Аннотация.

Онегина В.М., Витковский Ю.П., Кравченко Ю.Н. Финансовое обеспечение в стратегическом управлении инновационным развитием.

Целью статьи стало определение соответствия фактического финансирования научных и научно-технических разработок в Украине предусмотренном законодательством, а также выявление взаимосвязей между объемами финансирования научных исследований и разработок и объемам ВВП, сельскохозяйственного производства. Были использованы следующие методы: анализ, синтез, индукция, дедукция, сравнение, индексный, корреляционного анализа. Установлено, что уровень финансирования инновационной сферы в Украине является не только катастрофически низким, но и меньше законодательно утвержден. Расчеты показали тесную прямую взаимосвязь между индексами реального ВВП и индексами реальных расходов на финансирование научных исследований и разработок как за счет всех источников финансирования, так и за счет средств бюджета в Украине в 2013-2018 гг.; и отсутствие связи между затратами на научные исследования и разработки и объемами производства в сельском хозяйстве. Такой низкий уровень финансирования инноваций создает угрозы инновационному потенциалу национальной экономики, ее аграрного производства.

Ключевые слова: *инновационное развитие, инновационный потенциал, финансирование, расходы на научные исследования, стратегическое управление, сельское хозяйство.*

Abstract.

Onegina V. M., Vitkovskiy Yu. P., Kravchenko Yu. M. Financial provision in the strategic management of innovation development.

The aim of the article was to determine the correspondence of the actual level of financing of scientific and scientific-technical research in Ukraine and its level set up by law, to identify the relationship between the amount of funding for research and development and the volume of GDP, agricultural production. The following methods were used: analysis, synthesis, induction, deduction, comparison, index, correlation analysis. It was revealed that the level of financing of innovation sphere in Ukraine was catastrophically low, also less than level approved by law. The calculations showed a close direct correlation between the indices of real GDP and the indices of real expenditures for financing research and development both by means of all sources of funding and by the expenditures of the budget in Ukraine in 2013-2018; and the absence of a link between the financing of research and development and the volume of production in agriculture. Such low level of financing of innovation forms threats for innovation potential of national economy, its agrarian production.

Key words: *innovative development, innovative potential, financing, strategic management, agriculture.*

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MULTIFUNCTIONAL MODELING REGIONAL SYSTEM OF SOLID WASTE MANAGEMENT TO CONSIDERING SYNERIC EFFECT

Plaksienko V., Samojlik M., Pisarenko P. Multifunctional modeling regional system of solid waste management to considering syneric effect.

The article is formulated balance scheme life cycle of solid waste of the region, that allowed to develop ecological and economic model optimal management in the area of recourse with waste on the regional level and to determine optimization scripts of management this area theoretically optimal values of parameters. Based on model management area of recourse with solid domestic waste formed algorithm definition of optimal management strategies and mechanisms for their implementation, which allows solving the problems of optimize development area of handling with solid waste with a given set variables and parameters of system state for a particular type life cycle this area. The developed model has a set of admissible solutions and, accordingly, offers the choice of the best of them taking into account the target functions. The obtained results of research allowed formulating conceptual bases for ensuring ecological safety of the regions, aimed *at increasing the efficiency of the use of the natural and economic potential of the territory, resource conservation and resource replacement. The practical significance of the work is to optimize the strategy of ensuring environmental safety in the region, the implementation of which will allow: to improve the resource availability and competitiveness of the region, to obtain additional revenues from second-round resources; preserve primary resources and improve their quality; return the contaminated land to the economic circulation of the region; reduce the risk to public health from the negative impact of wastes; improve the socio-psychological climate in the*

Key words: *area of handling with solid wastes, optimization model, region, secondary resources, environmental safety, balanced development.*

Formulation of the problem. One of the conditions for sustainable territorial development is a socio-ecological-economic balance in the region, which presents such a state of regional systems that provides economic growth, social stability and ecological safety in the region. Violation of this balance leads to the emergence of losses having different characteristic features: ecological, economic and social. An essential element of socio-ecological-economic balance in the region is effective functioning of solid waste (SW) management sphere.

The problem of waste is one of the most important ecological-economic and social problems of regional development. One of the main reasons for the deterioration of the quality of the environment and the emergence of zones of «environmental disaster» is that huge amounts of substances extracted from the earth, converted into new compounds and scattered in the environment, without taking into account the fact that «everything is doing somewhere». As a result, large quantities of substances often accumulate in those places where, by nature, they should not be. The biosphere operates on the basis of closed ecological cycles of substances and energy, and the production of wastes is an exceptional feature of civilization.

One of the problems of modern science, which in the future leads to environmental problems of society, is that understanding of the processes occurring in the ecosphere is very difficult for modern specialists, because as a result of many years of differentiation of knowledge, it became a habit to consider individual, isolated events, each of which has some reason. In this aspect, the issue of forming innovative approaches to the solid waste management system, definition of optimization models and mechanisms for maintaining the adoption of managerial decisions based on the methodology of system analysis, taking into account the environmental, technological and socio-economic conditions and the synergistic effect of the functioning of such a system at the regional level.

