The main task of this study consists in evaluating the state of funding for environmental protection measures and substantiating the ability of the state and local communities to increase investments in environmental protection. To this end, the following was studied from 2010 through 2020:

1) mechanisms of filling and using funds of the Environmental Protection Fund of state and local budgets;

2) proportions of distribution of environmental revenues and expenditures between levels of the budget system. The analysis results showed that opportunities of the public economy sector in terms of environmental investment are reduced because of imperfect distributing mechanisms:

– the budgetary expenditures for environmental protection measures;

– the environmental tax revenues to the budget funds.

It was established that a significant part (about 70 %) of the "environmental" funds of the public economy sector is directed to non-priority goals and measures. Less than half of the amount of environmental tax revenues is allocated for financing environmental activities. This does little to address pressing environmental issues and hinders the sustainable development of the country. There was a significant discrepancy between the tax burden on "polluters" of water bodies (3 % of the total amount of environmental tax) and the levels of their polluting activities (30–40 % of all costs of the national economy to eliminate the effects of pollution). In order to increase public investments in the reproduction of the environmental and natural resource potential:

1) ways to improve the mechanism of using the Fund of Environmental Protection were proposed;

2) reserves for increasing capital environmental investments from the budget have been identified

Keywords: budgetary expenditures on environmental protection, budgetary investments in environmental protection

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ANALYSIS OF STATE OF PUBLIC FINANCING OF ENVIRONMENTAL PROTECTION

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1. Introduction

The world community is concerned about the deterioration of the global environmental situation and is aware of the need to increase green investments. According to the report of the UN and the World Economic Forum titled the State of Finance for Nature (2021), approximately USD 133 billion were invested in 2020. Of these, public funding amounts to USD 115 billion, and private funding amounts to USD 18 billion. At the same time, the report emphasizes the insufficiency of such sums and the need to raise investments in environmental protection projects three times by 2030 and four times by 2050 [1].

Countries of the European Union (EU) have undertaken and are implementing the commitments to implement legal norms in the field of environmental protection enshrined in 29 EU directives and regulations. Environmental woes of the countries aspiring to join the EU and having to undertake similar environmental commitments require a significant increase in funding for environmental projects. In the process of implementing the EU legislation, countries of Central and Eastern Europe received significant financial support from various EU funds. However, such assistance is not directly provided to some countries. Therefore, there is a need to mobilize investment in environmental activities from all possible sources. In particular, through increasing public investment, intensifying private investment, and stimulating the inflow of foreign investments in environmental activities. The current state of development of the financial market of some countries aspiring to join the EU does not allow to

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fully involve the well-known world practice mechanisms for external limitation of investment risks [2]. This greatly inhibits the inflow of foreign investments, in particular in environmental activities. Therefore, the assessment of investment abilities of state and local budgets for environmental protection is important and relevant, especially in the context of financial decentralization.

The increase in capacity of the public sector to invest in environmental protection is extremely important. The possibility of financing the construction and modernization of waste treatment facilities, installations for cleaning from dust and gas, arrangement of landfills, household waste processing plants, etc. depends on the size of these investments. In addition, public investments can be used to support studies in the field of environmental technologies and thus promote "green" innovations.

2. Literature review and problem statement

The increasing importance of environmental protection has led to the need to calculate costs in this area. The hypothesis of the U-shaped ecological curve of Kuznets (ECK) is the basis for substantiating the costs of environmental protection. It states that there is a negative relationship between welfare growth and environmental quality at the early stages of the country's development. But as incomes and general well-being get higher, the country pays more attention to environmental pollution, more money is allocated to its protection and, as a result, the environmental quality improves. The ECK hypothesis has been confirmed in more than 30 scientific papers [3].

In practice, more and more empirical studies are questioning the reliability of the conclusions that the state's attainment of a high-income level will guarantee environmental sustainability as flexibility of expenditures relative to income is lower than the expected level [4]. Contrary to the ECK hypothesis, the impact of economic growth on the level of environmental pollution differs significantly between countries with high incomes which is determined by the method of income distribution in the country [5].

Economists first became interested in the environment in the 1970s and the idea of estimating the environmental costs came later. Public spending on the environment is constantly rising in the EU. Its level depends on the economic situation in the country [6]. Larger economies tend to have higher public spending. However, the level of economic development of the country is not a determining factor for the level of public "environmental" spending. The level of environmental spending in most EU countries is more of a policy element and is not related to the income level [6].

The higher the level of public spending on the environmental sphere, the better the environmental indicators [7]. A study [8] conducted in 11 Central European countries for the period 2001–2012 shows that increased public spending on the environment has a positive impact on the economic growth of these countries. The positive impact of public environmental spending on economies of the countries that have suffered significantly from the global financial crisis of 2008–2009 was particularly strong. The results of modeling conducted in [9] show that growth of public environmental spending will lead to GDP growth. In particular, according to estimates [9], GDP will grow by an average of 0.36 % at a 0.01 % increase in public environmental spending.

However, many scholars see the environmental policy as a burden on economic growth, at least in the short and medium terms. In their opinion, such a policy increases costs without increasing production and limits the range of technologies. The results of study [10] conducted for Romania show that there is an inverse relationship between the country's economic growth and the cost of environmental protection. Other studies [11] show that environmental costs can stimulate businesses to environmental activities while maintaining their business activity and competitiveness in the market. This is possible if such costs are directed to environmental studies, environmental technological innovation, and the dissemination of environmental technologies. That is, there is no single generally accepted idea of the relationship between economic growth and environmental costs.

Previous studies on environmental costs were focused mainly on determining the conditions of environmental activities [12], the levels and structure of costs [13], and their effectiveness [14]. Assessing the effectiveness of public spending on the environment is a difficult problem as the level of expenditures is influenced by many factors [14]. Scientists around the world are studying various components of this issue. For example, the study [15] is devoted to determining the factors determining the effectiveness of public environmental expenditures. Indicators of efficiency of budgetary expenses for environmental protection were generalized and estimated in [16]. The issue of assessing the effectiveness of budget expenditures on environmental protection was studied in [17]. Some scientists offer new approaches to assessing the effectiveness of "environmental" costs. In particular, the system of indices of efficiency of state expenditures on environmental protection was presented in [18]. The study [19] is devoted to methods of multicriteria assessment of the effectiveness of current municipal expenditures on environmental protection. To determine the effectiveness of municipal expenditures on environmental protection based on a balanced assessment of economic, social, and environmental criteria are proposed [20]. Analysis of the results of scientific studies necessitates adaptation of world experience to specific conditions of the national economies [21].

A significant body of research addressed the effectiveness of public spending on environmental protection in the context of fiscal decentralization. The results obtained in [22] show that fiscal decentralization is negatively correlated with the cost-effectiveness of environmental protection. Therefore, the central government should strengthen oversight of local government spending on the environment. Authors of the study [23] came to the conclusion that as fiscal decentralization increases, local governments raise expenditures on environmental protection. However, such expenditures, in their opinion, are inefficient and do not give the expected result. The study [24] shows that environmental spending in regions is technically inefficient. GDP per capita in regions has a significant positive impact on the efficiency of budget expenditures on environmental protection and the level of urbanization and industrialization of the province has a significant negative impact.

