriented Enterprise, Environmental Technologies

1. Introduction

The current state of environmental pollution in Ukraine and the world results in the search of new approaches to the formation and implementation of eco-oriented innovation strategies of enterprises, which would allow on the basis of strategic management to analyse the operating conditions of the eco-oriented enterprise (EOE), determine its mission, strategic environmental innovation goals and objectives; identify key areas and preventive measures of eco-oriented innovation development to maximise the use of all relevant resources. Currently, eco-oriented innovation strategies combine the ideas of environmental innovation being a determining factor in eco-oriented innovation development of enterprises, optimal interaction between economic development of enterprises and the environment and is focused on minimizing the negative effect on the natural environment and sustainable development. Therefore, the study of modern approaches to the formation and implementation of eco-oriented innovation strategies of enterprises is relevant and urgent.

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EMAIL: mykola.v.Odrekhivskyi@lpnu.ua (M. Odrekhivskyi); uliana.i.kohut@lpnu.ua (U. Kohut); roman.v.kochan@lpnu.ua (R. Kochan); kostyuk_u@ukr.net (U. Kostyuk)
ORCID: 0000-0003-3165-4384 (M. Odrekhivskyi); 0000-0002-3847-2762 (U. Kohut); 0000-0003-1254-1982 (R. Kochan); 0000-0001-8826-8084 (U. Kostyuk)

2. Analysis of recent studies and publications

The issues of eco-oriented innovation development strategies were studied by such foreign scientists as S. Hollenson, R. Orsato, J. Ginsberg and P. Bloom and others. S. Hollenson stated that a company should assess the degree of novelty of eco-innovation, as this factor is crucial for the company competitiveness. The strategy selection according to this approach will depend on the way in which the company is going to make its product greener and the pace of implementation of these changes, the enterprise potential is based on the novelty of the innovation to be implemented. If the company is focused on cost reduction, paying less attention to providing the product with any additional features, then it will rely on a pollution prevention strategy. When the company seeks to create innovation, it will focus on the strategy - a "green product; new product (significant modification)" or the strategy of "prevention of environmental pollution and taking measures beyond those required by the state", but if it does not have enough funds for "prevention", it will adapt changes to the legislation and product improvements will be insignificant [1]. R. Orsato's approach is based on the interaction of a company's competitive advantage and its competitive focus (organisational process orientation or product and service orientation). Depending on the degree of this interaction, the author identifies four strategies: eco-efficiency (organisational process orientation), external leadership (organisational process orientation), eco-branding (product and service orientation) and price leadership (product and service orientation). The first "eco-efficiency" strategy is used when the enterprise aims to reduce production costs while cutting down its negative impact on the environment. The use of such policies is not usually demonstrated, as the first task here is to increase cost savings by means of environmental measures. If "external leadership" strategy is used, the company tries to improve its image through sustainable transformation of its operations and attract the attention of its customers to these measures. A third environmental policy option is "eco-branding", which allows the company to highlight improved products. However, for long-term success, it calls for environmental innovation in production processes. The fourth strategy according to R. Orsato is "price leadership". It is available only when the market is available to the consumer segments, targeted by the company, and is justified for companies offering eco-oriented products, as it involves selling products with a high price premium [2].

J. Ginsberg and P. Bloom identified four key strategies based on the size of the "green" consumer segment in the industry and the company ability to change products in the context of its environmental policy [3].

Voloshenko O. O. [4] and Tarasenko I. O. [5] propose to divide eco-oriented innovation strategies into four groups: co-operative and circular flows; eco-efficiency and sufficiency; clean production; eco-modernisation. Voloshenko O. O. [4], Arundel A., Kemp R. [6], Shukla, S [7]; Arranz, N., Arroyabe, M., Li, J., & Fernandez de Arroyabe, J. C [8] believe that these strategies are united by the idea of eco-innovations, being a determining factor in eco-oriented innovation development of enterprises, optimal interaction of innovation development and the environment. They divide eco-innovations as follows: innovations of environmental technologies; organisational innovations for the environment; innovative products and services that provide environmental benefits; innovations of green systems. The main properties of these eco-innovations are studied by Arranz, N., Arroyabe, M., Li, J., & Fernandez de Arroyabe, J. C.; Ben Amara, D., & Chen, H.; Geng, D., Lai, K. H., & Zhu, Q. [8-10]. It is relevant to study the environmental friendliness of the processes of implementing eco-oriented innovation strategies. Kharichkov S. K. and Averikhina T.V. [11] propose to assess the level of environmental friendliness of projects, programs and enterprises as a whole in stages and analyse the implementation of each stage. To process the assessment results for the state of enterprises, E. Pavlenko, D. Zegzhda [12] based on the homeostasis concept, proposed a description of the homeostasis for socio-economic systems in terms of a space of states and development of predictive methods for result processing based on a new paradigm of structural and functional cyber resistance of enterprises to external disruptive actions. It formed the basis of approaches to assess the implementation of eco-oriented innovation strategies and ensuring EOE sustainability.

Environmentalists and governments have used eco-innovation strategies to pursue economic growth, prevent environmental degradation, augment welfare and address societal challenges [7].

In the era of environmental awareness, eco-oriented culture must be the main habit of management and the focus of every strategy. A growing number of business leaders commits to create a better environment of the world by integrating eco-orientation to their corporate culture [13].

