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DEVELOPMENT OF CLUSTER STRUCTURES IN THE FIELD OF WASTE MANAGEMENT

The article formulates the methodological foundations that define organizational and innovative basis for the formation of cluster structures in the field of waste management. The structural-functional scheme of creation and functioning of environmental and resource cluster in the field of waste management is submitted in this article.

Keywords: waste management, cluster structures, environmental and resource cluster, structural-functional scheme of the environmental-resource cluster, cluster core, coordinating center.

The task statement in general form. Modern social-economic development of Ukraine is mainly in progress due to an extensive use of natural and industrial resources. According to the "National Security Strategy of Ukraine" (2012) the problems that threaten national security are "the formation of significant amounts of waste production and consumption, insufficient level of the secondary use, recycling and disposal" [1, p. 8]. Insufficient application of innovative clean technologies, as well as the implementation of closed production cycles and recycling cycles leads to the accumulation of significant amounts of waste production and consumption. Thus, the dynamics of the generation of waste in Ukraine according to the State Statistics Service indicates the general upward trend of absolute amounts of waste formation and accumulation. It leads of course to increased technogenic-resource load on the environment, deterioration of environmental quality and public health.

Analysis of recent researches and publications. There is a necessity to actualize the problem of creating of integrated business structures and corresponding organizational-economic mechanisms, to ensure the innovation and investment, financial-economic, social-ecological basis for the solution of multidimensional problems of formation, disposal of waste and their use as secondary raw materials with the aim of ensuring sustainable development.

The problems of development of the sphere of waste management received considerable attention and were shown in the works of such Ukrainian scientists, as N.M. Andrieieva [2], V.S. Mishchenko [3], N.V. Pavlikha [4], I.M. Sotnik [5], V.A. Studynskyi [6].

The main purpose of the article. The article is aimed at improving of the conceptual principles and mechanisms of organizational and innovation cluster development to ensure environmentally safe and resource-oriented waste management at the regional level. In this study, the hypothesis about the appropriateness and necessity of application of the theory of regional clusters for solving of environmental and economic problems in the waste management is advanced.

Main material. The gradual achievement of sustainable and environmentally balanced regional development requires the formation of strategic directions of the cluster interactions of enterprises and organizations of various sectors of national economy and the state administrative structures. Thus, the efficient functioning of water management, forestry and agro-industrial complexes for resolving of inter-sectoral social-economic, ecological and economic problems (for example, the need to improve the ecological quality of water resources, increasing forest coverage, complex processing of wood) is associated with the creation of cluster structures [7; 8]. In general it should be noted that M. Porter emphasizes that in a globalized economy the traditional division into sectors (industries) loses some importance and come first clusters [9]. The “Concept of clusters in Ukraine” (2008) implies that the increase in the competitiveness of regions should be done through the implementation of market mechanisms compensating for various destructive natural processes on the basis of flexible forms of cooperation, coordination and integration of joint activities of individuals [10].

The usage of the cluster approach to regional ecological-economic problems in the sphere of waste management, causes necessity to focus on the definition of “cluster”. The detailed analysis of the essentially-content base of concept of cluster structure has been conducted in [11]. And here it should be mentioned that system of important components in the process of solving ecological and economic problems in the sphere of waste management, such as specialization of production, the processes of combination, concentration and association of business potentials of enterprises (organizations) and government agencies, authorities, is necessary organizational-economic condition for the implementation of the cluster approach. *The mechanism of integrated business structures* in the field of waste management on inter-sectoral basis, in our opinion, is a set of interconnected measures and targets of institutional, sectoral and entrepreneurial character in process of forming of an integrated economic individual that operates on the basis of the organization-production structure and system of economic and financial relations between the participants.

