“Developing the system of instruments for business sector in order to transfer the environmental innovations effectively: case of Ukraine”

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DEVELOPING THE SYSTEM OF INSTRUMENTS FOR BUSINESS SECTOR IN ORDER TO TRANSFER THE ENVIRONMENTAL INNOVATIONS EFFECTIVELY: CASE OF UKRAINE

Abstract

The article analyzes the need to transfer the environmental innovations effectively in the system "enterprise-region-state" and to establish the relevant innovative changes promotion channels for the country's sustainable development. The authors study this problem in the context of priority directions of UNO Sustainable Development Strategy and Sustainable Development Strategy "Ukraine – 2020". Its solution is a key factor of influence on Ukraine's economic growth and security. The study is based on methods for defining the influence of national economy innovative activity on the choice of relevant ecological modernization state regulation channels for sustainable development. FCM analysis was used for the study. Six groups of instruments were defined and characterized depending on the influence on sustainable development subjects. The system of instruments was formed, and the approach towards making the managerial decisions in order to ensure Ukraine's national economy sustainable development was proposed. Practical value of the obtained results is that the established relevant channels can ensure the fastest reaction of business environment to state regulatory impact, which is the main constituent of state administration and sustainable development processes regulation system.

Keywords transfer, sustainable development, administration, instruments, regulation, entrepreneurship

JEL Classification L26, O32, Q58

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INTRODUCTION

National economy's development is determined by transformation processes, where social and economic and environmental changes occupy a special place. The economy undergoes changes, which depend on the conceptual basis of social development. It, in turn, provides for implementing the adaptation and bifurcation mechanisms of social and economic systems in their direction toward modern paradigm of environmentally sustainable development. Nowadays, this paradigm is a complex phenomenon and is based on such basic principles as sustainable development concept, information economics, "green" economy, industrial revolution.

Modernization changes in the economy acquire new nature and depend on the form of economic relationship transformation and social production pattern (its organization, forms, and content). It, in turn, induces the appearance of new standards of social development and social and economic systems functioning, which is a significant challenge of social and economic systems evolution. Such moderniza-

tion takes place owing to implementing the reforms and innovations, which, in case of replication and entrenchment in its total, lead to qualitatively new changes in the society. It undergoes continuous changes with separate features of social and economic systems adaptations and bifurcations. Unlike the innovative activity (which is directed towards searching for still "non-existent idea and developing the inventions), on the contrary, modernization is oriented to already existing scale of social development achievements, but, at the same time, is directed towards transition to "new" social development paradigm, which provides for sufficient level of economy's innovative potential.

1. LITERATURE REVIEW

In Ukraine, Melnyk, Kachur, Balatskyi et al. (2008), Boronos, Shkarupa, and Konovalov (2016), Veklich (2003), Hubarieva (2014), Kuliasov and Pakhomov (2004), Kudinova, A. Rozenberg, and G. Rozenberg (2013), Sotnyk and Chumakova (2013), Khvesyk, Stepanenko, Obykhod et al. (2016), Anderson, Andreieva, Alimov, Khlobystov, Ye V. et al. (2011), and others present certain developments concerning the directions of national economy modernization based on ecologization, formation of economy regulation models.

In recent times, the scientific interest in it is strengthening. In a range of studies, economic activity structural transformations are connected, first of all, with eliminating the distorted nature of business environment. At the same time, a range of authors substantiates the economy transformation effectiveness and the need for regulating the economic activity of economic entities in the process of moving the transition economy to socially-oriented market economy.

Some researchers, namely, Kulinich (2002), Hubarieva (2014), and Khvesyk et al. (2016), believe that it is important to align the territorial and national interests during the transition period, to disclose the role of foreign trade as a means for economic growth during market transformations, connect its system-forming action with the use of competitive advantage implementation mechanism at different levels.

In Shkola, Shilepnitskiy, Zybareva, Dron, and Verbovskaya (2004) opinion, the peculiarities of social and economic development transformation models are based on analyzing the dynamics, of production, financial, credit, and social relationships, as well as forms and methods of production organization and complex management of the country's transformation processes. In Yeshchenko, Hasanov, Chukhno, Leonenko et al.'s (2003) opinion, transformation is not just an adaptation of certain system to economic conditions, but a replacement of previous economic system with a qualitatively new one (systemic transformation) or at least significant change of available economic system, as a result of which there appears and begins to act a new economic mechanism (intersystem transformation).