The commitments taken to implement the EU Environment Directives require a significant increase in public investments in environmental protection. Rising public spending on the environment of the countries that are in the process of fiscal decentralization reform is not producing the desired results and does not provide the proper environmental impact.

Therefore, there is a need to identify factors affecting the decline:

1) efficiency of public expenditures on environmental protection;

2) investment potential of public financing the environmental protection.

3. The aim and objectives of the study

The study objective consists in determining the potential of state and local communities to grow their investments in environmental protection. This will provide an opportunity to suggest ways to improve the mechanism of public funding for environmental protection and identify reserves to increase capital environmental investments from the budget.

To achieve this objective, the following tasks were set:

– study the structure of costs and sources of funding, the level of funding for environmental protection in the national economy;

– identify the impact of the mechanism of filling the Environmental Protection Fund of the state and local budgets on the adequacy of financial resources for the implementation of environmental protection measures;

– identify the impact of the mechanism of using the Environmental Protection Fund of state and local budgets on the effectiveness of expenditures for environmental protection measures and explore opportunities to improve the structure of public "environmental" expenditures;

– identify reserves for increasing the amount of investments in environmental protection by the state and territorial communities.

4. The study materials and methods

Probably, the investment potential of public financing of environmental protection is reduced by the current system of public "environmental" expenditures. To confirm this hypothesis, the state of financing of environmental measures and mechanisms for filling and using the Fund of Environmental Protection of state and local budgets was studied. For this purpose, the procedure of structure analysis and construction of dynamics series was used and an assessment was made:

1) capital investments and current expenditures on environmental protection in Ukraine by sources of financing;

2) distribution of environmental expenditures among levels of the budget system and budget programs;

3) distribution of environmental tax revenues between levels of the budget system and general and special funds of budgets;

4) the level of implementation of financing the environmental expenditures planned in the consolidated budget.

Analytical calculations were performed based on the materials of the State Statistics Service of Ukraine, the State Treasury of Ukraine, the State Audit Office of Ukraine for the period of 2010–2020.

Compliance of the tax burden on "polluters" with the levels of their environmental and destructive activities was assessed using the method of comparison. The results of the analysis of the structure of environmental tax revenues, the structure of the national economy's expenditures on environmental protection, and the structure of Ukraine's eco-investment needs for the implementation of EU legislation were compared and logically generalized.

In order to study the theoretical foundations of financing the environmental protection costs, the method of a systematic review of scientific literature on this topic was used.

The practice of financing environmental protection in Ukraine and abroad has been studied through a systematic review of public information sources, namely, EU strategic documents and state environmental policy of Ukraine, legislative and regulatory acts of Ukraine, electronic resources of the Internet. The procedure of comparative analysis was used to compare the mechanism of using funds used to finance environmental protection measures in Ukraine and EU countries.

5. The results of the study of state and possibilities of public financing of environmental protection

5. 1. Expenditures on environmental protection in the national economy

According to the Environmental Performance Index in 2020, Ukraine ranks 109th among 180 countries [25]. This indicator indicates not the best state of the environment and viability of ecosystems, as well as the low level of solving environmental problems. Improvement of the situation is impossible without ensuring an adequate level of funding for environmental measures.

Environmental protection includes measures directly related to the prevention, reduction, or elimination of pollution or other damages caused to the environment as a result of industrial activities. Measures for environmental protection are financed at the expense of the state budget of Ukraine, local budgets, funds of enterprises, institutions and organizations, voluntary contributions, and other funds [26].

In nominal terms, the costs of environmental protection in Ukraine show a trend of steady growth and increased more than 3 times from 2010 to 2020. However, the increase in environmental protection expenditures is only nominal and is due to inflation and devaluation processes in Ukraine. The dynamics of the share of environmental expenditures in GDP fluctuate at the level of 1–1.5 % (Fig. 1) and has tended to decrease since 2013. Certainly, this decline distances Ukraine from the goals of sustainable development and fulfillment of its commitments in the field of environmental protection.

Total expenditures of all sources of funds for environmental protection in Ukraine are lower than in the EU countries which spend at least 2 % of GDP on environmental protection. It should be noted that from the standpoint of sustainable development, the limit of optimal environmental spending is 10 % of GDP which is 10 times more than that allocated in Ukraine. According to preliminary estimates, Ukraine's investment needs for implementation of EU legislation in the field of environmental protection amount to EUR 42–43 billion (approximately 1/3 of Ukraine's annual GDP) [28] and should be realized within 12–15 years [29]. This requires significant capital investments, operational and administrative costs. At the same time, the level of annual expenditures of the national economy on environmental protection is significantly lower than the investment needs to implement requirements of EU Directives. In particular, the cost of environmental protection in Ukraine was about 1.4 billion euros in 2019.

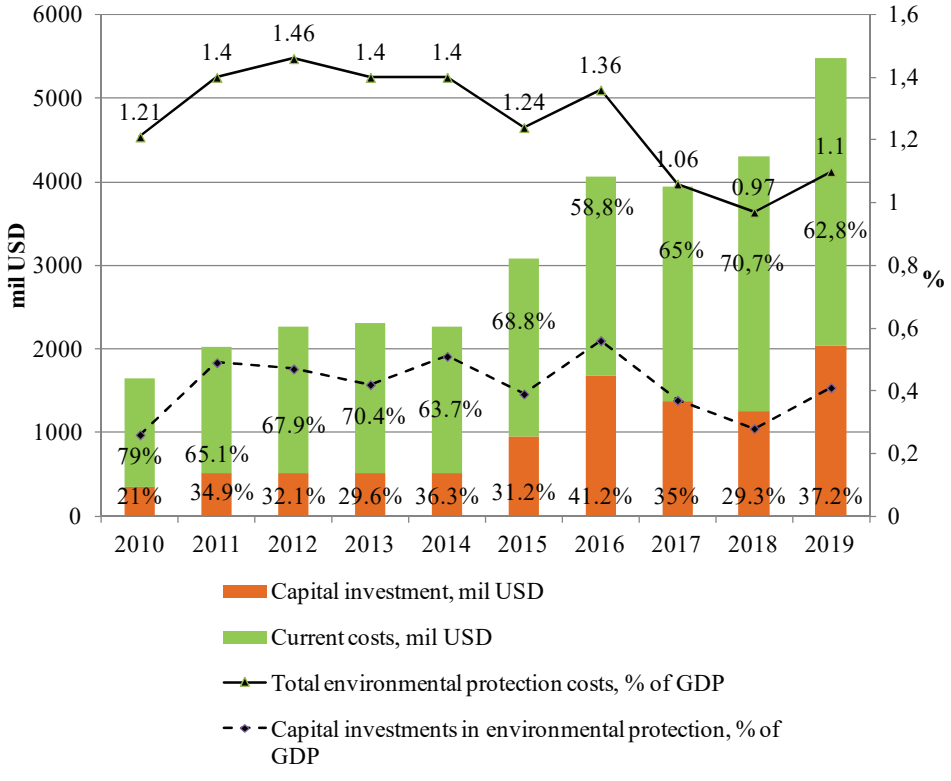

Fig. 1. Dynamics of capital investments and current expenditures on environmental protection in Ukraine for the period of 2010–2019

Compiled on the basis of [27]

The impact of state macroeconomic policy on environment state can be traced mainly through the level of investments in environmental protection. For a long time, current expenditures in environmental protection in the structure of the national economy's expenditures prevailed over capital investments. This indicates the current rather than strategic focus of environmental spending in Ukraine. Capital investments fluctuate at the level of 21–41 % of all environmental expenditures which does not fully contribute to the formation of a resource base for modernization, reconstruction, and technical re-equipment of environmental infrastructure. The predominance of current expenditures in total environmental protection expenditures (7 %) is observed in most EU member states [30].