Analysis of recent research and publications. Among the studies devoted to various aspects of improving the management of waste management and attracting them into economic circulation, it is necessary to distinguish works (N. Reymers (1990) [1]; R. Amos, D. Blowes, B. Bailey, D. Sego, L. Smith, A. Ritchie (2015) [2]; J. Powell, T. Townsend, J. Zimmerman (2016) [3]; N. Gupta, K. Yadav, V. Kumar (2015) [4]; C. Singh, A. Kumar, S. Roy (2017) [5]; M. Dmitrienko, J. Legros, P. Strizhak (2018) [6]; H. Il, N. Gui, H. Jee (2018) [7]; Y. Yunjiang, Y. Ziling, S. Peng, L. Bigui, G. Shu (2018) [8]; V. Vagin (2004) [9]; B. Burkinskiy, V. Stepanov, S. Kharichkov (2005) [10]; G. Rudko (2009) [11] and others). But the issue of improving the system of regional management area handling of SW on the basis of optimization modeling of this area is not sufficiently worked out. Noting a large number of approaches and applied research to reveal specific issues in the area of handling SW, it should be noted that multivariate analysis of the handling SW system and the development on this basis of optimizing economic and ecological models of management, decision-making algorithms in this area are still up to date for scientific research.

The purpose of the article is to develop and scientifically substantiate optimization model of the solid waste management system in the region, on the basis of which to formulate an algorithm for making decisions in the field handling of solid waste to increase the resource supply of the region and to determine priority tasks of management in this area.

Main results of the study. The technological system of handling with SW is a complex interconnected network of sources of waste generation, technological operations at each stage of the life cycle and objects of treatment, taking into account their mutual location in a certain territory, the presence of transport connections and directions of movement of waste streams. The main elements of the technology of handling with SW correspond to the main stages of the SW life cycle: education; collection, accumulation and temporary storage (formation of one or several wastes streams with certain characteristics); transportation (movement of wastes streams); utilization or disposal of waste (change of flows and the final disposal of waste). In this case, the functional-substantive model of solid waste management, taking into account the above methodological approaches, should be oriented to maximally take into account the principles of integrated waste management and include balance schemes of the life cycle of raw materials and energy in a closed loop using the material and energy resources of the region. In this case, the theoretical model construction of functional-subject interconnections and interdependencies between the main parts of the solid waste management system is based on two mutually complementary processes: 1) optimal use of primary raw materials and minimization of waste generation; 2) maximum return of material and energy secondary resources in economic circulation (fig. 1).

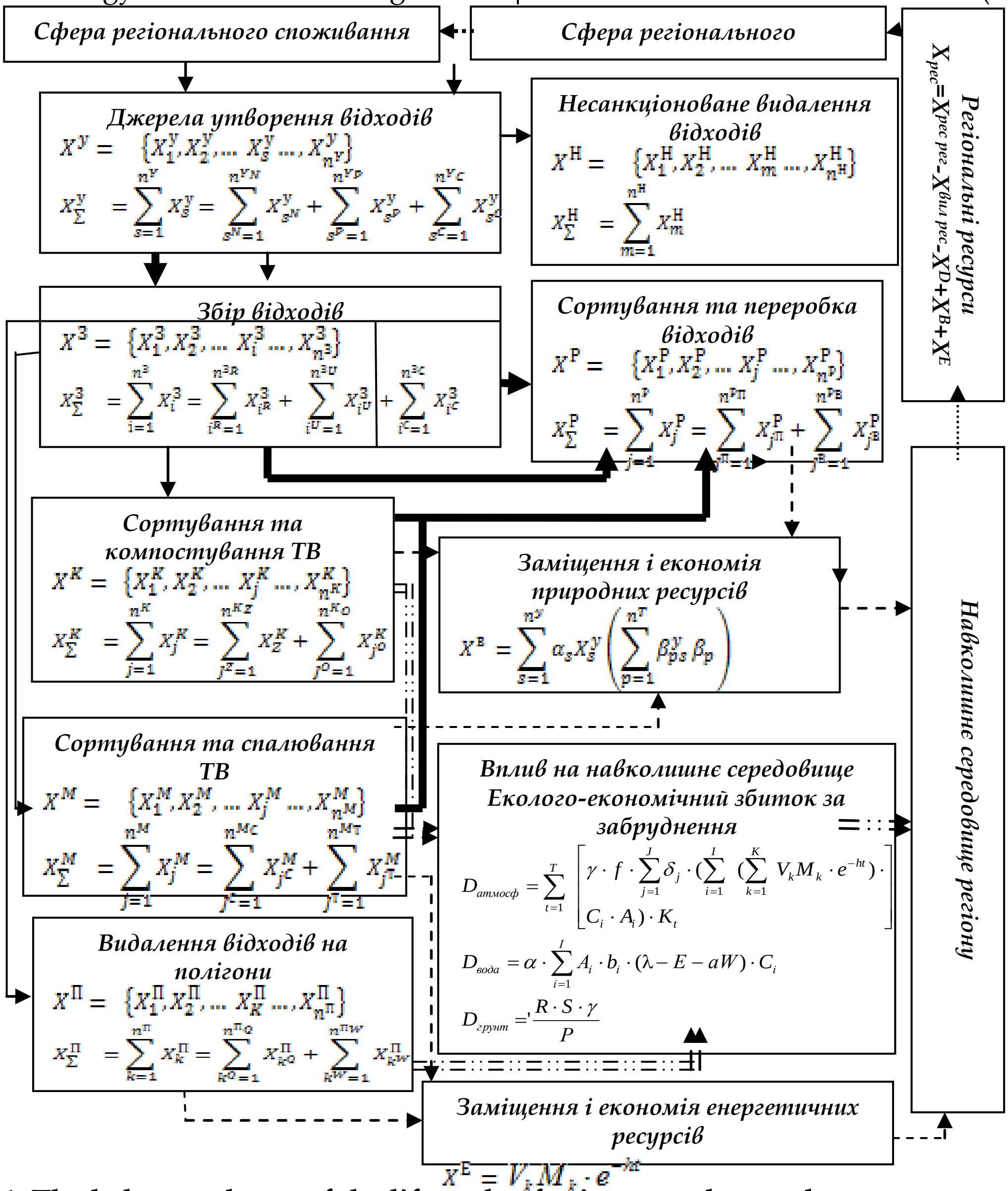

Fig. 1. The balance scheme of the life cycle of primary and secondary resources of the region (author's elaboration)

········► – primary resources; – solid waste; – secondary resources;
- - -► replacement and saving of material and energy resources;
=::► pollution of the environment.