The state of ecological entrepreneurship was also studied by M. Kravchenko, V. Pohorelov, Shpak N., Dvulit Z., Maznyk L., Mykytiuk O., Sroka W., Yasnolob I. and others who consider ecologization of enterprises in the context of increasing the level of competitiveness of the country's economy [14; 15; 16, 17].

Yasnolob I. notes that as a part of a general management system, an environmental management system, based on a system-environmental approach, ensures correlation of all management functions according to sustainable development concept and environmental justice principles [17].

Based on the analysis of scientific sources it can be concluded that the study of formation and implementation of eco-oriented innovation strategies is relevant and complies with current requirements. The processes of formation and implementation of EOE eco-oriented innovation strategies and assessment of EOE environmental friendliness of programs and projects in general are recommended to be performed according to defined stages. The analysis of references identified these stages and concluded the use of situational methodology, systemic and homeostatic approaches to management decision-making on the states of EOE environmental friendliness and successful implementation of eco-oriented innovation strategies to ensure the EOE sustainable development.

The goal of this paper is to study modern approaches to the formation and implementation of eco-oriented innovation strategies.

3. Methodology and research methods.

The methodological study basis is a set of general scientific and special methods of scientific knowledge, its application is conditioned by the purpose and logic to solve the problems of formation and implementation of eco-oriented innovation strategies that integrate eco-innovation ideas. That is, eco-innovation is a determining factor in ensuring eco-oriented innovation development of enterprises and their sustainable development. The scientific results obtained are based on the use of: systematic approach, logical analysis and synthesis to review the references on identifying approaches to formation and implementation of eco-oriented innovation strategies; environmentally-oriented methodology and relevant provisions, namely: innovation strategies form a system of hierarchically interrelated elements, which should correspond to global trends in eco-oriented development and accordingly the national economy development, combining macro-, meso-, micro- and nano-levels in interaction with foreign countries; methodology of structural design and graphic method for construction and visualization of eco-oriented innovation strategies within the system of strategic development management, structure of innovation strategy formation for EOE development, a model of eco-oriented enterprise management and a model of EOE homeostatic management.

4. Research results

Formation and implementation of eco-oriented innovation strategies is a systematic process containing the following main stages: analyzing the content of the conditions in which EOE operates, defining its mission, the system of strategic eco-innovation goals and objectives; assessing the eco-oriented innovation potential and external environment conditions; determining the priority areas of EOE development; choosing eco-oriented innovation strategies; implementing eco-oriented innovation strategies; assessing efficiency of implemented eco-oriented innovation strategies.

Therefore, eco-innovations are proposed to be divided into [4-8, 10, 18-20]:

1. innovation environmental technologies - pollution control technologies, including wastewater treatment technologies; atmospheric air cleaning technologies; cleaner technological processes: new production processes that are less polluting and/or use resources more efficiently; waste management equipment and technologies; environmental monitoring and instrumentation; green energy technologies; water supply; noise and vibration control.
2. Organizational innovation for the environment - pollution prevention schemes; environmental management and audit systems: environmental management systems including measurement,

reporting and responsibility for addressing the use of materials, energy, water and waste (e.g. EMAS and ISO 14001); network management: cooperation between companies to use raw materials sustainably and reduce or avoid environmental damage throughout the product life cycle;

3. innovation products and services offering environmental benefits - new or environmentally improved goods (products, services), including eco-houses and construction; green financial products (e.g. green leases or green mortgages); environmental services: solid and hazardous waste management, wastewater management, environmental consulting, testing and engineering, other testing and analysis services; services to reduce pollution and optimise resource allocation.

4. green system innovations - alternative production and consumption systems that are more environmentally friendly than existing systems: biological farming and an energy system based on renewable energy sources, etc.

Given the above, it is possible to highlight the main principal features of eco-innovations [8-10, 21]: The objects of environmental innovations can be resources, processes (methods, techniques and technologies), goods and services; eco-innovations shall be competitive on the market; eco-innovations shall be used to reduce negative environmental effects to a greater or lesser extent and optimally have zero effect or protect the environment from any negative effects; cover all phases of the value chain (procurement, production, distribution, consumption) and the product life cycle.

The development of EOE eco-oriented innovation strategies for should be based on eco-oriented methodology and related provisions. The EOE business strategy is aimed at profit earning with a focus on environmental conservation and sustainable development [22]. The basic assumption is that innovation strategies form a system with hierarchically interlinked elements. This system should correspond to the world tendencies of eco-oriented development and, accordingly, to the national economy development, combining macro-, meso-, micro- and nano-levels in interaction with foreign countries (Fig. 1).

The methods for formation of eco-oriented innovation strategies will be specific to each system level and component. The development process of eco-oriented innovation strategies should take into account the goals, objectives inherent in each level of the system, and strategies reflect a focus on the objectives.

The implementation of national eco-oriented innovation strategies includes selection of strategic priorities, depending on many targets of eco-oriented innovation and scientific-technical development, intensification of the national innovation process. During priority formation it is possible to develop and select various options, but they should be consistent with the world benchmarks of economic development and innovation, STP advanced achievements, goals and objectives of national socio-economic development. The formation of regional eco-oriented innovation strategies involves formulation of priorities, regional innovation policies, strategic and operational goals for eco-oriented regional development.