However, the generalization of experience of Central and Eastern European countries shows that implementation of EU environmental directives is accompanied by a significant increase in environmental investment [28] which is not observed in Ukraine. Despite the positive growth trend of the share of capital investments in the structure of total expenditures on environmental protection, capital investments on environmental protection remain very small: 0.3–0.5 % of GDP (Fig. 1). This indicates a slow pace of renewal of non-negotiable assets for environmental protection.

The nominal amount of capital investments in environmental protection has been increasing since 2000. Reduction of investments in environmental protection in Ukraine since 2010 was caused by the global financial crisis of 2008 and the national financial crisis of 2014 (warfare in eastern Ukraine, loss of territory, production capacity, and GDP). The highest value of total capital investments was observed in 2016. This increase is due to the devaluation of the national currency and significant capital investments in a number of environmental infrastructure facilities in the field of waste management (Fig. 1, 2). The increase in funding was due to the urgent elimination of consequences of environmental disaster at the Hrybovytsia landfill in the Lviv region. In Ukraine, there is a negative practice of compensating for the consequences of natural and man-made disasters through subventions from the state budget instead of compensating them by insurance companies and taking preventive measures [31].

The structure of expenditures on environmental protection in Ukraine has insignificant dynamics. There are three large groups of expenditures totaling 85–90 % in the structure of environmental expenditures in the national economy, namely:

1) waste management (37 % in 2019);

2) return water treatment (29 %);

3) protection of atmospheric air and the problems caused by climate change (17 %).

Total shares of all other environmental expenditures are very small. The smallest amounts of costs are directed to research activities for environmental purposes. They do not exceed 0.5 % of total environmental costs in Ukraine. This has a negative impact on the development and implementation of advanced innovative technologies in the field of resource use.

Environmental protection projects in Ukraine are financed mainly from enterprises' own funds. Their share in total environmental expenditures ranges from 67 % to 92 % and the share of public sector expenditures ranges from 2.3 % to 8 %.

During 2010–2016, there was a decrease in the share of capital environmental investments financed from the enterprises' own funds: from 77.7 % to 29.1 % (Fig. 2). This reduction is a negative consequence of the financial crisis.

While own funds of economic entities are used mainly to solve their own environmental problems, the use of public financial resources should be aimed at eliminating environmental and destructive processes within the state, regions, and local communities. Balancing public and private sources of funding in the implementation of strategic investment planning is important and relevant. For example, in Turkey, 73.5 % of total expenditures for implementation of EU environmental legislation falls on the public sector and only 26.5 % on the private sector. Note that Turkey is the most comparable to Ukraine in terms of industrial potential and environmental status.

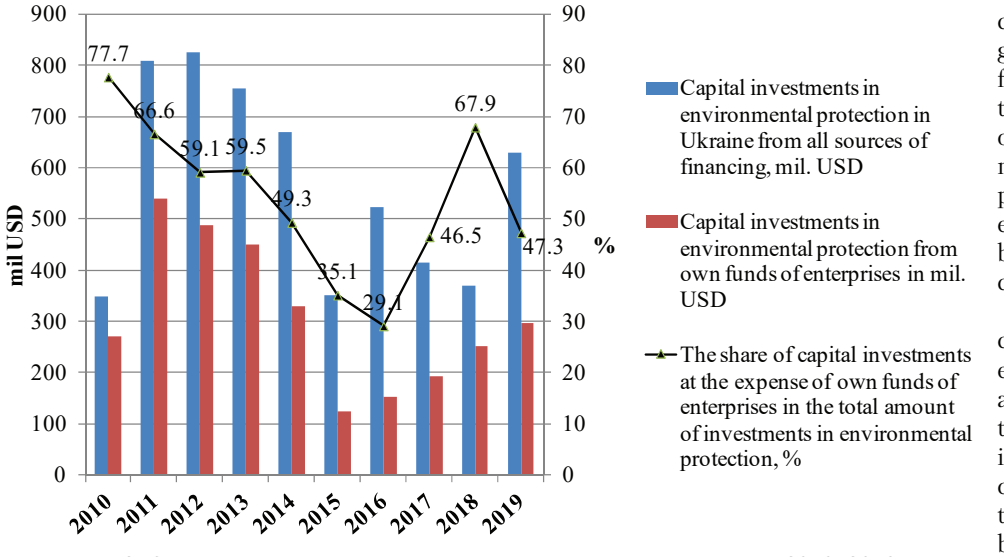

Fig. 2. Capital investments for environmental protection in Ukraine in 2010–2019
Compiled on the basis of [27]

5. 2. The mechanism of formation of budget funds for financing the environmental protection measures

State funding for environmental protection is provided in Ukraine through state and local environmental funds and the State Fund for Regional Development (in very small amounts). It should be noted that subvention to local budgets from the state budget as an element of funding for environmental protection was abolished in 2020 The Environmental Protection Fund has been established at the state and local levels as a part of respective budgets to finance environmental protection measures and the measures related to rational use and conservation of natural resources.

The Environmental Protection Fund is formed at the expense of:

1) a part of the funds received from payment of environmental tax;

2) a part of fines for "pollutants";

3) voluntary contribution of enterprises, institutions, organizations, and citizens [32].

Because of the lack of proper administrative tools, fines for violation of environmental legislation do not constitute a substantial source of replenishment of environmental funds in Ukraine. Receipt of the environmental tax is the main source of the formation of the Environmental Protection Fund. The share of other sources is very small.

In Ukraine, there is no direct link between the receipt of environmental tax in the budget and the financing of expenditures on environmental protection. Expenditures of the consolidated budget for environmental protection exceed the amount of environmental tax during the entire period of its existence (except in 2014 when the budget was sequestered). Funds from the environmental tax are enough to finance only 50–80 % of environmental protection measures planned in the consolidated budget of Ukraine (Table 1). This indicates its fiscal insufficiency.

In addition to the fiscal insufficiency of the environmental tax, there are also problems with the targeted use of funds from its receipt. Since its introduction, the environmental tax has been distributed between levels of the budget system and between special and total budget funds. The expenditures which have clearly defined areas of use are sent through the special fund, i.e. the receipt of environmental tax in the special fund of the budget is directed to the expenditures on environmental protection while expenditures on general functions of the state, i.e. provision of educational and medical services, social protection, law enforcement, defense, etc. are taken from the general fund. Until 2014, all revenues from the environmental tax in Ukraine were transferred to a special budget fund from which expenditures on environmental measures were made (Table 1). Since 2014, a significant part (from 32% to 46 %; 100 % in 2015) of the environmental tax has been transferred to the general fund of the budget (Table 1). This creates a generally opaque system of using funds from the environmental tax [34] and makes the fiscal function of this tax significantly dominant over its preventive function.

