Methodology for determining costs for environmental actions in land management

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Abstract

This article addresses the issues of the methodology for determining the costs of environmental measures in land management. The article specifies a mathematical model for determining the costs of environmental protection; calculating factors such as determining the volumes of the main types of harmful substances of harmful emissions and other factors such as the quality of the composition of water and capital costs during water treatment. Mathematic model could be used in process of planning buildings and land management to forecasts future spending. The main point of this work is the determination of water pollution in the water supply process and how much this factor affects the reclamation state of the soil.

Keywords: capital investments, wind and water soil erosion, household waste volumes, net income.

I. INTRODUCTION

Environmental protection measures for the given land management is one of the main directions envisaged in the conditions of irrigated agriculture. Therefore, the development of a methodology for determining the costs of such events and their implementation in the preparation of land management projects has a certain practical value in the Republic of Uzbekistan at the present stage.

II. METHODOLOGY OF RESEARCH

The costs of environmental protection measures in the area of an ecological disaster of the irrigated zone are determined by the number of expenses necessary to prevent the use of contaminated water and for irrigation and domestic needs, wind and water erosion of soils, secondary salinization the cost of creating sanitary protection zones, air purification systems, as well as the costs of disposal and disposal of industrial waste harmful emission including agricultural losses due to land allotment for the construction of these facilities and the organization of waste storage and disposal sites.

The costs of environmental protection measures provided for in the land management schemes and projects are determined by the amount of current annual expenses) and capital investments in the implementation of environmental protection measures reduced to the annual dimension taking into account the time factor.

Capital investments in the implementation of environmental protection measures in the schemes and projects of land management are determined by aggregated indicators or by the estimated cost of environmental protection objects.

Currently, inland management projects, the collector-drainage network is not considered an environmental measure, which is not true, since, in our opinion, it plays only an environmental role (preventing salinization / water logging).

Therefore, it must be included in environmental facilities and the costs associated with its construction in the capital costs of environmental measures.

The number and composition of environmental protection objects are determined on the basis of the existing assessment and the forecast for the future environmental situation in the land use territories.

In this case, there is a need to determine the volume of formed harmful substances (emissions) in the territory. They consist of atmospheric emissions, soil pollution, water sources in the territory.

Consider the methodology for determining the volume of the main types of harmful substances formed in agricultural enterprises, as well as determining the capital costs of their reduction or complete destruction.

We suggest determining emissions of gas, lead, and other harmful substances from vehicles, agricultural machinery, and heating systems into the atmosphere using the formula:

\[ V_{ai} = \sum_{i=1}^{n} \sum_{j=1}^{m} \omega_j \beta_{ij} \]  

(A.1)

In (A.1) \( V_{ai} \) is the volume of air emissions, \( \beta_i \)-type of pollutant, \( t \)- demand in the \( oj \)-th form of fuel
or its used amount, \( t \); - the volume of the \( i \)-th type of emissions forming from the combustion of a \( j \)-type of fuel, i.e.

Dust and other harmful emissions into the atmosphere are determined for each facility individually, based on the technological features and production volume of each of them, and then summed over the entire landmass.

Volumes of household waste and sewage from settlements can be determined by the formulas:

\[
V_c = \frac{H \cdot q}{1000}; \quad (A.2)
\]

\[
V_0 = \frac{H \cdot m}{1000}; \quad (A.3)
\]

In (A.2) and (A.3) \( V_c, V_0 \) are waste volumes and wastewater per day, respectively, \( t / day, m / day \), \( H \) is the design (existing) population, people, is the estimated rate of generation of household waste per inhabitant per day, \( kg / day \), \( m \) - the rate of water disposal per inhabitant per day, \( l / day \).

The volumes of the waste and wastewater producer are determined to take into account the characteristics of the production facilities separately for each of them and then are summarized throughout the territory.

Livestock waste is determined on the basis of the project (existing) livestock of agricultural animals, according to the formula:

\[
V_j = \sum_{i=1}^{n} N_i \cdot n_j \quad (A.4)
\]

In (A.4) \( V_j \) is the total daily volume of livestock waste, \( t / day \), \( N_i \)- design (existing) livestock of agricultural animals of the \( n_i \)-th species, heads, \( n_j \) is the output rate of experiments from one structural head of animals of the \( i \)-th species per day, \( kg / day \).