Author's elaboration

In the figure 1 accepted such notation:

$X = \{X^{У}, X^{З}, X^{Н}, X^{Р}, X^{К}, X^{М}, X^{П}, X^{В}\}$ – the set of all variables of the state area of handling wastes in the region: formation, collection, unauthorized removal, sorting and processing, sorting and composting, sorting and burning, removal on landfills, recyclable materials in the region;

$X^{У}_{\Sigma}$, $X^{З}_{\Sigma}$, $X^{Н}_{\Sigma}$, $X^{Р}_{\Sigma}$, $X^{К}_{\Sigma}$, $X^{М}_{\Sigma}$, $X^{П}_{\Sigma}$, $X^{В}_{\Sigma}$ – the total amount of waste, generated in the region; collected at all points of collection; illegally housed in unauthorized dumps; sorted and processed at waste processing factories, composting factories, combustion factories; sorted and removed at the landfills and authorized wastes landfills in the region; the total amount of recycled material collected in the region.

Sources of wastes formation are conventionally divided into objects of housing stock $(\sum_{sN=1}^{n^{Y}N} X_{sN}^{y})$, enterprises, organizations and institutions $(\sum_{sP=1}^{n^{Y}P} X_{sP}^{y})$, as well as objects of public use and street litter $(\sum_{sC=1}^{n^{Y}C} X_{sC}^{y})$. The wastes is then collected unitary $(\sum_{iR=1}^{n^{3}R} X_{iR}^{3})$ or selectively $(\sum_{iU=1}^{n^{3}U} X_{iU}^{3})$. In this case, the separate collection may be the same in the region (two-, triplex, etc $(\sum_{iU=1}^{n^{3}U} X_{iU}^{3} = \sum_{iU_1=1}^{n^{3}U_1} X_{iU_1}^{3} + \dots + \sum_{iUn=1}^{n^{3}Un} X_{iUn}^{3})$ or different. In addition, some of the secondary resources of the population can be taken to the points of reception of recycled materials $(\sum_{iC=1}^{n^{3}K} X_{iC}^{3})$. Some of the wastes is removed to unauthorized dumps $(\sum_{m=1}^{n^{H}} X_{m}^{H})$. Then the equation of balance for the s source has the form

$$X_s^{У} = X_s^{УВ} + X_s^{УЗ} + X_s^{УН}, \qquad (1)$$

where $X_s^{УВ}$ – the total mass of selected resource-based components of waste at the points of collection or in the corresponding containers;

$X_s^{УЗ}$ - total mass of collected waste;

$X_s^{УЗ}$ $X_s^{УН}$ - total unauthorized waste.

There are two possible options for using the owner of the recovered resources. The first one - the owner of the secondary resources puts them on the points of collection, and the income received is his property. The other – is to send resources to specialized points of collection (separate collection), and revenue from their implementation is obtained by an organization that collects them on behalf of the region. As a stimulus the region can reduce the amount of payments for the acceptance of sorted wastes, to carry out campaign work. Then, accordingly, the extracted resources are separated by the owner in so way:

$$X_{sp}^{УВП} = \alpha_s \alpha_{sp}^{В} \beta_{ps}^{у} \beta_p X_s^{у} = \alpha_{sp}^{В} X_{sp}^{УВ}, \qquad (2)$$

where $X^{УВП}{}_{sp}$ – number of second-rate resources, of p from s sources, which is sent to all points of collection of recycle; α_s – coefficient of sorting waste, $\beta_{ps}^{у}$ – coefficient withdrawal p type recycled materials from waste that can be sorted, in s owner of waste; β_p – potential average content of p type secondary resources in waste of region; $\alpha_{sp}^{В}$ – coefficient of division of secondary resources of p type of s owner who are transferred to the points of the general fee and points of reception of recycled materials; $X_{sp}^{УВ}$ – quantity of selected secondary materials s owner of p type.

Waste from i item of the collection is distributed to the n_T factories and $n_П$ landfills, then the balance equation for the i point of the waste collection has the form

$$X_i^{З} = \sum_{j=1}^{n_P} X_{ij}^{ЗР} + \sum_{j=1}^{n_M} X_{ij}^{ЗМ} + \sum_{j=1}^{n_K} X_{ij}^{ЗК} + \sum_{k=1}^{n_П} X_{ij}^{ЗП} + \sum_{j=1}^{n_B} X_{ij}^{ЗВ} = X_i^{ЗР} + X_i^{ЗМ} + X_i^{ЗК} + $$
$$+ X_k^{ЗП} + X_i^{В} \qquad (3)$$

where $X_{ij}^{ЗР}$, $X_{ij}^{ЗМ}, X_{ij}^{ЗК}, X_{ik}^{ЗП}, X_{il}^{ЗВ}$ – waste streams from i item collection on a j factory from processing, composting, combustion, κ landfill, l item recycling of secondary materials.

