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Digital Economy: New Opportunities to Implement Eco-Innovations at Production Enterprises

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DIGITAL ECONOMY: NEW OPPORTUNITIES TO IMPLEMENT ECO-INNOVATIONS AT PRODUCTION ENTERPRISES

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Abstract. In present day conditions sustainable social development can be secured only by implementing eco-innovations at production enterprises. Types of eco-innovations and research review of production enterprises environmental management are given in this article. One of the management tasks is finding a balance between the production enterprises economic efficiency aimed at making a profit and practicability of introducing new ecological standards. One of the lines of digital economy is implementing of energy saving technologies and "green" patents. Today digital and "green" innovations synergy represents the sustainable development demand. Key aspects of digitalization positive influence on production plants ecological stability are listed in the paper. A new algorithm of implementing eco-innovations at production enterprises has been suggested. Digital economy methods used in this algorithm provide new opportunities for the enterprises sustainable development.

Key words: digital economy, eco-innovations, «green» patents, production enterprises, sustainable development.

INTRODUCTION. PROBLEMATIC FIELD DESCRIPTION

One of today's problems is manmade environmental load increase. Technological innovations have controversial influence on sustainable social development. One of the ways to solve this problem is popularization and introduction of new types of innovations – environmental ones. These can be defined as new technologies helping to preserve the Earth's ecosystem. Herewith, two types of eco-innovations can be singled out [1].

First order eco-innovations imply greater involvement and more effective use of natural productive forces and natural resources in industrial processes. This suggests rational and resource-conscious ecosystem exploitation, creating "green" technologies, developing renewable energy sources, sensible use of fresh water, improving land fertility, forest conservation and reforestation, creating products that can be used as production source raw material after their first use. To implement the innovations it is necessary to form such a structure of public production which is targeted at increasing resource-saving production efficiency with production processes rationality. These innovations have a positive influence on economic and social dimensions of sustainable development.

Second order eco-innovations imply harsher measures of environmental control. It is carried out by drafting international and national legal standards regulating polluting emissions into the habitat. Second order environmental innovations are rather costly, their results becoming evident only in the long-term perspective. Therefore, this type of innovations contributes to strategic policy of sustainable development. Eco-antirent on manufacturers and eco-taxation on consumers of resource-heavy goods and services can be the source of these innovations.

Digital economy provides new opportunities to introduce eco-innovations in production enterprises.

REVIEW OF CURRENT ECO-MANAGEMENT RESEARCH

Eco-management efficiency at production enterprises has been widely studied in a number of scientific papers. Paper [2] dwells on the basic environmental, natural and manmade background of current unfavourable environmental conditions. The authors consider functional measurement of current sustainable development challenges and put forward a classification depending on their

origin, including classical and synergetic challenges, reformation of human consciousness as well as social, environmental and economic imbalances.

Interrelation between environmental policy using environmental management systems and enterprise activity to develop and introduce ecotechnologies is analyzed in article [3]. The findings show that implementation of eco-innovations directly depends on the economy and market sector where the company operates as well as on the enacted regulatory requirements and the controlling authority actions and performance.

Methodology to estimate the enterprise activity eco-efficiency is described in article [4]. It is based on available and reliable information obtained from reported data and proves to be multi-purpose for various manufacturing sectors.

The methodology suggested in [5] to analyze the production enterprise eco-system is based on multi-criteria estimate. Herewith, the designed multi-criteria matrix allows one to determine all forms of environmental impact priorities, and specific realization of Theory of Inventive Problem Solving (TIPS) provides rationalization for individual eco-innovative solutions.

A method to estimate eco-innovations is suggested in article [6]. The method allows to assess factors proving the effect of implementing these innovations as well as to compare this effect to the enterprise operating performance displayed by its volume and employment growth. A mixed-type effect regression model operating some statistical data was used to obtain the estimate results. The results have shown that not all the introduced eco-innovative strategies boost the enterprise performance efficiency.

Research results justifying applicable methods of eco-system approach for participatory estimate of promising industry projects are given in paper [7]. A number of business processes has been formulated, including the project result estimate and its stages along with the team's resourcefulness.

An environmental innovative project classification is dealt with in article [8] depending on the accomplished goals: single-purpose and multi-purpose ones. As is noted, in a number of cases environmental investment projects can be referred not to single-purpose (environmental) but to multi-purpose ones (technological with economic assessment).

A regression analysis method to estimate traditional (production waste and resource-intensiveness) and modern (eco-innovations) environmental management performance indicators impact on environmental conditions is suggested in [9]. The research results show that in the event of environmental crisis, economic growth should be considered not as a goal in itself, but as a means of ecological recovery and the environmental crisis management tool.

Production enterprise performance and its innovative activity based on digital economy methods are estimated in article [10]. Technological innovations growth trends of an enterprise are analyzed basing on the algorithm of differential binary coding optimization.

A model for choosing the enterprise innovative course which is state-subsidized to carry out eco-technological innovative projects is developed in article [11]. It also shows opportunities to encourage an enterprise to implement eco-technological innovations and attain the best standard of social welfare.