Pakhomov, Pavlenko, Krymskiy et al. (2006) pay attention to the fact that transformation process provides for management or programming factor, although it can take place spontaneously as well. Transformation processes are partially controllable, partly take place in the process of system self-organization, that is why the result of transformation, in general, cannot be forecasted at the beginning of the process, but is a consequence of mutual influence of external and internal factors. The term "transformation" is convenient for characterizing separate processes in economic systems because it consists of such elements as expediency and goal-setting factor. It is goal setting for effective transfer of environmental innovations being a basis for transformations, which, in turn, creates the conditions for sustainable development.

The instruments for managing the environmental innovations development, drivers and barriers for environmental innovations transfer system development were studied by Horbach (2016), Sehnem, Lazzarotti, and Bencke (2016), Jackson (2005), Tietenberg and Lewis (2014), and others.

One should note that mainly they are of general theoretical nature, as there exists a wide gap in understanding the economic instruments for regulating the processes of national economy sustainable development. The certain instruments for environmental innovations transfer, which possi-

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bly can be a basis for different enterprises, which could rest on available and adequate statistical basis, and on studying the inverse relationships between enterprises (direct developers of environmental innovations) and other stakeholders, were not proposed yet.

The commonly accepted factor of social and economic systems management is triple helix model – power, business, science, whose interaction determines the viability of national economy and its competitiveness. Herewith, human factor plays a leading role in the processes of national economy sustainable development, as the implementation of scientific and technical progress results changes the corporate responsibility level and lays down new, more demanding norms for building the social relationships. National economy increasingly depends on the nature of corporate responsibility: the economy's sustainable development depends not only on the development of economic relationships and potential of nature and resource sphere but also on living standards, level of local development management, competitiveness of economic entities potential, and those who makes important managerial decisions. In this context, the issues of human resources creative management as a non-linear form of general management system remain interesting, which is an important factor of national economy sustainable development.

In conditions of increasing load on the environment, the priority direction for developing the economic systems of all levels is implementing the environmental innovations, which favor the increase of environmental and economic security level and natural and resource potential. Official statistics shows the very low level of environmental innovations implementation in Ukraine (0.5% of GDP), whereas in the EU countries – on average, 8-10% of GDP. According to the results of European innovation scoreboard Innovation Index calculation, Ukraine refers to the category of "moderate innovators." During 2015–2017, 79.6% of Ukrainian enterprises did not implement the innovations at all, only 10.0% dealt with technological innovations, of which only 5.8% of enterprises implemented the environmental innovations (low-waste, resource-saving, and zero waste). At the same time, according to Ecotec report data, average annual turnover of the European market of environmental innovations in 2000–2010 was near EUR 183 billion, and the annual growth rate of this market is near 5.4%. As of 2017, environmental innovations segment capacity is near EUR 1,000 billion per year.

In the developed countries of the world, for a long time, the regulatory mechanisms for sustainable development are a full constituent of national economy management system. Denmark, the Netherlands, Finland, Norway, Germany are the most successful in implementing them owing to diversified system of environmental taxes, "green" fiscal reform, system of subsidies, grants, etc. In Great Britain, the USA, Japan, it is done mainly through deposit-collateral regulation, subsidies, loans, taxes, fees, fines, credits, quotas, methods of accelerated depreciation. In Denmark, Sweden, the Netherlands, Canada, state regulation is focused primarily on state subsidies for green technologies. In Ukraine, the potential for transition to "green" economy is not used to a full extent, which is caused by imperfect infrastructure, institutional and normative environmental innovations support environment, and unsystematic state regulation measures.

Specificity of ecological modernization changes implementation requires the development of flexible system of instruments, which would take into account both the number of niche ecological modernizations implemented and their quality, general innovative changes in industrial and regional aspects. The economic relationships policy modernization itself requires the improvement for future generations (based on improving the environmental security requirements to producers) and current ones (business stimulation policy – as a need for national producer support, need for supporting its social and environmental advantages, more full internalization of expenses, etc.).

In order to do it, it is necessary to generalize the potential opportunities of using the instruments for regulating the national economy sustainable development, in order to form the regulation measures base, which can be the basis for the mentioned system of instruments.

In the developed countries of the world, the following main types of instruments are used for

regulating the economy's sustainable development processes:

1) administrative-command instruments (order, directives, prohibitions, constraints, licensing procedures);

2) market-oriented economic instruments ("green" taxation, payments for usage of resources, certificates, permissions, subsidies, etc.);

3) recommendation instruments (information distribution, management systems, experience exchange stimulation, agreements between government agencies and business sector).