Balance equation for j factory sorting and recycling waste (4); burning waste (5); their composting (6); waste disposal at landfills and landfills (7) can submit so:

$$X_j^{P} = X_{jП}^{P_П} + X_{jB}^{P_B} + X_j^{РП} = \sum_{j=1}^{n_P} X_j^{P} (\sum_{p=1}^{n_T} \overline{\beta_p} \beta_p^{p}) X_j^{P} + \sum_{j=1}^{n_p} \sum_{k=1}^{n_П} X_{jk}^{РПТ} + \sum_{j=1}^{n_p} X_j^{РПТ} \qquad (4)$$

$$X_j^{З} = \sum_{i=1}^{n_З} X_{ij}^{ЗМ} = X_j^{МВ} + X_j^{МП} = \sum_{j=1}^{n_M} X_j^{M} (\sum_{p=1}^{n_T} \overline{\beta_p} \beta_p^{M}) X_j^{P} + + \sum_{j=1}^{n_p} \sum_{k=1}^{n_П} X_{jk}^{МПП} + \sum_{j=1}^{n_M} X_j^{МПГ} + \sum_{j=1}^{n_M} X_j^{МПР} \qquad (5)$$

$$X_j^{K} = \sum_{i=1}^{n_З} X_{ij}^{ЗК} = X^{КВ} + X^{КК} + X^{КПП} + X^{КПГ} + X^{КПР} = \sum_{j=1}^{n_K} X_j^{M} (\sum_{p=1}^{n_T} \overline{\beta_p} \beta_p^{K}) +$$
$$\sum_{j=1}^{n_K} X_j^{КК} + \sum_{j=1}^{n_K} \sum_{k=1}^{n_П} X_{jk}^{КПО} + \sum_{j=1}^{n_K} X_j^{КПГ} + \sum_{j=1}^{n_K} X_j^{КПР} \qquad (6)$$

$$X_j^{П} = X_k^{ЗП} + X_k^{РПТ} + X_k^{МПП} + X_k^{КПП} + X_k^{НП} = \sum_{i=1}^{n_З} X_{k_i}^{ЗП} + \sum_{j=1}^{n_p} X_{k_j}^{РПТ} + \sum_{j=1}^{n_M} X_{k_j}^{МПП} + \sum_{j=1}^{n_K} X_{k_j}^{КПП} + \sum_{m=1}^{n_H} X_{kM}^{НП} \qquad (7)$$

$$X_m^{H} = X_m^{ЗН} = \sum_{S=1}^{n_З} X_{mS}^{ЗН} = X_m^{НЗ} + X_m^{НП} \qquad (8)$$

where $X_{jП}^{P_П}, X_{jB}^{P_B}$ – the flow of recycled materials for processing by the owner or for processing to another owner;

$X_j^{РП}$ – flow of waste residues from the j transformation plant to remove (compaction $X_j^{РПТ}$ - solids and $X_j^{РПР}$ liquid);

$\beta_{pj}{}^{P}$ – coefficient withdrawal of p type secondary resources on j waste recycling factory;

$\overline{\beta_p}$ – average content of p type secondary resources in the region;

$X_j^{ЗМ}$, $X_j^{МВ}, X_j^{МП}$ – flow of waste from all collection points on j factory from burning, waste