To form eco-oriented innovation strategies at EOE it is necessary to: set priorities and goals for eco-oriented innovative development of EOE; define a plan of specific actions to manage eco-oriented innovation activities; considering global, international, national and regional innovation strategies for eco-oriented development; coordinate actions with development strategies of industries, entities of regional innovation system, participants of economic relations and other economic entities.

The structure of EOE development innovation strategies formation process will be as follows (Fig. 2): During the first stage, the priorities of EOE development in the short, medium and long term are assessed, the goal and objectives of EOE innovation activities are formed, a preliminary assessment of goals and objectives of EOE innovation development is performed; during the second stage, the EOE internal and external environment is monitored; during the third stage, the analysis, assessment and forecasting of EOE conditions, possible changes in external factors of direct and indirect effect, internal factors and appropriate decisions regarding EOE conditions, optimal strategic goals or adjustments.

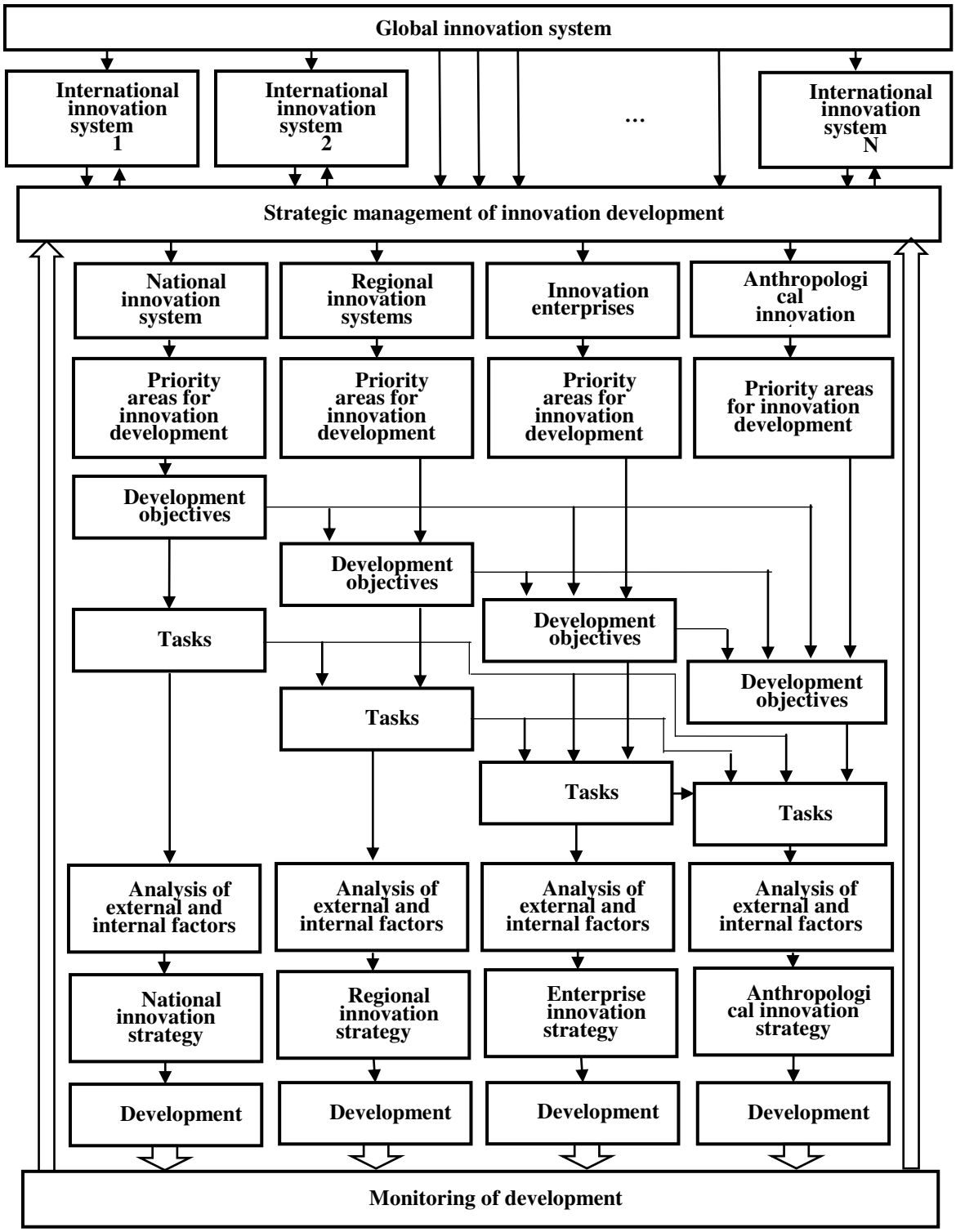

Figure 1: A model for formation of eco-oriented innovation strategies in a strategic development management system

Thus, formation of innovation strategies for EOE development involves, within the framework of established goals, eco-oriented strategic goals and objectives of EOE activities, their eco-oriented innovation culture and personnel, structure and environmental innovation technologies, research into innovation potential, intensity of EOE innovation development, cost of innovation and technological capital and risks of eco-oriented innovation activities.