Table 1

Actual structure of financing the expenditures on environmental protection and the actual structure of distribution of environmental tax in Ukraine for 2011–2020

Budget	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Distribution of environmental tax among consolidated budget funds										
General fund, %	0	0	0	54	100	32	37	46	46	69
Special fund, %	100	100	100	46	0	68	63	54	54	31
Distribution of environmental tax among levels of the budget system										
State budget, %	47.7	44.9	60.6	74.8	45.1	32.5	36.6	56.5	63.3	61.3
Local budgets, %	52.3	55.1	39.4	25.2	58.9	67.5	63.4	43.5	36.7	38.7
Percentage of environmental expenditures for which there are insufficient funds from the environmental tax (%)										
State budget	36.1	30.6	54.5	139.2	27.3	33.9	36.3	53	61	49.8
Local budgets	134.9	133.5	153.6	137.5	107.4	227	114.1	71.4	65.6	86.4
Consolidated budget	58.5	53.2	69.7	138.7	48.7	79.7	63.9	59.7	62.6	59.6
Distribution of actual expenditures on environmental protection by levels of the budget system, %										
State budget	77.3	78.1	82.1	74.6	73.3	76.3	64.5	63.6	64.9	73.3
Local budgets	22.7	21.9	17.9	25.4	26.7	23.7	35.5	36.4	35.1	26.7
Percentage of actual expenditures on environmental protection, %										
State budget	61.2	51.4	50.2	52.5	77.2	77.1	75.8	76	76.5	80
Local budgets	51.2	46.1	35.1	31.9	62.1	55	59	63.8	68.7	64.3
Consolidated budget	61.2	51.4	50.2	52.5	77.2	77.1	75.8	76	76.5	79.9

Note: Compiled on the basis of [33]

Since 2018, the centralization of revenues from the environmental tax in the state budget is observed: the central government is gradually taking over twice the share of revenues from the environmental tax (Table 1). This is entirely not in line with the concept of the decentralization reform launched in 2015 which provides for the creation of territorial communities and their empowerment with broad powers and the resource base to exercise those powers. In particular, the reform envisages the institutional allocation of a significant share of natural resources and environmental payments to territorial communities to solve environmental problems. The central government cannot respond flexibly to the environmental needs of regions. Therefore, centralization of environmental tax revenues will cause financial difficulties in implementing the tasks of greening individual regions which differ significantly in the state of their environment and, accordingly, in financial needs for its improvement.

5. 3. The mechanism of budgetary financing the environmental protection measures

Expenditures on environmental protection range from 0.7 % to 1.1 % in the structure of expenditures of the consolidated budget of Ukraine. Countries similar to Ukraine in terms of environmental pollution, direct 1.4–2 % of total public spending in this area [35]. The amount of "environmental" expenditures is growing but, in general, the consolidated budget expenditures on the environment did not exceed 0.3 % of GDP. Such budget expenditures in European countries account for up to 1.4 % of GDP [36].

Most of the expenditures on environmental protection are made from the state budget of Ukraine. At the same time, they make up no more than 1.3 % of state budget expenditures. Percentage of the state budget expenditures on environmental protection that could be financed by the environmental tax to the state budget varied from 27 % to 61 % in 2011–2020 (excluding 2014). At the level of local budgets, expenditures on environmental protection through the receipt of environmental tax by 2018 could be financed in full (Table 1). At the same time, the state budget accounted for 64–82 % of all budget expenditures on environmental protection in Ukraine while local budgets account for only 18–36 % (Table 1).

Since 2011, the mechanism of financing environmental measures from the State Fund for Environmental Protection provides for the use of funds from budget programs in accordance with the plans of environmental and resource-saving measures of main administrators [37, 38]. The state budget funds allocated to the Ministry of Environmental Protection and Natural Resources of Ukraine (hereinafter the Ministry) which are aimed at environmental protection are distributed among the budget programs defined by the order of the Ministry for each budget period. Budget programs are financed (Table 2) at the expense of both general and special funds of the state budget. Funds of the State Fund for Environmental Protection are sent to the Ministry to implement the budget program called Implementation of Environmental Measures (Table 2).

Of all the budgetary programs that correspond to the Environmental Protection direction according to the functional classification of expenditures, only 3 programs (codes: 2701270, 2701500, and 2701530) provide funding for environmental measures. At the same time, their share in the total amount of expenditures on environmental protection decreased from 85.9 % to 8 % during 2016–2020 (Table 2). That is, in fact, only 8 % (in 2020) of state budget funds allocated in Ukraine for environmental protection are used directly for environmental protection measures. Accordingly, 92 % is directed to financing budgetary institutions in the Ministry management of environmental protection, i.e. to perform the management function.

Direct financing of environmental measures is the goal of the program titled Implementation of Environmental Protection Measures (code 2701270). The analysis shows that only a small part of the environmental tax revenues is directed to this program (18.8 % in 2018 and 1.59 % in 2020) (Fig. 3).

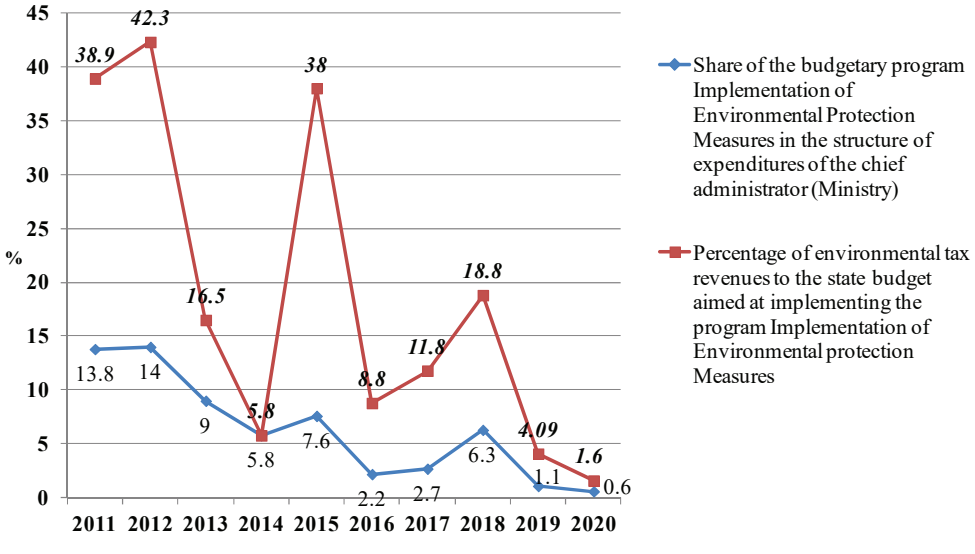

Fig. 3. Dynamics of indicators of financing the budgetary program titled Implementation of Environmental protection Measures in 2011–2020

Compiled on the basis of [33]

Thus, analysis of data (Fig. 3) has revealed a tendency to shift the compensatory function of environmental tax (the use of the environmental tax to compensate for damages caused to the environment by "polluters") to implement the management function of the state. However, this reduces investment opportunities of the public sector in terms of environmental protection despite the constant growth of environmental tax rates in Ukraine.