The volume of pollutants coming from irrigation water depends on the quality of the water and is determined separately for each harmful substance contained in it according to the following formula:

\[
V_B = \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{P_i M_j \alpha_{ij}}{1000} \quad (A.5)
\]

In (A.5) \( V_B \) is the total amount of harmful substances coming from irrigation water, \( t \); \( P_i \)- sown area of the \( j \)-th crop, \( ha \), \( M_j \)- irrigation rate, \( i \)-th crop, \( m / ha \); \( \alpha_{ij} \)-content, \( j \)-th type of harmful substances in 1 \( m^3 \) of irrigation water, \( kg / m^3 \).

Capital expenditures for environmental measures in the schemes and projects of land management are determined by the formula:

\[
K = \sum_{i=1}^{n} K_i \quad (A.6)
\]

In (A.6) \( K \) is the cost of construction of the \( i \)-th environmental facility, thousand soums.

The number of capital expenditures for water treatment plants and installations, waste storage and disposal facilities is determined by their estimated cost.

a) for farms in areas of new development and irrigation

\[
K = \sum_{i=1}^{n} P_i \frac{N_{Hi}}{1000} \cdot S \quad (A.7)
\]

In (A.7) \( P \) is the land area of the \( i \)-th massif (depending on the soil mechanical composition, salinity and depth of groundwater, etc., various massifs require different specific lengths of CLO, \( ha \). \( N_{Hi} \)- standard (rational) length of BWW per 1 \( ha \) for \( i \)- massif, \( m / ha \), \( S \)- aggregated costs for the construction of 1 \( km \) of collector-drainage network, sum.

b) for farms of the old irrigated zone

\[
C = \sum_{i=1}^{n} \sum_{j=1}^{m} C_{ij} \quad (A.8)
\]

In (A.8) \( C_{ij} \) are the current costs of the \( i \)-th conservation facility of the \( j \)-th species.

Operational expenses and depreciation deductions in projects and land management schemes are determined by aggregated indicators in the established percentage of deductions from capital investments for environmental protection measures.

Losses associated with the allotment of land for the construction of environmental facilities (\( C \)) are
determined by the amount of net income lost from the area occupied by environmental facilities:

\[ C_0 = P \times D \quad (A.9) \]

In (A.9) \( P \) is the area of land occupied by environmental facilities (taking into account the areas allocated for the organization of waste storage and disposal sites as well as land occupied by artificial water receivers in lower places of the farm territory where collector-drainage and other wastewater is discharged), ha, \( D \)- average farm income per 1 hectar.

The area of land occupied by nature conservation sites (\( P \)) is defined as the sum of the areas of various nature conservation sites (\( P_j \)):

\[ P = \sum_{j=1}^{n} P_j \quad (A.10) \]

The size of investments in water treatment plants and in air-treatment plants and plants, waste storage and disposal facilities, etc., are determined by their estimated cost.

When developing land management schemes and projects, it becomes necessary to select the most environmentally effective options for design decisions.

When comparing options that provide the same level of quality of the surrounding natural environment, the indicator of environmental efficiency is the minimum of total annual expenditures and capital investments reduced to the annual dimension according to the well-known formula (A.11):

\[ C_t + E_t K \rightarrow \text{min} \quad (A.11) \]

From the content of the above measures to protect nature and improve the use of land resources, we can conclude that many of them are directly or indirectly related to the organization of the territory not only on large landmasses but also within individual farms.

At the same time, it is not excluded, but it is expected that there will be a need for a number of other activities, such as legal, organizational, technological and other nature, related to the creation of the most favorable working conditions, life and recreation of the population both in the city and in the countryside. Therefore, in our opinion, at this stage in the development of land management, the development of measures to protect nature and improve land resources should be an integral part of all land management projects.

The detail and depth of the solution to these issues should be determined by specific conditions and tasks.

III. CONCLUSION

Based on the above studies, it can be concluded that the nature conservation measures in land management projects which developed for irrigated agriculture conditions should take into account the specific conditions of place and implement integrated land management projects which drawn up on the basis of such comprehensive measures, and provide the objective opportunities for solving the problem of land and other natural resources of the republic.

References

6. The Importance of Monitoring and Controlling Saline Soils in the Republic of Uzbekistan