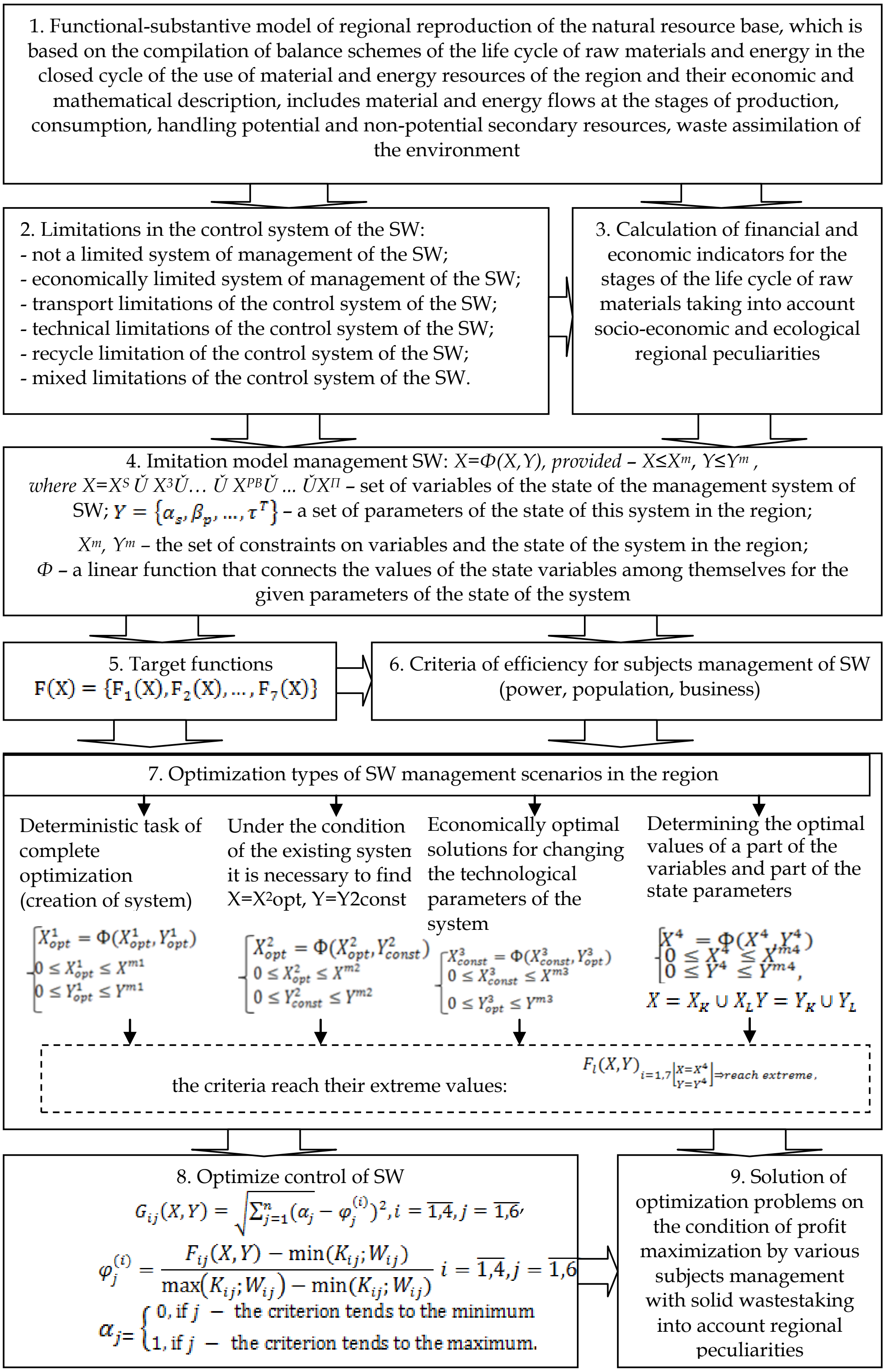

Fig. 2. **Optimization model for solid waste management in the region**

Author's elaboration

In this case, the only integral criterion in the process of solving the optimization problems management of SW can be used the sum of squares of deviations of normalized target functions (F_j, $j_{=\overline{1,6}}$) from their maximum and minimum values (K_{ij} and W_{ij} – best and worst meanings *j* criterion in *i* tasks of optimization of the system of SW ion handling).

In order to reveal the general dependencies of the solutions of the SW control problems, analytical solutions of one-dimensional deterministic optimal control problems are formed, based on the replacement of the linearly-perturbing dependence of the integral flow SW, which passes through waste collection points, waste treatment factories and polygons to a nonlinear continuous function. These dependencies allow to calculate the optimization characteristics of solid waste management for different subjects management of SW (fig. 3).