The problem consists not only in the very low funding of environmental protection measures in Ukraine but also in the misuse of this program. According to the report of the State Audit Office [39], funds of the program Implementation of Environmental Protection Measures in 2018–2019 were also used in addition to

1) protection of atmospheric air;

2) protection and rational use of water resources;

3) ensuring and rational use of industrial waste and household waste;

4) protection and rational use of natural plant resources and wildlife resources, the share of which in 2019 was less than 5 % (up to 55 % in 2018) were also used in such areas as:

5) preservation of the nature reserve fund;

6) organization of environmental impact assessment;

7) science, information, and education, training;

8) measures for informatization;

9) ensuring participation in activities of international environmental organizations, the introduction of an economic mechanism to ensure environmental protection;

10) repayment of liabilities of previous periods.

Table 2

Actual structure of financing environmental protection in terms of budgetary programs, %

Budgetary program code	Budgetary program	2016	2017	2018	2019	2020
2701010	General management and administration in the field of ecology and natural resources	2.4	6.3	8.1	24.2	9.6
2701040	Applied scientific and technical developments, implementation of study results under state target programs and state orders in the field of environmental protection, financial support for training of scientific personnel	1.6	3.4	4.3	5.4	9
2701090	Advanced training and retraining in the field of ecology and natural resources, training of scientific and pedagogical staff	0.8	3.1	2.5	2.4	6.3
2701160	Preservation of the nature reserve fund	9.2	29.2	28.1	34.1	66,5
2701270	Realization of environmental measures	8.5	21.1	44.9	13.5	8
2701500	Realization of measures to implement priorities of environmental development	5.2	12	1.5	3	0
2701530	State support for measures aimed at reducing emissions (increasing absorption) of greenhouse gases including insulation of social security facilities, development of international cooperation on climate change	72.2	24.6	10.2	17	0
–	Other	0.1	0.2	0.4	0.3	0,6
2701000	All budgetary programs for environmental protection...	100	100	100	100	100
–	...of them, budgetary programs that provide funding for environmental measures	85.9	577	56.6	33.5	8

Note: Compiled on the basis of [33]

In particular, in 2018–2019, under the program Implementation of Environmental Protection Measures, 206 measures were funded in the field of "conservation of nature reserves" [39]. 31.2 % of this amount (39 measures) was aimed at strengthening the material and technical base of nature reserves. Such use of funds does not meet the objectives of the program Implementation of Environmental Protection Measures and does not contribute to the improvement of the environment. These measures should be funded by the program 2701160 Conservation of Nature Reserves which provides for the maintenance of nature reserves. Also, the program Implementation of Environmental Protection Measures provided in 2018–2019 funding of strengthening the material and technical base of a research institution and State Ecological Academy of Postgraduate Education. Such measures should be financed by relevant budget programs of the Ministry aimed at maintaining such institutions, i.e. through other programs.

Other examples of misuse of these programs include the Ministry's funding for the reconstruction of the central alley in 2018–2019 and the construction of a complex of facilities in Sofiyivka National Dendrological Park. At the same time, 83 % of the allocated amount was financed by the budget program Implementation of Environmental Protection Measures. The remaining 17 % were taken from the program Implementation of Measures to Implement Priorities of Environmental Development [39]. Thus, the program Implementation of Environmental Protection Measures finances a number of measures (on average, 70 % of the amount) that are not directly related to achieving the environmental effect.

The mechanism of use of the funds intended for financing environmental measures [38] provides for the inclusion of such measures in the plan in accordance with the approved List [40]. During its existence, the current List [40] was amended 18 times, each time expanding the activities and now it contains 85 items. At the same time, the presence of a mandatory environmental effect due to the implementation of measures and its calculation is not provided by regulations. As a result, the budget requests submitted by administrators to the Ministry for allocation of funds from the Environmental Protection Fund have a number of shortcomings, namely, they

1) do not contain data on the expected level of their impact on the environment;

2) do not meet basic criteria for the priority of environmental measures;

3) are not aimed at reducing the adverse impact on the environment.

The budget requests are mainly aimed at strengthening the material and technical base of public administration bodies which corresponds to the current List [40]. As a result, the current mechanism assumes that the funds under the program Implementation of Environmental Protection Measures are not used to address pressing environmental issues and achieve environmental protection. Therefore, the effectiveness of their use is questionable. The lack of criteria and indicators of the effectiveness of environmental measures makes it impossible to assess the environmental impact of their implementation which has little effect on the solution of pressing environmental issues.

Since 2000, the EU countries have had a classification of environmental measures and expenditures including 9 environmental domains, namely:

1) protection of atmospheric air and climate;

2) wastewater management;

3) waste management;

4) protection and remediation of soil, groundwater, and surface water;

5) mitigation of noise and vibration;

6) protection of biodiversity and landscapes;

7) protection against radiation (including external security);

8) research and development;

9) other environmental protection measures.

However, for a measure to be considered an environmental protection measure, it must not only have a goal meeting the current classification but also meet the criterion of "ultimate goal", i.e. environmental protection.

Less and less money (from 14 % in 2011 to 0.6 % in 2020) allocated for the Ministry is spent for environmental protection measures aimed at preventing, reducing and eliminating environmental pollution (Fig. 3). Insignificant amounts of funding are allocated for key areas of Ukraine's environment, such as ensuring the rational use and storage of industrial waste, household waste, wastewater treatment, and air protection which does little to improve the environmental situation in Ukraine.

The effectiveness of financing the expenditures on environmental protection in Ukraine is very low. Under fulfillment of the planned amount of expenditures on environmental protection in the consolidated budget is from 24 % to 50 % (except 2014) (Table 1). This does not contribute to solving current environmental problems. In particular, under the program Implementation of Environmental Protection Measures, almost 40 % of unused funds were returned during 2018–2019. Too long approval and confirmation of the budgetary program passports cause systematic non-implementation of planned environmental protection measures. A request for funds for implementation of environmental protection measures under the budget program is the basis for consideration and inclusion of the measure in the plan of the Ministry of Environmental Protection and Natural Resources of Ukraine. For example, the plan of measures for 2018 was formed by the Ministry in July 2018 and approved by the Cabinet in September and the plan for 2019 was approved in August 2019. As a result, the term of implementation of environmental protection measures is too short, tender procedures are not fulfilled on time or canceled altogether and contractors do not properly fulfill their contractual obligations. As a result, the measures are not implemented and the funds allocated for budgetary programs are not used. Prolonged procedures of approving the budgetary programs are the main cause of significant underperformance of expenditures on environmental protection: from 20 to 50 % in the state budget and from 30 to 80 % in local budgets (Table 1).

There is a disproportion between the distribution of environmental protection responsibilities between state and local budgets and the distribution of the environmental tax assigned to the levels of the budgetary system for exercising these responsibilities. For example, local budgets received 52.3 % of the total environmental tax in 2011 (Table 1). These funds covered the planned local environmental protection measures by 135 % (Table 1). That is, local budgets could use the planned expenditures on environmental protection in full (100 %) at the expense of the environmental tax and 35 % of the funds would remain in surplus (Table 1). Instead, the planned expenditures of local budgets were fulfilled only by half (51.2 %). This trend continued until 2018. At the same time, revenues from the environmental tax were used mainly for the reconstruction of sewers, city parks, control of quarantine plants, etc., that is, not for the goals identified by ecologists as a priority. The rest of the temporarily free budget funds intended for financing environmental protection were placed on bank deposits in order to generate revenues of the development fund. Therefore, receipt of the environmental tax in the special fund of local budgets does not guarantee the targeted use of funds.