Thus, it is necessary to emphasize that the basic processes of creating of integrated business structures in the field of waste management should include a system of organizational, economic, financial, social and environmental activities at different hierarchical levels of governance: national, sectoral, regional (territorial), as well as on the level of business organizations (enterprises). From these perspectives, integrated businesses focused on cooperation in the field of waste management can have, in our opinion, a form of cluster associations. In this context, cluster policy in the field of waste management should be considered to be a system of organizational and economic relations between the public authorities and individuals regarding environmentally safe disposal of waste as secondary raw materials, improving the competitiveness of enterprises due to formation and development of

cluster formations. In general, a cluster is a group of geographically interrelated and interacting economic actors in the sphere of waste management, which are characterized by common activities. The theory of creation of the cluster structures allows to determine the fundamental differences between cluster as a business structure in the field of waste management from other territorial and industrial associations:

1. A cluster is a geographically concentrated combination of enterprises in the waste management, including related industries (municipal, agricultural and water management). This industrial foundation of cluster is simultaneously formed by major competitive enterprises of waste production.

2. Regional ecological and resource cluster has broader and more specific compound, which is formed not only by production (economic) entities that are included in the organizational-technological chain of formation, disposal and utilization of waste (waste streams), but also by the necessary service organizations, research centers, specialized banks, educational institutions, government agencies, small businesses, entrepreneurs and non-profit organizations.

3. A cluster provides more favorable entrepreneurial and innovative business climate in the regional of waste management in accordance with the principles of sustainable development.

Based on the conducted theoretical analysis of conceptual organizational and economic foundations of cluster associations, and research of the differences of these formations from other integrated structures (in particular from the territorial-production complexes) we have formulated the concept of environmental and resource cluster in the waste management. *Environmental and resource cluster of the waste management* is the geographic polycentric agglomeration of interrelated principles of waste flows effective regulation and utilization of of enterprises of different forms of ownership and organizational-legal forms of business: business structures, scientific and educational institutions, government authorities, non-profit organizations and other organizations that complement each other (in particular through cooperation) in the direction towards solving of social, ecological and economic problems in a particular area of waste disposal and use as secondary raw materials.

The purpose of the formation of environmental and resource cluster waste management is the implementation of a comprehensive approach to the problem of waste in the region by combining the efforts of different enterprises of the various sectors of economy, the local authorities and the state government regarding the regulation of waste flows on the basis of innovation ensuring sustainable development of the region on the basis of cluster cooperation of stakeholders.

According to the objectives, main tasks concerning the formation, operation and development of such a cluster can be represented as follows:

1. Reducing of rational formation, effective disposal of waste and use as secondary raw materials.

2. Identification of the interests of stakeholders in the system of waste management for regional needs.

3. Separation of organizations (companies) as structuring and providing economic subjects of the cluster formation.

4. Implementation of innovative technologies for the use of waste and integral management in the process of solving of ecological-resource problems.

5. Continuous provision and evaluation of production-economic, organizational,

environmental and social instruments and levers of waste management based on the synergetic effects.

6. Constant improvement of organizational and institutional, financial-economic, ecological-economic levers that influence management decisions regarding the efficient use of waste in the process of cluster interactions.

7. Improving of the efficiency of interaction between organizations – members, other regional entities and population concerning the changing of environmental conditions.

8. Continuous improvement of the monitoring system for the effectiveness of interaction between participants of cluster formation.

9. Increasing of the effectiveness of interaction coordination between local government, local authorities, organizations-participants of the cluster, non-profit organizations, local communities (population) in the field of waste management.

Irrespective of the chosen business strategy of each member of the cluster formation regarding the environmentally safe waste management, construction of their interaction is determined by the content of certain principles. These principles of cluster interactions are well represented in the scientific literature concerning problems of cluster formation.