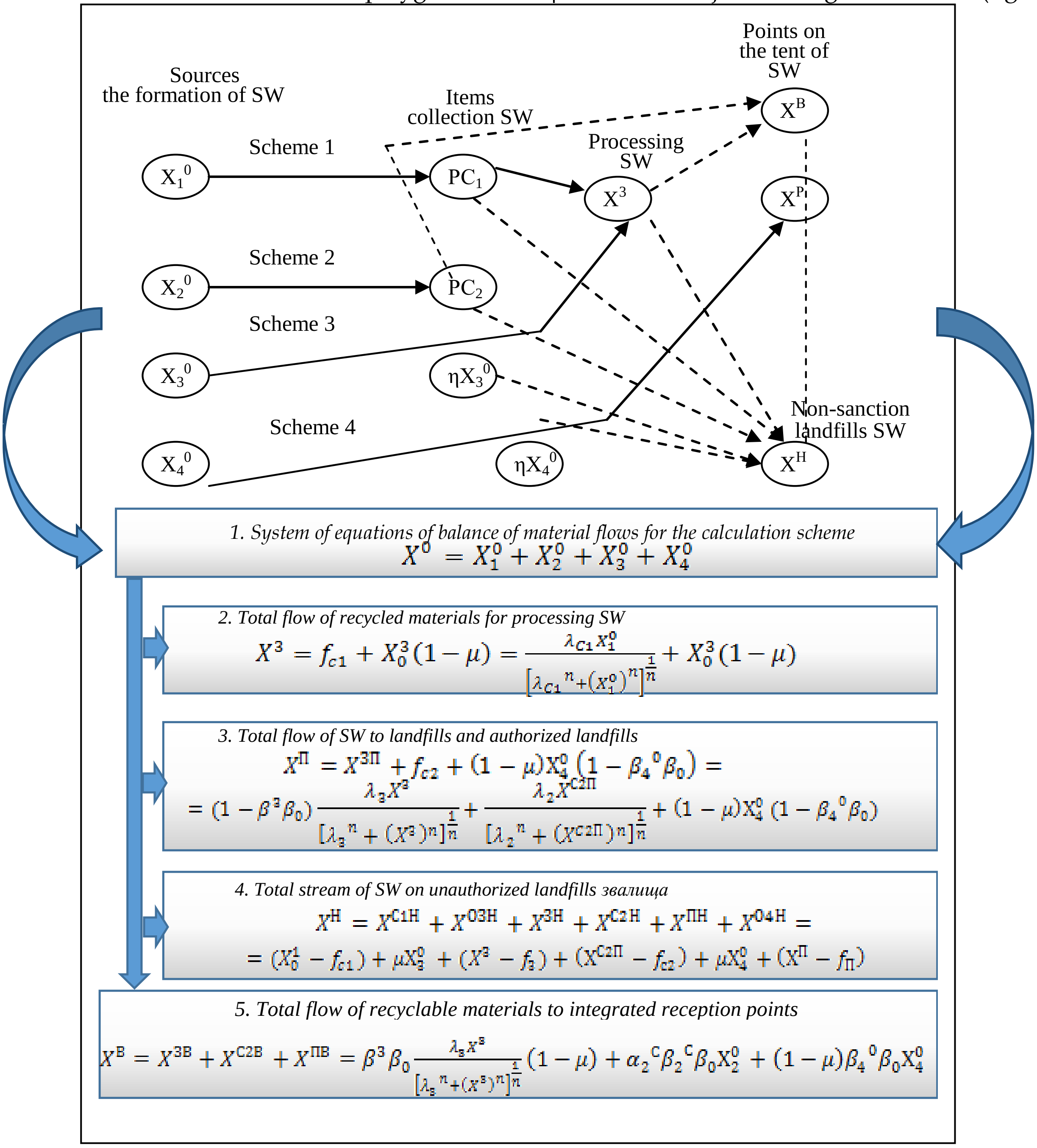

Fig. 3. Calculated balance scheme of integrated flows potentially and non-captively reuclable in the region (author's elaboration)

Author's elaboration

On the figure 3 the following notation has been adopted: $X_1^0, X_2^0, X_3^0, X_4^0$ - integral streams of potential and non-potential secondary resources at the input of each of the solid waste disposal schemes; $\beta_0, \beta_2{}^C, \beta_3^0, \beta_4^0$ - average weighted coefficients of the content of secondary resources in solid waste (β_0), their removal on reception point, owners of SW (X_3^0, X_4^0) in accordance; $X^{3B}, X^{C2B}, X^{ПB}$ - integral streams of secondary resources entering the integrated reception points of secondary resources; μ - the coefficient of unconsciousness of «SW owners», which determines the fraction of waste that the owner will send for unauthorized removal in order to obtain «imaginary» profit; $X^{O3H} X^{O4H}, X^{O1H} X^{O2H}, X^{3H}, X^{ПH}$ - losses of recycled materials, which are caused by objective and subjective factors of the treatment with SW system in the region.

In practical we can use presented model and it can be represented such on the example of the Poltava region. In the Poltava oblast annually, about 480 thousand tons (1.6 million m3) of solid domestic wastes are produced, which are removed on 377 authorized landfills and landfills of SW and 4.5 million tons of industrial wastes (of which 200 thousand tons are hazardous wastes) [14]. Average level of using waste as secondary resources in industry is about one third (about 30%), and domestic wastes - about 8% of the total mass [15].

Considering regional features of Poltava region, we can distinguish the following target functions of optimization management of SW:

1) ecological risk to the health of the population from the sphere of SW treatment:

$$V = \sum_{n=1}^{N} Y_n \cdot R_n = \left(\sum_{n=1}^{N} 1 - exp\left\{\ln(0.84)\left[\frac{C}{\text{ГДК}\cdot K_e}\right]^b\right\}\right) = (\gamma \sum_{i=1}^{n}[\sum_{j=1}^{J} \delta_j \cdot \sum_{i=1}^{I}(\sum_{k=1}^{K} V_k M_k e^{-ht}) \cdot C_i a_i] + \varphi \sum_{i=1}^{I} a_i b_i (l - E - \mu W) \cdot C_i + (BP + PP) \rightarrow min \quad (9)$$

Where Y_n – economical loss for pollution environment from dealing with SW, UAH ; R_n– the health of the population from the sphere of treatment SW; C – the average concentration of substance entering the human body during life; K_e – coefficient of dangers which is determined dependent from the class danger of substance; b – coefficient of inefficiency; γ,φ – constants whose numerical value is established taking into account inflation; δ_j – coefficient the relative danger of atmospheric air pollution over areas of different types of j; V_k– theoretical potential for the formation of methane from the organic component of SW, m³/year; M_k – mass an organic component in the total waste, t/t; h – the constant of the formation of methane from organic waste; t - time from the moment of opening of the polygon, years; C – is a mass destiny and harmful substances in the total volume of biogas (filtrate); a_i– indicator relative aggressiveness i harmful substance; b_i – an indicator of the relative ecological hazard of dumping of harmful substances in the reservoir; l – total volume of water inflow, m³ / year; E – volume of evaporation and transpiration of water, m³/year; μ– absorbing ability waste; BP– shortfall profit of the region from extraction lands under objects handling of solid waste from economic circulation, UAH; PP – losses from land pollution, UAH;

2) maximizing profits with minimal investment in the area of handling solid waste:

$$D = \sum_{t=0}^{T}[\left(\theta_t + U_t - \sum_{t=1}^{T}[\frac{1}{(1+i)^t} \cdot (A_t \cdot X_t + B_t \cdot Y_t + C_t \cdot Z_t + E_t + F_t) - \text{H}_{зt}\right) \rightarrow max, \quad (10)$$

where U – profit from the processing of resource cost fractions, UAH; θ – payment for acceptance of wastes; i – discount rate; t – periods of functioning of area treatment with SW, year; A– money for recycling minus profit from sales resource cost fractions, UAH / t; B – money for collection and transportation of SW, UAH / t; C – money for burial of SW, UAH / t; X – - mass of SW, that come in for recycling, t; Y - mass of SW, which is transported to the landfill, t; Z – general amount solid waste, removable, and the remainder from processing, t; E, F– costs for opening factory (station), landfill which reworking waste, UAH; H_3 – how much costs lands that coming out from agricultural turn around as a result of pollution, UAH;

3) energy intensity of area handling with SW [16].