Expenditures on prevention and elimination of environmental pollution in the structure of local budget expenditures on environmental protection have been halved. On the other hand, the share of expenditures under the item "other activities in the field of environmental protection" (Fig. 4) which are in fact administrative expenditures, increased more than 5 times.

The analysis of expenditures under the item "Other activities in the field of environmental protection" in regional passports of budget programs shows that most of them are expenditures aimed at 2 main areas, namely:

1) information support of environmental activities (competitions, festivals, exhibitions, and other events);

2) organization and implementation of environmental education.

Thus, we can assert that the negative trend of using funds allocated for environmental protection for non-priority purposes is growing and the effectiveness of public spending on environmental protection does not fully ensure the sustainable development of Ukraine.

In the conditions of power decentralization (since 2015), the volume of financing the environmental protection measures at the expense of local budgets has increased (Table 1). In the structure of public investment in environmental protection, investments from local environmental protection funds account for a much larger share than investments from the state budget.

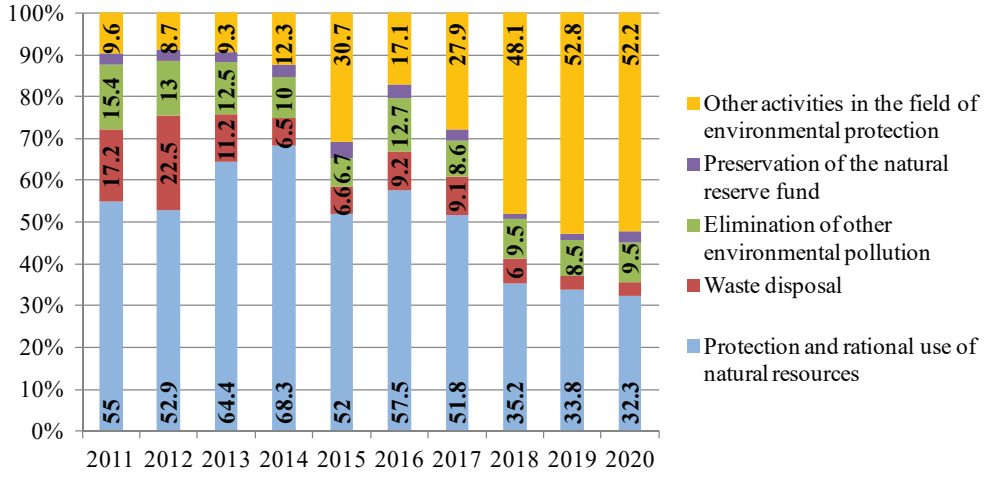

Fig. 4. Structural dynamics of environmental protection expenditures from local budgets in Ukraine in 2011–2020
Compiled on the basis of [33]

The priorities for financing environmental protection expenditures should be as close as possible to the environmental problems of specific areas. The Environmental Protection Fund in the structure of local budgets should remain

the main source of funding for the development of environmental infrastructure and restriction of eco-destructive activities. Therefore, the share of environmental protection tax contributions to local government budgets should be increased. However, there is a need to develop methodological approaches to determine the effective ways of implementation of state policy in the field of environmental protection at the level of local communities and strengthen public financial control over the targeted use of local budgets.

5. 4. Reserves for increasing public environmental investments and current environmental expenses

According to the functions of the environmental tax, revenues from its payment should be a source of funding for environmental protection measures and its amount should be sufficient to implement measures compensating for the damage caused to the environment by "polluters". Revenues from the environmental protection tax significantly exceed the state budget expenditures on environmental protection measures (Fig. 3). In particular, it is seen from Fig. 3 that for 1 UAH of environmental expenditures financed from the state budget in 2018 there were 3 UAH of revenues from the environmental tax, 18 UAH in 2019, and 44 UAH in 2020. The situation in local budgets is similar with regard to all expenditures on environmental protection (Table 1). This shows that the state can significantly raise the amount of environmental investments and current environmental expenditures, however, only in the case of appropriate changes in the budgetary legislation and full crediting of environmental tax revenues to the Environmental Protection Fund.

A significant part of the consolidated budget expenditures (up to 56 %) is allocated for the protection and rational use of natural resources which also provides for the protection and rational use of land and mineral resources [26]. At the same time, the rent for special use of natural resources is not linked to financing the projects of reproduction and protection of natural resource potential. The exception is the part of water resources rent which began to come to the Water Development Fund as a part of the general fund of state and local budgets in 2018. In EU countries, rent payments for the use of resources including energy taxes, transport taxes, and pollution taxes are environmental taxes. To increase public environmental investments, it is necessary to concentrate a part of natural resource payments in the Environmental Protection Fund to reproduce the relevant component of the natural resource potential. We are talking about the rent for the use of subsoil, special use of forest resources, and water.

Improving the environmental situation is impossible without the proper motivation of "polluters". Encouraging investment in environmental measures is a preventive way to protect the environment. For this mechanism to be effective, tax rates must be such that it is more profitable for enterprises to modernize production than to pay the tax. Therefore, the size of the environmental tax should be increased so as to motivate polluters to invest in modern treatment technologies and thus pay less tax without reducing their business activity. Despite the constant increase in environmental tax rates in Ukraine, financial motivation to reduce pollution is insufficient. This is because of the fact that the amount of environmental tax is insignificant compared to the income of such entities. Under such conditions, minimization of environmental tax for the payer is not an additional incentive to modernize and ecologize production [34]. In order for pollution payments to fulfill their main function, i.e. stimulation, they must ensure the payback of environmental protection measures at a level close to the payback period of the costs of basic production.

The structure of expenditures on environmental protection differs significantly in different European countries. For example, France, the United Kingdom, Spain, and Italy spend more than 50 % of their expenditures on the environment while Germany and Poland spend up to 20 %. For Turkey, the priorities are related to wastewater and drinking water (53 %), industrial emissions (27 %), waste disposal (18 %), and air protection (2 %). In general, the structure of the national economy's expenditures on environmental protection corresponds to the structure of Ukraine's investment needs for the implementation of EU legislation in the field of environmental protection (Fig. 5). This makes it possible to suggest that proportions of the cost of remediation correspond to the scale of the damage. However, there is a significant disproportion between the revenue of the environmental tax to the consolidated budget by the tax objects and the areas of financing the environmental protection measures.