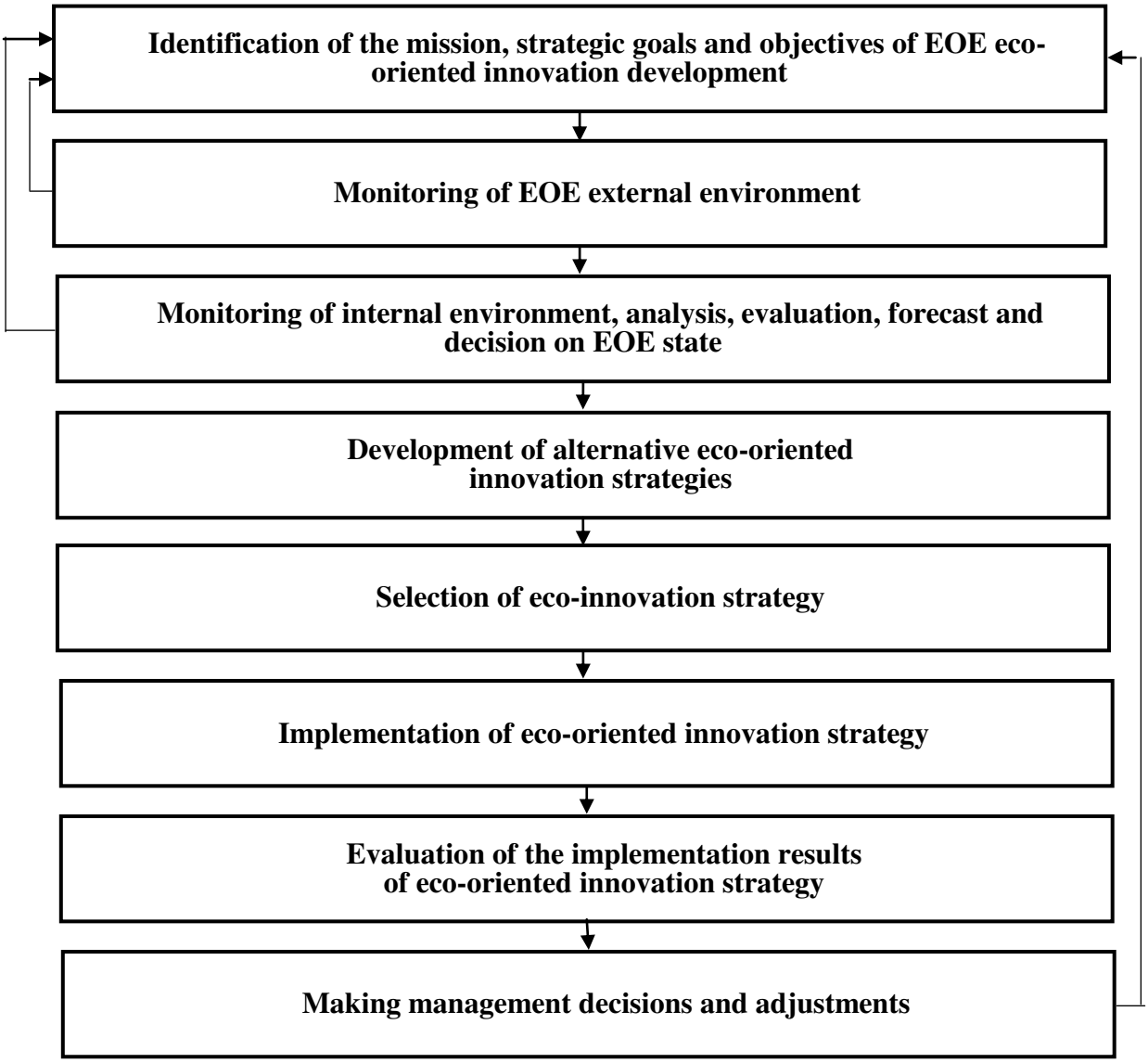

Figure 2: Formation stages of EOE innovation strategy

In the following stages, alternative innovation strategies are formed, innovation ideas and different types of innovations are accumulated to be implemented in EOE. The selection of an eco-innovation strategy for the EOE, the selection of ideas that are the best means of realising the strategic environmentally-oriented innovation goals of the EOE, development of appropriate innovation projects, identification of the types of environmental innovations, the introduction of which is recommended if the best one is chosen.

For successful implementation of eco-oriented innovation strategies for enterprise development, programs are formed with a set of eco-oriented innovation projects, and which are preferred by different criteria, e.g. environmental friendliness level, net present income, profitability index, yield index, internal rate of return, payback period, optimum risk, etc. That is, innovation program efficiency is evaluated according to its environmental, profitability, liquidity and risk levels.

It is recommended to assess the level of project environmental friendliness, programs and enterprises as a whole according to the following stages [11]: collection and analytical processing of the initial information used to assess absolute actual indicators and characterizing certain areas of eco-oriented activity of the enterprise; calculation of actual indicators; determination of the ratio of actual indicators with strategic (benchmark) values; determination of generalized indicators and the integral index of environmental friendliness of the enterprise. The assessment of environmental friendliness of EOE will allow creating and accumulating the information base, identifying weak links in the

organization and management of EOE, the level of environmental safety of EOE, their competitiveness and investment and innovation attractiveness by the environmental component.