At this accepted limitation have recirculation character.

Results of integrated modeling for five modernization scenarios of a systems with handling with solid wastes for the search task $X=X^3_{const}$, where $Y=Y^3_{opt}$, (the set of criteria reaches extreme values) on fig. 4.

Notes: * *The first scheme.* The current situation persists.

The second scheme. In place of existing landfills, regional landfills are introduced (seven landfills to ensure the complete removal of the TV, taking into account the maximum logistics of transport, two of which serve the city of Poltava and Kremenchug with a capacity of 200 thousand tons, and five with a capacity of 50 thousand tons.

The third scheme. Construction of four garbage processing plants (total capacity 1.2 million m3). The balance is exported to TV landfills (in addition - seven landfills with a capacity of 50 thousand tons.) *The fourth scheme.* Construction of two waste incinerators (Poltava, Kremenchug), additional seven landfills with a capacity of 50 thousand tons.

The fifth scheme. Construction of two plants for biocompoundation, in addition to seven landfills with a capacity of 50 thousand tons (tab. 1).

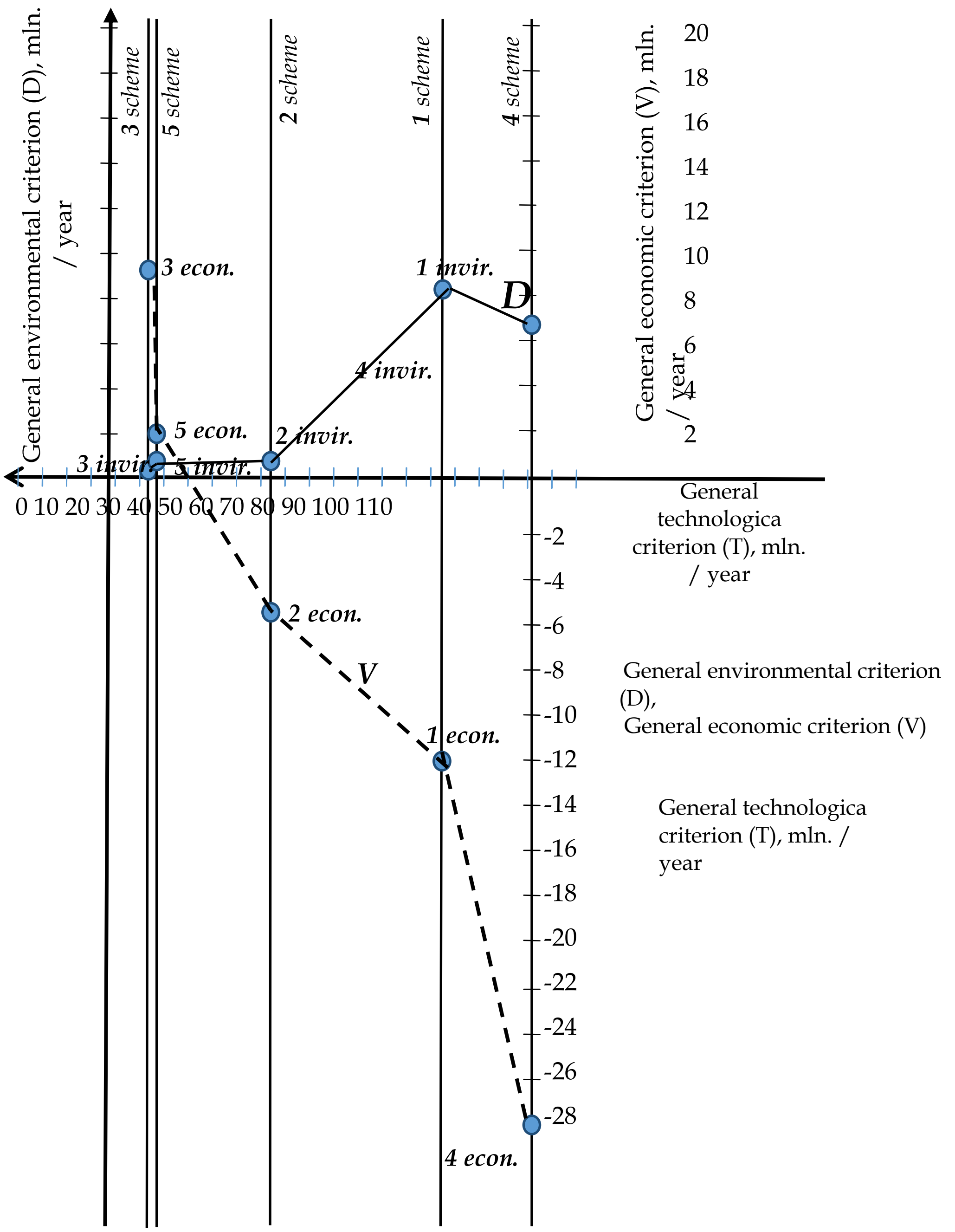

Fig. 4. **Optimization of generalizing criteria of various technological solutions for management of solid wastes on the example of the Poltava region**,
where: econ. – economic; invir. – ecological, 1-5 - waste management schemes.
Author's elaboration

Conclusions. Based on the developed balance schematics of life cycle of solid waste in the region- is scientifically grounded an optimization model for management of wastes management. Since the set X is wider than the set of connections in the functional *Φ*, that this model has set of permissible solutions and accordingly offers the choice of the best of them, taking into account the target functions. Thus, the developed model allows solving the problems of optimization of the development area of solid waste management with a given set of variables parameters for a specific type of waste life cycle. The expected results of implementing optimization strategies are a comprehensive solution to the economic, social and environmental challenges of the region, ensuring economical using of primary raw materials, and fuel-energy resources of the regions of Ukraine.