The key measure concerning the formation of economy's sustainable development preconditions is population and business consciousness, development of so-called "sustainable consumption". A whole range of regulatory impacts in the state (e.g., eco-certification, eco-marking – so-called ecological signs) are directed towards it. Eco-marking programs function in more than 50 countries of the world and cover almost all the business activity spheres. Eco-marking helps the consumer in obtaining the information when choosing the product and making environmentally conscious solutions, stimulating the producers to develop and supply more environmentally-friendly products, reduce the harmful effect on the environment. Herewith, the consumer not only pays attention to environmental aspects of product quality but also assesses its life cycle as a whole – from production and distribution to usage and disposal. There exists an opinion that in the national economy system, implementing the eco-marking and eco-certification national systems can create non-tariff trade barriers, but such issues are solved in advance by way of mutual recognition at the international level.

Today, the issue of sustainable development regulation goes beyond the government agencies only, which take part in promoting and developing the "green" economy. State regulation provides for involving the non-public organizations and associations in the process of implementing the "green" economy concept at the national level.

State regulation levers are effective when being used and targeted differentially depending on specificity of innovations and control object. For instance, in Germany, in order to stimulate the transition to eco-friendly transport, the instruments are divided according to the objects as follows: for companies and local communities, which invest in the development of charging infrastructure for electric cars – state subsidies, and for citizens – grants to consumers (electric cars – 4 thousand euros, hybrid cars – 3 thousand euros).

In Ukraine, multivector nature of environmental innovations diffusion hinders their effectiveness due to absence of their transfer model. An important aspect of achieving the goals and tasks on environmental innovations transfer is clearly delineating the factors, which are catalysts/inhibitors of environmental innovations scaling-up for enterprises at the meso- and macrolevel, through which such transfer can take place most productively and quickly.

To that end, this study aims to develop the approaches towards ensuring the environmental innovations transfer in the system "enterprise-region-state" and formalizing the convergent relationships between the factors, which are catalysts/inhibitors of environmental innovations scaling-up for enterprises at the meso- and macrolevel.

2. METHODS

The main stage of the study is analyzing the results of expert assessment, which is a common practice in many countries of the European Union. The quality of innovative change at the level of economic entities is a catalyst for structural change of the system of sustainable development instruments, which induces the relevance the channels like (*Inner-Ch-Ef*), induced by the level of enterprises-eco-innovators readiness to intensify their activity in the sustainable development sphere.

To substantiate the list of relevant *Inner-Ch-Ef* channels, cognitive modeling of complex systems (FCM analysis was used), as this method: 1) enables to convert the qualitative scores into qualitative ones; 2) is effective when processing the large amounts of parameters with weakly formalized

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nature and different size; 3) enables to formally describe the system of cause and effect relationships between basic factors-concepts, group them according to different criteria, define the structural peculiarities of the system. The FCM analysis helped to quantitatively assess the strength of direct and inverse relationships between the factors, which the representatives of enterprises and organizations-eco-innovators defined, according to the survey results, as the most significant for them from the viewpoint of activating the ecological modernization in future. One hundred and twenty representatives of Ukrainian enterprises and organizations were surveyed with the aim to reveal their opinion on the extent of influence of 17 factors-concepts (17 groups of factors, which in total cover 89 parameters) on promoting the environmental innovations and effectiveness of local ecological modernization changes. Based on survey results generalization (incidence matrix, built with the help of RStudio – 1.0.136 software) sequentially with the help of FCMapper software, 21 fuzzy cognitive FCM map was built, where the irrelevant parameters were eliminated at every iteration (with the growth of calculations' accuracy). Building this model based on real data enables to group the factors of influence, define their assessment criteria, make their simulation mechanism more controllable and predictable.

3. RESULTS

Final results of the study are presented in Figure 1. Cognitive map describes the convergent relationships between different factors in terms of social and economic nature, which are catalysts/inhibitors for scaling up the projects of local eco-entrepreneurs. High scientific value of building this model is that the majority of its parameters are weakly formalized due to different data dimensionality, their objective and subjective nature. The built FCM map shows that the following factors-concepts, which are catalysts of economic entities stimulation towards activating the ecological modernization measures:

1) very strong positive effect – *Econ, Hum, Ek, Pr, Dem, Fin, Inter, Q*;

2) moderate positive effect – *Tech*;

3) weak positive effect – *Sci*;

4) very weak positive effect – *Edu*.