To make decisions about the states of EOE environmental friendliness and accordingly, about successful implementation of eco-oriented innovation strategies, under the action of internal and external factors, it is proposed to use the situational methodology and system approach to making management decisions based on a comparative analysis based on the comparison of actual indicators of eco-oriented EOE activities with the indicators of strategic plans. Based on comparison results of the value of the i-th (i = 1, 2, ..., N) actual indicator with its strategic value, management decisions are made. Let us assume that (Fig. 3) Y00 is the eco-oriented innovation strategy (main goal) of the EOE; Y0i is strategically targeted, planned value of the i-th studied indicator of the EOE activity, and Yi is the actual value, then EOE management body makes decisions based on the deviation of Yi from Y0, that is, based on the absolute value of difference /Y0i – Yi/. If the values of external factors exceed the range of acceptable values and disturb EOE business processes, decisions are made on the basis of disturbances. Disturbances at EOE today can result in: environmental pollution, Covid-19, energy crisis, etc.

Environmental pollution can be assessed based on the Composite Atmospheric Pollution Index (CAPI), a quantitative value of the atmospheric pollution level generated by n substances present in the atmosphere of a settlement or individual EOE. CIPA is calculated by the formula (1) [23].

$$I_n = \sum_{i=1}^{n} I_i = \sum_{i=1}^{n} \left(\left(\frac{\overline{q}}{\mathrm{TLV_{od}}} \right)_i^{C_i} \right)_n \qquad (1)$$

Where $\overline{q}$ is concentrated over time (month or year), calculated for the post of an individual EOE or a group of EOE, an individual locality or group of localities, the concentration of the i-th impurity; i - impurity.

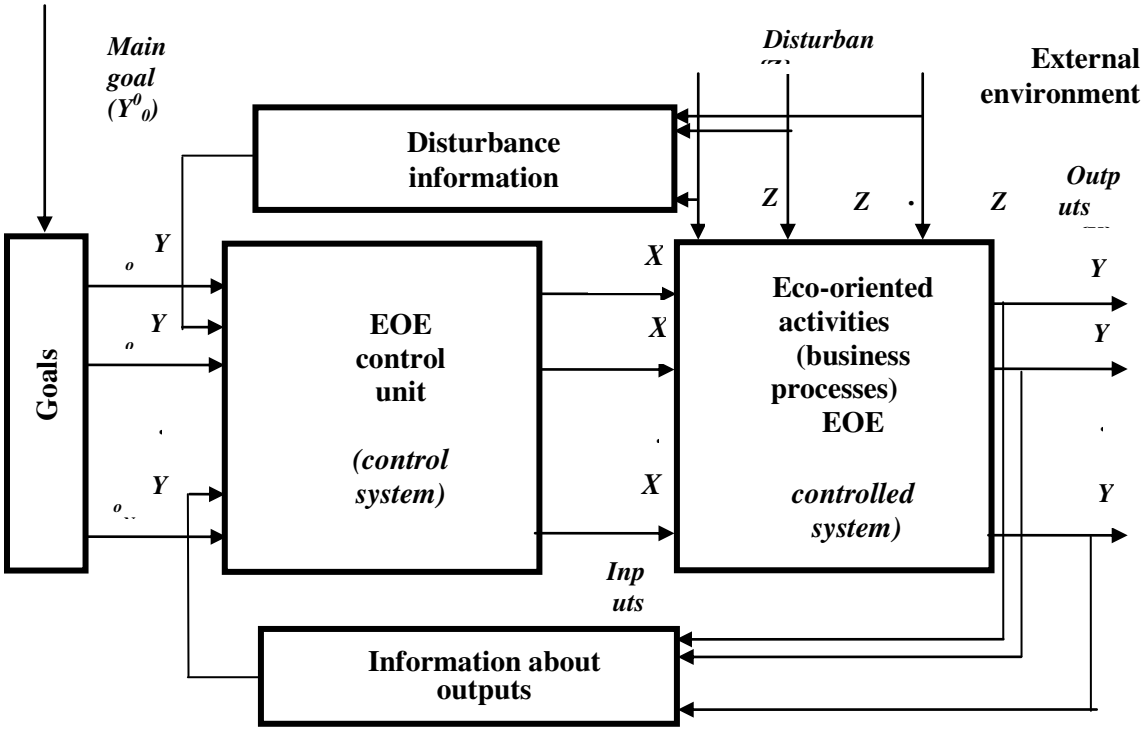

Figure 3: The management model of eco-oriented enterprises (Y00 is main goal; Y0i (i = 1, 2, … , N are strategic values of studied indicators; Yi (i = 1,2, … , N) are actual values of studied indicators; Xj (j = 1, 2, M) are main effects; Zl (l =1,2, …, L) is disturbance.)

CAPI for the considered period for one or K posts of the city is calculated as the sum of all atmospheric pollution indices (API). CAPI considers n substances present in the atmosphere. For the

integrated assessment of the level of air pollution using CAPI, you can use the values of API unit indices of the five pollutants for which these values are the highest, then formula (1) will be (2).

$$I_5 = \sum_{i=1}^{5} I_i \tag{2}$$

Thus, assessment criteria for the levels of EOE environmental pollution can be determined based on the air pollution index. The air pollution index value less than 2.5 corresponds to a clean atmosphere; from 2.5 to 7.5 - slightly polluted; from 7.6 to 12.5 - polluted; from 12.6 to 22.5 - heavily polluted; from 22.6 to 52.5 - highly polluted; more than 52.5 - extremely polluted atmosphere. Therefore, the graph of EOE environmental pollution levels is proposed to be presented as shown in Fig. 3.