The authors in [12] study consequences for enterprises introducing measures of environmental improvement by means of innovations processes. The factors determining eco-innovative course, associated with using "green" patents which reduce negative impact on the environment are analyzed in the paper.

The role of environmental policy and driving factors of "green" demand to provide steady implementation of eco-innovations aimed at efficient use of resources and rational ecosystem exploitation is discussed in paper [13]. As a result of processing a large amount of data for enterprises, evidence has been obtained proving the importance of environmental policy and demand-side factors to introduce innovations facilitating waste disposal and reducing negative impact on the environment.

Concepts of stability, innovations and risk management at small and medium-size enterprises (SME) in order to develop a flow-chart of TIPS method in SME and innovation

assessment in such types of enterprises are dealt with in article [14]. TIPS method in SME brought about the results providing speedy solutions, efficient processes and competitive products and services.

Comparative quality analysis of enterprises in [15] has determined four various combinations of interrelated innovative direction variables, ecological sustainability, resource exploitation and employee engagement resulting in the enterprise performance socio-economic efficiency. The only variable present in all the combinations is ecological stability which points to the fact that it can be of critical importance in achieving sustainable development.

A new quantitative description approach to technological eco-innovations standards based on product life-cycle assessment methodology is put forward in article [16].

DIGITAL ECONOMY AS A DRIVING FORCE TO IMPLEMENT ECO-INNOVATIONS

Contemporary social development is largely based on information telecommunication technologies, forming new economic and social relations modernization trends. Nowadays «Digital economy» programme is carried out in Russia which is aimed at development and introduction of legal, institutional, technical, financial and other provisions for digital transformation in various economy sectors [17]. Digital economy can be defined as economic relationships in socio-economic systems based on information telecommunication technologies allowing to enhance the use of productive forces in different sectors of the country's economy. Herewith, two types of digitalization can be singled out.

First-type digitalization is the activity connected with development of digital computer technologies, forming a new business environment and increasing the economic agents' competitive capacity. Digitalization has a number of advantages including: increase of labour efficiency, improvement of service quality and availability, transaction and other costs reduction, competitive growth of the enterprises, single database creation, job creation, overcoming social inequality. Thus, this digitalization aspect gives a boost to sustainable development, secures technological dominion, and forms a synergistic effect in key industries.

Second-type digitalization contains measures to prevent digitalization failure. Digitalization downsides include: data protection issues, social management of human behaviour based on their credentials, disappearance of some jobs and sectors, cut-off of the access to digital education and digital services, insufficient rate of government bodies' transformation [18].

Environmental aspect of digital economy is of crucial importance for sustainable development. Three aspects of digitalization positive impact on the enterprise ecological stability are given in article [19]:

1. decreasing direct impact of information and communication technology by means of extensive use of renewable energy sources;
2. boost of digitalization positive effect to develop green economy by means of productivity enhancement and products and services consumption increase;
3. sustaining consumer behavior transformation systemic effects, economic and social structures and management processes.

At the same time, according to article [20], the effect of digital technologies speedy implementation in the economy and state administration has both advantages in the sphere of maintaining environmental safety and a number of unclear points. This is connected to the fact that digital economy implementation means forming a new lifestyle pattern and a new basis for the whole society development. On the one hand, it remains unclear what environmental consequences the digital economy programme may have and on the other hand how the digital economy programme achievements can be used to provide the environmental safety.

Applying digital economy methods, we suggest the following algorithm of eco-innovation implementation at production enterprises which will provide new opportunities for their sustainable development:

1. The demand to estimate eco-innovations implementation taking into account environmental impact at the regional, sector and enterprise levels. This allows the enterprise to

assess its position among many other enterprises in question from the point of view of its environmental impact and eco-innovative capacity analysis.

2. The enterprise eco-innovative capacity estimate based on the system of indicators. These allow providing an integral assessment of an enterprise activity aimed at eco-innovations implementation. It gives an opportunity to analyze this capacity dynamics and compare it to other enterprises.

3. Assessment of the eco-innovations implementation efficiency based on statistic financial statements. This estimate includes eco-investment activity indices, dynamics of environmental load change and innovative environmental activity.

The suggested system of indicators [21] allows enterprises to assess their position in eco-efficiency rating as a part of the regional or sector production enterprises as well as its own environmental development dynamics. Besides, it will allow to regulate the activity connected with eco-innovations implementation.

CONCLUSION

The findings of this paper show the demand for implementation of eco-innovations at production enterprises in present-day conditions. Up to now production enterprises have consistently faced a choice between solely economic efficiency aimed at profit-maximization and ecological expediency connected with observing the existing norms and obligations.

Although digitalization may have a double-natured effect on the sustainable development of society, it is necessary to use its advantages for environmental processes enhancement both in the national economy and at individual production enterprises. Key aspects of digitalization positive impact on the enterprises ecological stability have been analyzed in the paper. A new algorithm of eco-innovations implementation at production enterprises has been suggested providing new opportunities for their sustainable development using digital economy methods.

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