This optimization of general criterias of solid waste management on the example of the Poltava region made it possible to conclude that from the economic, ecological and technological point of view the most effective solution is the third, is construction (to build) four factories for reworking waste (total capacity 1.2 million m^3) and 7 landfills with a capacity of 50 thousand tons, which is provided minimal economic risk, but annually economic effect is 9,88 million UAH.

Table 1

Comparison of the current situation with possible scenarios for the technological re-equipment of SW coverage in the Poltava region

Scheme	*Atmospheric pollution*			*Pollution of the water environment*			*Soil contamination*			*Total contamination*	
	Risk	*Economic damage, mln. UAH*	*Economically estimated risk, UAH million*	*Risk*	*Economic damage, mln. UAH*	*Economically estimated risk, UAH million*	*Risk*	*Economic damage, mln. UAH.*	*Economically estimated risk, UAH million*	*Economic damage, mln. UAH*	*Economically estimated risk, UAH million*
1 scheme	0,19	14,62	2,75	0,3	9,26	2,79	0,26	15,20	4,02	39,07	9,58
2 scheme	0,04	0,04	0,0	0,276	0,08	0,02	0,26	2,65	0,69	2,79	0,71
3 scheme	0,02	0,04	0,0	0,02	0,048	0,01	0,02	0,94	0,01	1,03	0,02
4 scheme	0,46	6,60	3,69	0,57	0,93	0,53	0,59	3,88	2,21	11,42	6,52
5 scheme	0,00	0,01	0,0	0,02	0,03	0,01	0,02	0,91	0,01	0,95	0,02

Author's elaboration

Most dangerous for health of the population, as well as the most expensive is the construction of factories where waste will be burning. Situation on nowadays, although characterized by the lowest cost, is unacceptable, since it is characterized by the greatest environmental risks (9.58 million uan).

Based on model management area of recourse with solid domestic waste formed algorithm definition of optimal management strategies and mechanisms for their implementation, which allows solving the problems of optimize development area of handling with solid waste with a given set variables and parameters of system state for a particular type life cycle this area. The developed model has a set of admissible solutions and, accordingly, offers the choice of the best of them taking into account the target functions. The practical application of this model is proved on the example of the Poltava region on the basis of optimization of three target functions: the ecological risk to the health of the population from the area of handling with solid waste; maximizing profits with minimal investment in this area; energy intensity of the waste management system.

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Аннотация.

Плаксієнко В. Я., Самойлік М. С., Писаренко П. В. Мультифункціональне моделювання регіональної системи управління твердими відходами з урахуванням синергічного ефекту.

У статті сформульовано балансову схему життєвого циклу твердих відходів регіону, що дозволило розробити еколого-економічну модель оптимального управління сферою поводження з відходами на регіональному рівні та визначити оптимізаційні сценарії управління даною сферою при теоретично оптимальних значеннях параметрів. На основі моделі управління сферою поводження з твердими відходами сформовано алгоритм визначення оптимальних управлінських стратегій і механізмів їх реалізації, який дозволяє вирішувати поставлені задачі оптимізації розвитку сфери поводження з відходами при заданій множині змінних і параметрів стану системи для конкретного типу життєвого циклу даної сфери. Обгрунтовано практичне використання даної моделі на прикладі Полтавської області на основі оптимізації трьох цільових функцій: екологічний ризик здоров'ю населеннявід сфери поводження з ТВ; максимамізацію прибутку при мінімальних вкладеннях у дану сферу; енергоємності системи поводження з відходами.

Ключові слова: *сфера поводження з твердими відходами, оптимізаційна модель, регіон, вторинні ресурси, екологічна безпека, сталий розвиток.*

Abstract.

Плаксиенко В. Я., Самойлик М. С., Писаренко П. В. Мультифункциональное моделирования региональной системы управления твердыми отходами с учетом синергетического эффекта

В статье сформулировано балансовую схему жизненного цикла твердых отходов региона, что позволило разработать эколого-экономическую модель оптимального управления сферой обращения с отходами на региональном уровне и определить оптимизационные сценарии управления данной сферой при теоретически оптимальных значениях параметров. На основе модели управления сферой обращения с твердыми отходами сформирован алгоритм определения оптимальных управленческих стратегий и механизмов их реализации, который позволяет решать поставленные задачи оптимизации развития сферы обращения с отходами при заданном множестве переменных и параметров состояния системы для конкретного типа жизненного цикла данной сферы. Обоснованно практическое использование данной модели на примере Полтавской области на основе оптимизации трех целевых функций: экологический риск здоровью населения от сферы обращения с ТВ; максимизации прибыли при минимальных вложениях в данную сферу; энергоемкости системы обращения с отходами.

Ключевые слова: *сфера обращения с твердыми отходами, оптимизационная модель, регион, вторичные ресурсы, экологическая безопасность, устойчивое развитие.*

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ОСОБЛИВОСТІ ЗМІСТОВНОГО НАПОВНЕННЯ КАТЕГОРІЇ «МАРКЕТИНГ»

Липовий Д. В. Особливості змістовного наповнення категорії «маркетинг».

В статті проаналізовано з точки зору історичного розвитку змістовне формування категорії «маркетинг», розкрито існуючі особливості формування та провадження маркетингової діяльності через