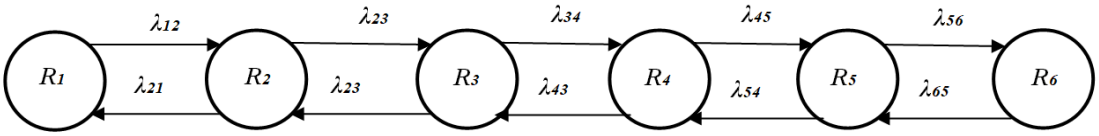

Figure 3: Graph of EOE pollution levels in the natural environment λij are intensities of transitions from level i to level j; i,j=1,2,...,6; i ≠ j.

The vertices of this graph are represented by levels [23]:

R_1 (clean environment) is the pollution level, when the value of environmental pollution index is less than 2.5;

R_2 (slightly polluted environment) - the pollution index value is from 2.5 to 7.5;

R_3 (polluted environment) - the pollution index value is from 7.6 to 12.5;

R_4 (heavily polluted environment) - the pollution index value is from 12.6 to 22.5;

R_5 (highly polluted environment) - the pollution index value is from 22.6 to 52.5;

R_6 (extremely polluted environment) - the pollution index value is more than 52.5.

It is recommended that the values of EOE pollution parameters should be described using a system of Kolmogorov differential equations (3).

$$\begin{aligned}
\frac{P_{R_1}}{dt} &= -\lambda_{R_1R_2}P_{R_1} + \lambda_{R_2R_1}P_{R_2} \\
\frac{P_{R_2}}{dt} &= \lambda_{R_1R_2}P_{R_1} - \left(\lambda_{R_2R_1} + \lambda_{R_2R_3}\right)P_{R_2} + \lambda_{R_3R_2}P_{R_3} \\
\frac{P_{R_3}}{dt} &= \lambda_{R_2R_3}P_{R_2} - \left(\lambda_{R_3R_2} + \lambda_{R_3R_4}\right)P_{R_3} + \lambda_{R_4R_3}P_{R_4} \\
\frac{P_{R_4}}{dt} &= \lambda_{R_3R_4}P_{R_3} - \left(\lambda_{R_4R_3} + \lambda_{R_4R_5}\right)P_{R_4} + \lambda_{R_5R_4}P_{R_5} \\
\frac{P_{R_5}}{dt} &= \lambda_{R_4R_5}P_{R_4} - \left(\lambda_{R_5R_4} + \lambda_{R_5R_6}\right)P_{R_5} + \lambda_{R_6R_5}P_{R_6} \\
\frac{P_{R_5}}{dt} &= \lambda_{R_5R_6}P_{R_5} - \lambda_{R_6R_5}P_{R_6}
\end{aligned} \tag{3}$$

The variables in the system of differential equations (3) are level probabilities, the coefficients are expressed by intensity of transitions from one level to the other. When $t \to \infty$ and $dP/dt = 0$ in the system of differential equations (3) is transformed into a system of algebraic equations (4).

$$\begin{aligned}
-\lambda_{R_1R_2}P_{R_1} + \lambda_{R_2R_1}P_{R_2} &= 0 \\
\lambda_{R_1R_2}P_{R_1} - \left(\lambda_{R_2R_1} + \lambda_{R_2R_3}\right)P_{R_2} + \lambda_{R_3R_2}P_{R_3} &= 0 \\
\lambda_{R_2R_3}P_{R_2} - \left(\lambda_{R_3R_2} + \lambda_{R_3R_4}\right)P_{R_3} + \lambda_{R_4R_3}P_{R_4} &= 0 \\
\lambda_{R_3R_4}P_{R_3} - \left(\lambda_{R_4R_3} + \lambda_{R_4R_5}\right)P_{R_4} + \lambda_{R_5R_4}P_{R_5} &= 0 \\
\lambda_{R_4R_5}P_{R_4} - \left(\lambda_{R_5R_4} + \lambda_{R_5R_6}\right)P_{R_5} + \lambda_{R_6R_5}P_{R_6} &= 0 \\
\lambda_{R_5R_6}P_{R_5} - \lambda_{R_6R_5}P_{R_6} &= 0
\end{aligned} \tag{4}$$

Test this mathematical framework during 2016/2020, we assessed pollution levels of territorial entities in Lviv region. The largest volumes of pollutant emissions into the air in the region result from electricity, gas, steam and air-conditioning supply companies, as well as from coal and lignite mining. Therefore, pollution levels were assesses in Kamianka-Buh and Sokal districts, in the cities of Chervonohrad and Lviv [24]. A total of 600 supervisions were analysed, i.e. 30 per year in each locality [25, 26, 27]. The intensity of transitions from one level to the other are represented above the graph arcs (Fig. 4). To determine initial conditions to study the dynamics of pollution and make appropriate forecasts, 120 observations were taken for 2020. The analysis of these observations showed that at R1level (clean environment) there were settlements at 45 observations; at R2 level (slightly polluted environment) at 33 observations, at R3 level (polluted environment) at 25 observations, at R4 level (highly polluted environment) at 10 observations; at R5 level (highly polluted environment) at 5 observations; at R6 level (extremely polluted environment) at 2 observations.