Thus, in [12] twenty seven principles of cluster interactions of businesses, in particular, such as scarce resources, the limited capacity of human capabilities, competition, compromise, freedom of choice, subjectivity, desire for certainty, associativity, risk, responsibility, interaction with the environment, concentration of resources, constructive destruction, creativity and innovations, differential, system integration have been considered. The creation and operation of the forest complex cluster is based on similar principles, including: scarcity, integration and differentiation of resources; development of property relations; values, freedom of choice and compromise; uncertainty and risk; rationality and system analysis; responsibility, interactions with the environment; constructive destruction; innovation development; system integration [8].

These principles of interaction of cluster formation members in one way or another are inherent for environmental-resource cluster of the waste management:

1. *System integration, cooperation and competition of participants of the cluster formation.* Complex system integration and cooperation of enterprises provides coordination of their resource and industrial, financial, economic, ecological-economic interests and stipulates synergetic effect and thus contributes to competitiveness.

2. *Systematic interdependence and self-organization.* This principle involves stable relationships (organizational-technological, economic, financial, etc.) between the participants of the regional environmental-resource cluster. It consists of elements of system self-organization and self-development of businesses as a condition of innovation development.

3. *Uncertainty and risks.* In the cluster of environmentally safe waste management a variety of economic activities cannot be defined and finally planned due to the need to ensure freedom of all its participants. Some uncertainty in terms of the implementation of the current cluster interactions leads to risks of each subject of interaction, which are the result of free management of agricultural and forestry enterprises.

4. *Innovation.* The principle is aimed at developing of the implementation and dissemination of innovation (technological, organizational-administrative, market) associated with the use of waste on environmental and economic grounds.

5. *Dynamic and balanced formation, operation and development of cluster formation.* It should also be constant adaptation to changing environmental conditions. This principle also

includes structural-functional transformation of cluster members for organizational and technological, environmental, economic, institutional settings.

6. *Economic-legal and social-environmental responsibility at different hierarchical levels of management.* It indicates compliance with contractual obligations, agreements within integrated business processes in the waste management, and environmentally responsible behavior.

7. *Unity of complex information support of cluster members* through the monitoring system creation of different organizations (companies) interactions on the logistics basis.

The proposed structural – functional diagram of ecological and resource cluster of the waste management is represented in Fig. 1. which highlights the specific structural-functional features of formation and functioning of the cluster.

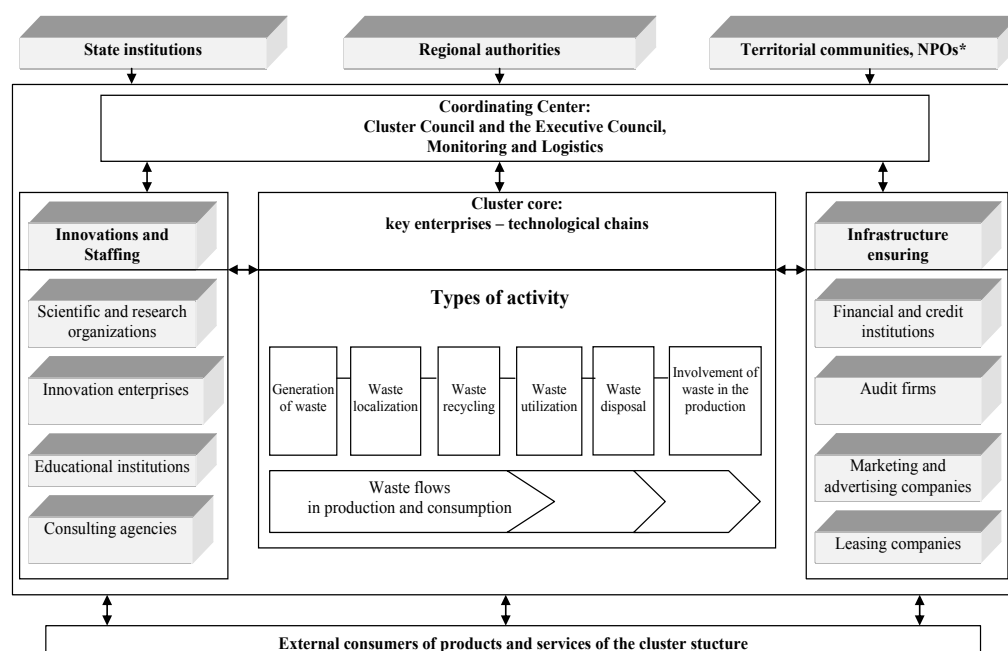


Figure 1 – Structural-functional scheme of the environmental-resource cluster of waste management, (NPO* – non-profit organizations)