In these directions, the measures and instruments should be stimulating in their nature, and priority in using them should be defined according to strength of the effect found. The factors-concepts, defined as inhibitors for environmental innovations transfer effectiveness, are as follows:

1) very strong negative effect – *Proc*;

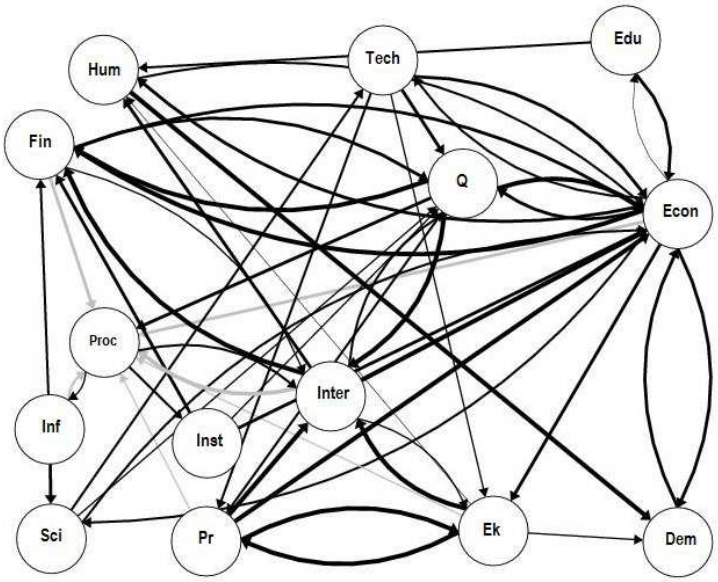
2) weak negative effect – *Inst, Inf.*

State regulation measures in these directions should aim to reduce/eliminate the negative manifestations of the problems found, and the strategy for their implementation should correlate with strength of their effect. The effect of such factors-concepts as *Infra, Or-adm,* and *Soc* was found to be insignificant for enterprises.

It is proposed to divide the instruments for regulating the national economy's sustainable development into the levels depending on the priority of effect on the economic entities (from 1 – instruments of drastic nature to 6 – instruments of preventive nature). This study is based on methods for defining the effect of national economy innovative activity level on the choice of relevant channels for state regulation of ecological modernization for sustainable development, whose elements were mentioned earlier (Khvesyk et al., 2016).

According to the importance of the instruments' effect on sustainable development subjects, it is proposed to define the following:

- *level 1 – very strong and strong positive effect:* drastic instruments, "shock therapy" (adoption of laws on eco-modernization activity, on market and innovations exchange formation, development of additional financing programs at the account of state budget expenses for ecological modernization, irretrievable financing, control over economic performance, demand stimulation, creation of "green" investment bank); *moderate effect:* implementation of target fiscal direct stimulation, state support, investment tax credit, protection of

Vector of factors-concepts target values at 21st (end) iteration	Cognitive FCM map graphic image
$Inner-Ch-Ef^{(21)} = \begin{pmatrix} Econ = 0{,}993 \\ Hum = 0{,}819 \\ Ek = 0{,}893 \\ Pr = 0{,}842 \\ Inst = -0{,}398 \\ Dem = 0{,}868 \\ Sci = 0{,}304 \\ Inf = -0{,}254 \\ Tech = 0{,}533 \\ Fin = 0{,}934 \\ Edu = 0{,}099 \\ Inter = 0{,}937 \\ Q = 0{,}912 \\ Proc = -0{,}889 \end{pmatrix}$	

Group of factors-concepts	Parameters, which were assessed within the groups of factors-concepts
Econ	Level of economic stability at the enterprise, in the region, and the country as a whole; budget, tax support of business; level of innovative development effectiveness
Hum	Population living standards, level of labor potential social responsibility; level of demand structure compliance with supply structure at the labor market; social payments targeting; households' needs level
Ek	Level of production and consumption processes environmental sustainability at the local level (in particular, landscaping, waste disposal, etc.)
Pr	Development of technologies of using the non-renewable and renewable natural resources in the business and in the region
Inst	Normative orderliness, transparency of state and local support of local business initiatives, level of international standards (environmental, quality, trade, etc.) implementation
Dem	Staff turnover at the enterprise and in the region, regional migration, access to databases to search for necessary specialists
Sci	Access to innovative developments, relations with scientific institutions, availability of venture capital, availability of scientific and methodological base for promoting the innovations
Inf	Access to information at the local level, information and communication support of business processes, quality of information relations with authorities and other stakeholders
Tech	Level of business technological development, access to energy- and resource-saving technologies, level of service centers for equipment maintenance, opportunity for reconstruction or construction
Infra	Development of external and internal transport and logistic infrastructure, participation in cluster structures, cooperation with local authorities
Fin	Business climate, donor, budget, or investment support of small and medium business; level of personal expenses for modernization projects
Or-adm	Level of participation in target ecological modernization programs, availability of system for collecting the data on ecological modernization projects at the local level; quality of system of modernization economic instruments (fees, taxes, subsidies, etc.), level of innovative development strategic planning in the region
Edu	Level of education, professional training, access to innovative advanced training programs
Soc	Participation in modernization projects on a voluntary basis, public control over budget support
Inter	Access to information about innovative activity national strategy, about modernization directions within European integration
Q	Energy effectiveness (energy-saving) indicators, availability of recircular material consumption, level of modernization measures effectiveness
Proc	Level of social and economic communication, level of modernization projects cost-effectiveness, bureaucratization, monopoly for innovative and renovative technologies; corruption