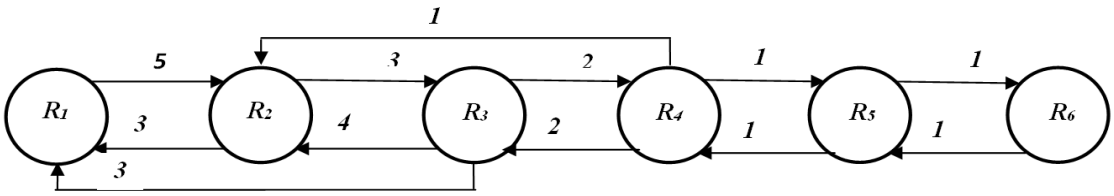

Figure 4: Graph of pollution levels of territorial settlements in Lviv region

Solution of systems of equations (1) and (2) describing the above graph (Fig. 4), with given initial conditions: *PR1=45/120=0.38; PR2=33/120=0.28; PR3=25/120=0.2; PR4=10/120=0.08; PR5=5/120=0.04; PR6=2/120=0.02*, using appropriate numerical methods and techniques, allows assessing pollution levels in the study areas based on the obtained dynamic and static characteristics (Fig. 5) and making appropriate forecasts. Here the values of level probabilities P_1, P_2, P_3, P_4,P_5,P_6 correspond to the values of P_{R1}, P_{R2}, P_{R3}, P_{R4}, P_{R5}, P_{R6}. It should be noted that observation results are generalized, as they were performed in four settlements as a whole, although it was possible to perform many observations for each polluting enterprise individually, develop dynamic and static characteristics for each enterprise in particular and make appropriate forecasts for optimal managerial decisions on the transformation of these companies into eco-oriented enterprises. In this case, R_2 is the most likely level (slightly polluted environment), resulting in appropriate decisions to reduce emissions into the environment and bring the pollution to R_1 level (clean environment).

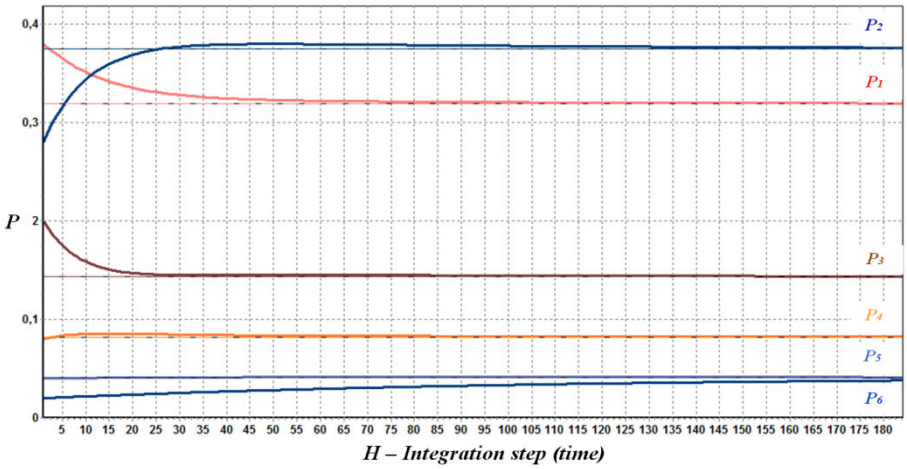

Figure 5: Dynamic and static characteristics of pollution levels

Thus, modern problems of functioning and development of enterprises as eco-oriented ones require new approaches to their management, because they different ecological contradictions have

remained unsolved for years. Therefore, the paper proposes to put these contradictions based on EOE management organization, using the homeostatic approach.

In the day-to-day enterprise management in the presence of various contradictions, the system approach and situational methodology are most often used to make management decisions [19]. The homeostatic approach is based on the systematic approach, complements it and allows to effectively manage the development of modern enterprises. It is more justified in terms of supporting the stability of existence and development of enterprises in the long term and uses homeostatic management [28]. That is, the control of many processes of modern EOE, based on the concept of homeostasis [28], inherent exclusively in living systems, can be shown as the bipolar control, its model is shown in Fig. 4 in the form of management through goals and contradictions between them.

The homeostatic approach to the organization of EOE management is appropriate and allows, based on the contradictions that arise between the requirements for EOE environmental friendliness, their operational and economic effects, to develop a strategy for management of EOE sustainable development. Environmental friendliness of technologies requires high knowledge and waste-free technologies in the manufacturing sector, promotes high-tech development of EOE, but it calls for significant resources and, consequently, reduce the economic efficiency of business processes in the initial stages, resulting in contradictions. That is, environmental friendliness of EOE technologies requires an appropriate innovation capacity to ensure their sustainable development.In other words, when constructing a homeostatic EOE management model, the eco-oriented innovation strategy can be the main goal (goal 1) or the target function in the homeostatic approach to EOE development management.