First of all, it should be mentioned that the establishment of the environmental-resource cluster of the waste management – is quite new innovative initiative in implementing a comprehensive and systematic approach to solving ecological-resource problems that need coordinated organizational, economic and financial efforts of different industries and local authorities in the region. Regional and local authorities, government regulation of industrial, social and environmental issues should ensure some organizational and financial support for the creation of clusters and the necessary organizational and institutional conditions.

The main functions of local and regional authorities, state regulation of natural resources, social and environmental problems in the process of formation and development of regional ecological and resource cluster are as follows:

1. Institutional and regional support of strategic directions of cluster structures formation of ecological and economic orientation for ensuring of sustainable development.
2. Development of effective organizational and economic relations between participants of the cluster, as well as small businesses.
3. Support the development of infrastructure (business, innovation and investment, personnel, etc.).
4. Tax incentives for businesses of various forms of ownership and management within the cluster interactions.

Thus, the formation and development of ecological and resource cluster of the waste management should include close cooperation of enterprises and local authorities, state authorities concerning social and economic development on the innovative basis.

It is necessary and important to identify the characteristics and possible forms of public-private partnership in the regional system for the waste management to achieve the competitive advantages of enterprises participating in the cluster of the environmentally safe waste management. It requires an institutional and organizational alliance between the state, local governments and private businesses in the improvement and further development of innovative waste management in the region.

In general it should be mentioned that public-private partnership has a wide range of different forms in different sectors of the economy, including the sphere of nature using: a variety of contracts that the state provides for private companies; rental (leasing) relations; production sharing agreements; the establishment of business companies with mixed public and private capital; the concession agreements [13].

Effective implementation of mechanism of the cluster interactions of authorities, government agencies, businesses and organizations for solving of regional environmental and social-economic problems of the waste management requires the creation of *Coordinating Cluster Center*. The given existing proposals concerning the principles of creation of the cluster (coordination) center, and the composition of its structural elements [8; 14], we outlined the following basic constituents taking into consideration the specificity of solving environmental and resource problems related to the waste management:

1. The Coordinating Center is composed of the Council of the cluster and the Executive Directorate. The Council of the cluster, as it is known, is the highest governing body. Operational management of the coordinating centre for implementation of the regulatory and managerial functions, the Executive Directorate headed by the Director in accordance with the regulations approved by the Council of the cluster.

2. The Council of the environmental and resource cluster includes representatives of different structuring companies and organizations of the cluster core (waste industry, specialized transportation enterprises, recycling enterprises, landfills, etc.) as well as business, innovation and investment, consulting and staffing (e. g., financial institutions, leasing and insurance companies, research and design organizations, educational institutions, consulting firms).

3. The Council of the cluster may include representatives of the local Council (local government, state agencies regulating social-economic and environmental development of the region, as well as deputies of regional and district levels). These institutions should certainly coordinate the activity of enterprises within all phases of the creation, functioning and development of the environmentally oriented cluster of the waste management.

4. The monitoring system of cluster interactions on logistics principles (Center for Monitoring and Logistics) is necessary for the effective functioning of the coordinating center,

also for its information-analytical support and integral assessment of the effectiveness of cluster formation development at different hierarchical levels of management.