Figure 1. FCM analysis results for defining *Inner-Ch-Ef* channels for stimulating the ecological modernization changes in the national economy

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intellectual property rights, creation of import substitution condition; *weak and very weak effect:* active social policy, active financial support; taxation optimization, instruments for consumer protection;

- *level 2 – very strong and strong positive effect:* anti-stress instruments (subsidies, preferential loans, in particular, decrease of interest rates level, supported by state guarantees, strategic analysis, environmental audit, risk management, anti-crisis management instruments, reengineering, benchmarking); *moderate effect:* implementation of public investment (including corporate and mutual funds), venture entrepreneurship funds, guarantee funds; *weak and very weak effect:* preferential loans, collateral security of eco-modernization changes;

- *level 3 – very strong and strong positive effect:* instruments, directed towards "scrapping of tendencies" (state promotion and stimulation of products and services sales, direct and indirect budget financing, new approaches of capital expenses policy, attraction of private investment, allowance for profit of enterprises); *moderate effect:* activation of commercial banks' investment activity, interest in long-term lending, direct, portfolio, venture, intellectual investment, ensuring the foreign entrepreneurship support; *weak and very weak effect:* financial support of startups in the form of subvention (over 50%), financing of youth entrepreneurship, microloans;

- *level 4 – very strong and strong positive effect:* depreciation instruments, formation of "buffer zones" in national economy (transparent policy of innovations state support, development of innovative infrastructure, monitoring of small and medium businesses); *moderate effect:* non-traditional forms of financing for moving the income from low-technology to high-technology sectors (franchising, leasing, factoring, forfeiting, etc.); *weak and very weak effect:* donor support, consulting, staff training, workshops, seminars;

- *level 5 – very strong and strong positive effect:* stimulating instruments, directed towards reducing the risks (increase of incomes, restoring the trust to state institutions, encouragement of market actors' investment behavior, compensation of lease payments in the network field of innovative activity); *moderate effect:* stimulation of foreign investment in long-term modernization projects, creation of cluster structures, increase of investment opportunities of small and medium businesses, simplification of procedure for obtaining the necessary permits; *weak and very weak effect:* implementation of social packages, instruments for private business stimulation, dividend policy;

- *level 6 – very strong and strong positive effect:* instruments for support and control (state guarantees in lending, preferential loans of projects, sales market support, insurance, budget support programs); *moderate effect:* programs of technical support from local budget resources, indirect budget support programs; *weak and very weak effect:* formation of databases about investment prospects at the local level, legal and advisory support of business.

Thus, the methods of sustainable development state regulation can be implemented not only in the form of target financing of sectors, industries, territories, economic entities. State subsidies, grants, which are provided at the account of funds from state or local budget, as well as special funds, favor in implementing the large-scale eco-innovative projects. Stimulating function of state regulation is manifested in using the tax and credit benefits, customs instruments, accelerated depreciation, support at the market, emission rights trading, etc. Such economic instruments favor the manifestation of enterprises' initiative to search for their niches in transition to sustainable development, which in general leads to their scaling-up and geographic distribution.

Also, the important constituent of state regulation is the formation of social institutes in the sustainable development sphere: new progressive ideas about "green" economy, embedding the values of lean production and consumption in the national culture. The level of education and culture development in the society, including the public administration subjects, determines the effectiveness of using the instruments for sustainable development state regulation in many aspects.

CONCLUSION

The analysis of the existing instruments for sustainable development in national economy's system enable to find the relevant channels, which can ensure the quickest reaction of business environment to state regulatory effects, which is a main constituent of public administration and sustainable development processes regulation system. It enables to define the regulatory effects, which are catalysts and/or inhibitors of effectiveness of ecologically necessary modernization changes in the country, accelerate or constrain the stakeholders' activity, whose activity is determining for intensifying the sustainable development processes. Ensuring the effectiveness of instruments in different channels depends on the increase of enterprises-eco-innovators number. Its basis are the forecasts concerning the increase of the share of enterprises-eco-innovators in national economy in general and in separate industries depending on the moment in time, when these enterprises will start to implement the ecological modernization projects owing to using the different types of state regulatory effects.

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