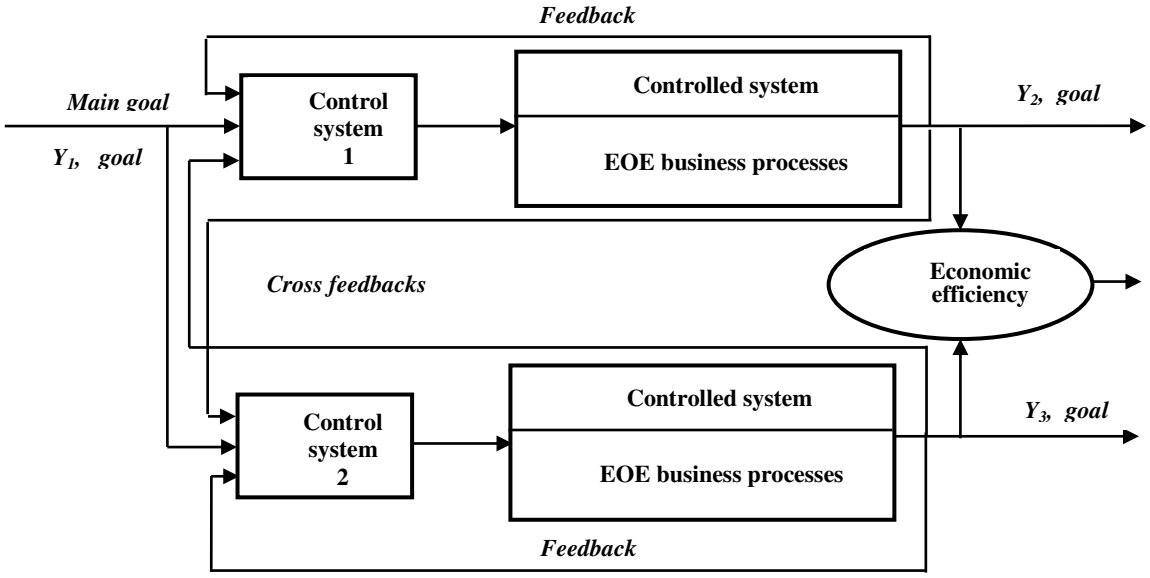

Figure 6: EOE homeostatic management model

To ensure EOE sustainable development it is recommended to develop an improved management structure for the relationship system, introduce scientifically justified limitations on anthropogenic pressures and ensure the development of eco-technologies, which could become, in turn, the target function of homeostatic management of the production sphere (goal 2). Enhancement of the level of EOE operational effect (goal 3) and, consequently, the economic effect as an integral one can be the target function of EOE homeostatic management. Homeostatic management and marketing in EOE organizational activities of EOP is relevant here. The essence of management in EOE functioning can be represented as the management of people to keep them active in the implementation of professional activities. This view reflects the central idea of management - the management of people performing a particular activity [11]. This idea can be expressed in a scheme by means of a feedback control loop, where the object of control is represented by people performing a certain production activity. The goal function here can be the management goal (goal 2) is to encourage EOE staff to perform their activities properly. This activity may result in environmental products or products to be

used as goods or services. The work of managers ends when the products are ready for use. The products are transformed into goods or services by other people whose activities belong to the marketing area.

The marketing essence can be expressed as customer relationship management. This concept of marketing reflects its idea as an activity of transforming the products, produced by EOE into goods and services that meet the demands of their consumers. It is also relevant to express this idea in a feedback management scheme, when the object of management is represented by the relationship with consumers. The marketing goal (goal 3), a customer satisfaction, can serve as a goal function. This type of management is reflected in key areas for marketing, namely: changes in goods and services, changes in prices, sales channels of goods and services, promotion of EOE products on the market.

Thus, the implementation results of eco-oriented innovation strategies are assessed, decisions are made regarding the states of EOE business processes, selection of main effects on EOE business processes and appropriate adjustments are made to the strategy as a whole. Implementation of eco-oriented innovation strategies will ensure EOE sustainability in the long run.

5. Conclusions

Formation and implementation of EOE eco-oriented innovation strategies shall contain the following main stages: analysis of the content of the conditions in which EOE operates, defining its mission, the system of strategic eco-innovation goals and objectives EOE; assessing the eco-oriented innovation potential and external environment conditions; determining the priority areas of EOE development; choosing eco-oriented innovation strategies; implementing eco-oriented innovation strategies; assessing efficiency of implemented eco-oriented innovation strategies.Eco-oriented innovation strategies shall be divided into four groups: co-operative and circular flows; eco-efficiency and sufficiency; clean production; eco-modernization. They are united by the idea of eco-innovations, being a determining factor in ensuring eco-oriented innovation development of enterprises, their optimal interaction with the external environment. It is recommended to assess the level of EOE environmental friendliness according to the following stages: collection and analytical processing of the initial information used to assess absolute actual indicators and characterizing certain areas of eco-oriented activity of the enterprise; calculation of actual indicators; determination of the ratio of actual indicators with strategic (benchmark) values; determination of generalized indicators and the integral index of environmental friendliness of the enterprise. It will create and accumulate information base, determine the level EOE eco-safety, weak links in EOE organization and management, and their competitiveness, investment and innovation attractiveness of the environmental component. Decision-making on the state of EOE environmental friendliness and success of ecologically-oriented innovation strategies, affected by internal and external factors, selection and implementation of management effects on EOE and adjustment of eco-oriented innovation strategies is proposed using situational methodology, systematic and homeostatic approaches.

6. References

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