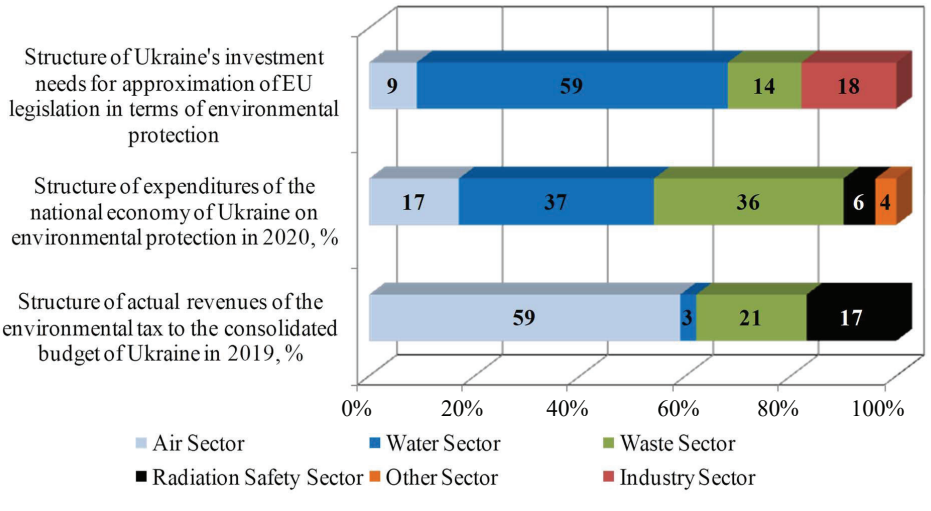

Fig. 5. Structure of environmental protection expenditures for sectors and structure of environmental tax revenues by the sectors
Compiled on the basis of [27, 28, 33]

The object of environmental tax includes:

1) volumes and types of pollutants emitted into the atmosphere by stationary sources;

2) volumes and types of pollutants discharged directly into water bodies;

3) volumes and types (classes) of disposed waste, except for volumes and types (classes) of waste as secondary raw materials which are disposed on own territories of economic entities;

4) the volume and category of radioactive waste generated as a result of activities of economic entities and temporar-

ily stored by their producers beyond the period established by special conditions of the license.

Revenues of environmental tax can be divided into four sectors according to the objects of taxation and types of environmental protection measures. The Air Sector, the Water Sector, the Waste Sector, and the Radiation Safety Sector should be financed mainly by receiving an environmental tax on relevant taxable items. The structure of sources of financing the budget expenditures for measures to preserve the sectors differs significantly from the structure of environmental tax revenues in the consolidated budget and from the structure of expenditures of the national economy to eliminate pollution (Fig. 5). This indicates a significant mismatch of the tax burden on environmental taxpayers to the levels of their polluting environmental and destructive activities.

During 2010–2020, revenues to the consolidated budget from "polluters" of the Air Sector accounted for 55–59 % of the total amount of environmental tax revenues. At the same time, the costs of environmental protection in the Air Sector are only 15–19 % of the total costs. In contrast, in the Water Sector, environmental tax revenues from pollutant discharges directly into water bodies account for only 3 % of the amount of environmental tax revenues. At the same time, costs of the national economy for wastewater and return water treatment, protection, and rehabilitation of groundwater and surface water accounted for 30–40 % of total costs (Fig. 5). That is, the burden of the environmental tax on "polluters" of water bodies is disproportionate to their damage to the environment [41, 42] and the cost of eliminating the consequences of their activity. Thus, the structure of the environmental tax revenue does not correspond to the structure of cost of elimination of the environmental damage consequences and therefore violates the principle of environmental taxation: "the polluter pays".

Polluting companies seek to share part of the tax burden with their consumers by raising the price of goods, labor, and services. This leads to the danger of reducing aggregate demand, business activity, reducing the number of jobs. However, the increase in the tax burden on the environmental tax on "pollutants" in the Water Sector is necessary to achieve fair taxation and is a reserve for increasing revenues of the Environmental Protection Fund.

Industrial enterprises which are members of large financial and industrial integrated associations are the main polluters of the environment in Ukraine. In particular, metallurgical enterprises and water utilities, as well as the economic entities engaged in the production and supply of electricity are the largest polluters of water bodies. Such associations (apart from water utilities) have a large capital, multibillion-dollar turnover, export orientation, and are able to finance capital-intensive environmental projects which will significantly reduce emissions and discharges of harmful substances into the environment. At the same time, they are very slow in ecologizing their business, implementing energy and resource-saving technologies, and modernizing their environmental protection infrastructure.

The state should force such associations and enterprises which are the main nature users and "polluters" of the environment to increase investment in its protection. This practice is common in market economies. The mechanism of state stimulation of the private sector to environmental protection activities should be aimed at ecologizing all stages of reproduction and create conditions under which it is economically advantageous to comply with established environmental regulations and restrictions. The experience of the European Union in stimulating environmental costs, in addition to an effective system of environmental taxation, provides a number of effective economic levers in a form of trade permits, subsidies, deposit return systems. Positive results of stimulating the business entities to increase environmental investment in China were achieved by creating environmental courts in the process of environmental justice reform [43].

The current situation in the national economy has put a significant number of enterprises, especially small and medium, on the brink of survival [44]. The best option for state aid to such polluting enterprises consists in stimulating or even directly financing the modernization of production and environmental measures under state programs. Subsidies to the private sector should be provided for the implementation of the most capital-intensive environmental projects through soft loans, state or municipal guarantees of loans for environmental activities, direct financing of environmental projects, etc.

In order to increase the volume of financing of capital environmental investments, it is necessary to use financial mechanisms of public-private partnership, in particular, in the field of waste management; wastewater collection, purification, and distribution; tourism, recreation, ensuring the functioning of irrigation and drainage systems. Applying such an approach will make it possible to shift to some extent the financial burden to the private sector.

Reserves for increasing public environmental expenditures in general, and capital investment in the environment, in particular, in our opinion are as follows:

1) expansion of the environmental tax base;

2) increase in environmental tax rates, especially in terms of taxation of discharges into water bodies;

3) direction of natural resource payments to the Environmental Protection Fund.

The growth of budget revenues from the environmental tax will lead to an improvement in the environment only if these revenues are spent on environmental measures and incentives for "polluters" to reduce the tax burden by modernizing production. However, raising environmental tax rates will not ensure the implementation of the function of environmental protection under the current procedure of distribution and use of collected funds.

6. Discussion of the results of analysis of the state of public financing of environmental protection measures

The obtained results confirm the assumptions that the current system of financing the public environmental expenditures reduces its investment potential.

Analysis of the structure of costs and sources of funding and assessment of the level of funding for environmental protection in the national economy showed that:

1) the level of total environmental expenditures in % of GDP is slightly lower in Ukraine than in the EU. However, given the much lower absolute size of GDP, we can say that there is insufficient funding for environmental protection to ensure sustainable development. This is also evidenced by the Environmental Performance Index;

2) although the structure of capital and current environmental expenditures in Ukraine (Fig. 1) corresponds to that

in the EU, the level of investment is insufficient for the implementation of EU environmental directives. Ensuring the sustainable development of the national economy and implementation of Ukraine's international obligations involve a significant increase in state investment in the reproduction of environment and natural resource potential. Therefore, the level of environmental spending in Ukraine should not depend on the level of the state income, but, as demonstrated in [7], it should be the result of a political decision;

3) Ukraine is in the process of implementing EU environmental directives. At the same time, the tendencies of this process differ from those in the countries of Central and Eastern Europe. Namely, there is no significant increase in environmental investments (Fig. 1) and the increase in environmental spending is only nominal and achieved due to inflation and devaluation processes.