The main objectives of the Center for Monitoring and Logistics must be: formulation of a comprehensive monitoring system of organizational and technological, financial, economic, environmental, social and environmental indicators of the cluster development; formation of integrated logistics systems of material, financial and information flows; assessment of social-ecological and economic efficiency of cluster formation and structuring enterprises; development of communicative policy with a wide range of stakeholders regarding the waste production and consumption within existing logistics flows.

It should be mentioned that there is a difficult problem to attract direct investments in the sphere of waste management, which is associated with the threat of low economic efficiency of borrowed financial assets, especially at the initial stage of the cluster creation. It requires effective motivational mechanisms to attract businesses to cluster interactions. Specific motivational preferences of economic actors of ecological and resource use of waste are reduced to the following:

1. *Motivation benefits for structure enterprises:*
 1. System improvement of indicators of the financial and economic, industrial and economic activities (liquidity of financial assets, profitability, capital productivity, etc.).
 2. Reduction of production and logistics costs (including material, transport, transaction and so on).
 3. The implementation of a strategy for sustainable improvement of competitiveness of enterprises.
 4. Ability to implement cost-effective transfer of innovative technologies.
 5. Enhancing innovation and investment and business infrastructure software.
 6. Increasing of the human, intellectual and social capital.
 2. *Motivational orientations for public administration:*
 1. Increase in budget revenues due to higher tax revenues.
 2. Increase of investment attractiveness of the region and improvement of the innovation climate.
 3. Improving of the competitiveness of the region.
 4. Increasing of the rate of employment in the region.
 3. *Motivational benefits for financial and credit institutions:*
 1. Participation in innovative and investment projects.
 2. The additional income from active financial activity.
 4. *Educational Institutions – motivational orientations:*
 1. Participation in innovation and investment projects of ecological and economic nature.
 2. Financial revenues for the development of project documentation for the development of innovative technologies in the sphere of waste management.
 3. Increase of research and innovation potential.
- It is important to focus on the need of a mechanism development of participating non-profit organizations in the formation of cluster policy in the sphere of waste management. The main components are:
1. *Consultative component* is connected with the main directions of environmental and cluster policy, systemic vision of ecological-economic, social-environmental aspects for the development of effective waste management.
 2. *Monitoring component* provides public environmental and social assessment of projects, environmental and social control.

3. *Innovation component* is implemented by initiating of the use of innovation in solving of regional problems of the waste management. For example, it includes initiative creation of a social system-responsible environmental reporting of participants of the cluster structure [15].

Conclusions and directions for further researches. The theory of regional clusters allowed us to substantiate and formulate the main conceptual principles and mechanisms of the formation and development of environmental and resource cluster in the sphere of waste management. In terms of social-economic and financial crisis, the creation of cluster structures, including the environmental and resource cluster of the waste management is an innovative process, which can hardly be realized without the active assistance of state and local authorities that are able to provide the necessary institutional conditions, certain financial and managerial support, and can also act as the main generating start for sustainable mutual beneficial economic relations between members of the cluster structures. The further researches should take into account the formation and development of the complex mechanism for the cluster management.

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Розвиток кластерних структур у сфері поводження з відходами

У статті сформульовані методологічні положення, що визначають організаційно-інноваційну основу формування кластерних структур у сфері поводження з відходами. Обґрунтовано структурно-функціональну схему створення та функціонування еколого-ресурсного кластера поводження з відходами.

Ключові слова: поводження з відходами, кластерні структури, еколого-ресурсний кластер, структурно-функціональна схема еколого-ресурсного кластера, кластерне ядро, координаційний центр.

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Развитие кластерных структур в сфере использования отходов

В статье сформулированы методологические положения, определяющие организационно-инновационную основу формирования кластерных структур в сфере управления отходами. Обоснована структурно-функциональная схема образования и функционирования эколого-ресурсного кластера в сфере использования отходов.

Ключевые слова: использование отходов, кластерные структуры, эколого-ресурсный кластер, структурно-функциональная схема эколого-ресурсного кластера, кластерное ядро, координационный центр.

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