Analysis of the formation of income sources for public expenditures on environmental protection shows the following:

1) fiscal insufficiency of the ecological tax: funds from its receipt are enough to finance only 50–80 % of environmental protection measures planned in the consolidated budget of Ukraine (Table 1);

2) non-transparency of the system of distribution of environmental tax revenues. A significant part (from 30 % to almost 50 %) of the environmental tax is transferred to the general fund of the budget (Table 1). Only a small part (from 42 % to 2 %) of environmental tax revenues is used to direct financing of environmental protection measures (Fig. 3).

3) centralization of revenues from the environmental tax in the state budget creates unfavorable conditions for ecologizing individual regions.

The obtained results testify inconsistency of the state environmental policy which consists in financing measures for environmental protection on a "residual basis".

Analysis of the mechanism of public expenditures shows a significant negative impact of the use of the Environmental Protection Fund on the effectiveness of expenditures on environmental protection measures. It was found that a significant part (16–92 %) of "environmental" funds of the public economy sec of (Table 2) is directed to programs that do not provide funding for environmental measures. Also, 70 % of the funds of the programs that provide funding for environmental measures are directed to non-priority goals and activities. As a result, the level of use of the Environmental Protection Fund for implementation of environmental measures at the level of both state and local budgets is insufficient. This does little to address the pressing environmental issues and does not increase opportunities for the public economy sector in terms of environmental investment.

The results obtained can be explained by the following:

1) the lack of criteria in Ukraine for assessing and normative determination of the effect of environmental protection measures and an effective system of planning and monitoring effectiveness of their implementation which leads to negative consequences, namely, to directing a significant part of funds of the State Fund for Environmental Protection to non-priority goals and activities as well as to their significant dispersion among a number of budgetary programs;

2) violation of terms of approval and authorization of budgetary programs which causes a decrease in quality of budget management in terms of environmental protection;

3) low level of state financial control over local budget expenditures which leads to misuse of funds in the field of environmental protection (Fig. 5).

The low efficiency of the mechanism of state and local budget expenditures on environmental protection significantly reduces their effectiveness. There are conclusions of foreign studies that the increase in public spending on the environmental sphere leads to a corresponding improvement in environmental indicators [7] which is not confirmed in Ukrainian reality. In contrast to [8] where simulation results in GDP growth due to increased public spending on the environment, this study allows suggesting that the suboptimal and inefficient system of allocation of public spending on environmental protection significantly underestimates the effect of the investment multiplier, and therefore has no a positive impact on economic growth. Without improving the mechanisms of formation and use of financial resources of the Environmental Protection Fund, the increase in expenditures on environmental protection will not give desired results.

The existing mechanism of using the funds of the Environmental Protection Fund needs to be significantly improved, namely:

1) the current List of activities related to environmental protection measures should be revised and brought in line with the strategic objectives of the state environmental policy;

2) it is necessary to develop and establish normative assessment criteria for approval of environmental protection measures with an indication of the environmental effect of such measures;

3) develop a new procedure of planning environmental protection measures which will contain the concept of "environmental effect", the criteria for its evaluation, and a mechanism for analyzing their effectiveness;

4) review budgetary programs and resulting indicators taking into account the degree of achievement of the public policy objectives;

5) verify the conducted environmental protection measures, the amount of their funding and develop a system of measures to respond to deviations from the program and their adjustment;

6) strengthen the state's financial control over the targeted use of local budgets.

An increase in public funding for environmental protection can be achieved by fully crediting the environmental tax to a special fund of budgets in the Environmental Protection Fund; expanding the tax base and increasing environmental tax rates, in particular, in terms of volumes and types of pollutants discharged directly into water bodies; assigning a part of natural resource payments to environmental ones with their direction to the Environmental Protection Fund. The analysis has revealed a significant discrepancy between the tax burden on "polluters" of water bodies (3 % of the total environmental tax) and levels of their polluting activities (30–40 % of all expenditures of the national economy to eliminate the pollution effects) (Fig. 5). Therefore, lifting the tax burden of the environmental tax on "polluters" of water bodies is necessary to achieve fair taxation and increase the Environmental Protection Fund's income.

Implementation of the proposed measures will create preconditions for ensuring the effectiveness of public expenditures on environmental protection and increase the investment potential of public funding for environmental protection.

The limitations inherent in the study consist in its locality, i.e. the conclusions are addressed only to Ukraine. The number, objectives of budgetary programs, and, accordingly,

the structure of expenditures of each program are constantly changing. This creates difficulties for analysis of environmental protection expenditures according to the program classification of the budget because of data incompatibility. The information base for analysis of budgetary programs can be formed only beginning from 2016 when the list of budgetary programs and their objectives remained unchanged. Therefore, an analysis of budgetary programs was conducted from 2016 to 2020.

Further development of this study includes the following:

– establishing an optimal for Ukraine ratio between public and private sources of investment financing to improve the environmental situation and increase "green" investment;

– establishing the optimal distribution of expenditure powers between state and local budgets in terms of environmental protection and sources of income to implement these expenditure powers in connection with the deepening of decentralization processes and the reform of local self-government.

7. Conclusions

1. Expenditures on environmental protection in Ukraine from all sources of funding have current, not strategic directivity. Investment support for environmental protection in Ukraine is at an insufficient level and the investment amount contributes little to the formation of the resource base for modernization, reconstruction, and technical re-equipment of the environmental infrastructure. This state can lead to irreversible negative impacts on the environment. Environmental protection projects in Ukraine are financed mainly from the enterprises' funds. The share of public funding is small and does not exceed 8 %. Funding for environmental protection from the budget is insufficient and needs to be increased.

2. Funds from the environmental tax are insufficient to finance environmental protection measures planned in the consolidated budget of Ukraine. A significant part of environmental tax revenues remains in the general fund. Less than half of the environmental tax revenues are used to finance environmental protection activities which does not enable the solution of current environmental problems. There is a disproportion between the distribution of environmental powers between state and local budgets and the distribution of the environmental tax assigned to the levels of the budgetary system for exercising these powers. An increase in the budgetary revenues of the environmental tax will improve the environment state only if these revenues are spent on environmental protection measures and encourage "polluters" to reduce the tax burden through modernizing their production.

3. Insignificant amounts of funding are allocated to key areas of Ukraine's environment, namely, to ensure rational use and storage of industrial waste, household waste, treatment of wastewater, and air protection. This situation does little to improve the environmental situation in Ukraine. A significant part (about 70 %) of "environmental" funds of the public economy sector is directed to non-priority goals and measures. Insufficient effectiveness of public spending on environmental protection does not ensure sustainable development of Ukraine, does little to promote the implementation of a rational state environmental policy and solution of pressing environmental problems.

4. Reserves for increasing capital environmental investments from the budget and increasing current environmental costs include:

1) crediting the environmental tax to the special fund of budgets in the Environmental Protection Fund;

2) expanding the tax base and increasing environmental tax rates, in particular, in terms of volumes and types of pollutants discharged directly into water bodies;

3) assigning of a part of natural resource payments to ecological ones with their direction to the Environmental Protection Fund, in particular, in the part of the rent for subsoil use, special use of forest resources and water.

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