FORMATION OF BUDGETARY AND TIME CONSTRAINTS ON THE IMPLEMENTATION OF ENVIRONMENTAL TAXATION IN UKRAINE: NATIONAL AND INTERNATIONAL ASPECTS*

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Abstract. Formation of a budgetary and time constraints system on the implementation of environmental taxes should be carried out in the format of integrated social, environmental and economic policy (economic, energy, social, environmental), and is largely influenced by political processes. It was found that the environmental taxes implementation required defining budget and time constraints as the leading parameters in the field of tax regulation of environmental quality and efficiency of natural capital on an entrepreneurial and innovative basis. The economic essence of environmental taxation in the national security system is revealed through their main tax functions (fiscal, regulatory, incentive). In addition to the functions of environmental taxes, dysfunctions have been proposed such as: burdening, inflation and counteracting. Effectiveness of the implementation of environmental taxes functions is carried out on the basis of an appropriate system of indicators of their effectiveness at the macro level (in particular, the effectiveness of environmental tax revenues, assessment of fiscal effectiveness, etc.), taking into account the environmental payments effectiveness in foreign countries. In this paper, taking into account the existing proposals, the emphasis is

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on the criteria (indicators) as follows: effectiveness assessment of revenues from environmental taxation (in this case, the ratio of tax revenues and public environmental costs); fiscal efficiency (effectiveness); assessment of the motivational nature of environmental taxation. It is also stated that the assessment of the effectiveness of target functions implementation in the national security can be detailed in certain areas (energy, economic and environmental security), as well as depending on the tasks of management decisions by economic entities. From these perspectives optimization of the environmental taxes structure taking into account national specifics has been proposed. Taking into consideration the national specifics of nature management in Ukraine, the list of environmental taxes has been selected on the certain principles as follows: deteriorization of the ecological state; import dependence (dependence on energy imports); high demand for environmentally destructive goods; powerful natural and resource potential.

A score assessment of environmental taxes compliance with the peculiarities of national nature management and national security has been proposed. It was stated that energy taxes have the maximum profitability potential and the highest eco – attributive efficiency. Also, a matrix of environmental taxes compliance with the criteria of fiscal and eco – attributive efficiency has been constructed.

1. Introduction

The costs for preventing environmental pollution and compensating for the negative consequences in the spatial and temporal, budgetary dimension, as well as in various sectors (industries) of the economy are objectively determined and acquire the status of socially necessary costs that must be taken into account and regulated in reproduction processes at different hierarchical levels of management (global, national, regional and local). *Environmental taxes* should become an effective organizational and economic mechanism for compensation and prevention of economic damage from pollution and eco – destructive state of natural resources at different spatial levels of management (national, regional and local), and thus ensure the achievement of *national (social, environmental and economic) security*.

Implementation of the environmental taxation system in Ukraine, increasing the effectiveness of the target functions of environmental taxes

requires development in the format of its reforming, transformation and modernization taking into account the foreign taxation experience. Since the current realities prove the existence of a large number of problems in the field of social, ecological and economic development of Ukraine, it is obvious that the environmental taxation system remains inefficient: first, in terms of determining the list of taxes, their rates and collection procedures; second, in terms of mobilized financial resources redistribution in the process of determining priority funding objectives; third, in terms of targeted use of mobilized financial resources [1].

The purpose of the research is to determine the strategic guidelines for the formation of budgetary and time constraints on the implementation of environmental taxation in Ukraine based on the assessment of functional effectiveness, taking into account the foreign experience.

The scientific novelty of the presented research is as follows:

– to identify the main components of the environmental taxation implementation in the format of the mechanism (system) of state regulation for environmental taxation;

– to deepen the substantive basis of environmental taxes functions based on the following indicators: assessment of the effectiveness of the use of revenues from environmental taxation; fiscal efficiency (effectiveness); assessments of the motivational nature of environmental taxation;

– a score assessment of environmental taxes compliance with the peculiarities of national nature management and national security.

2. Defining principles

The system of environmental taxes implementation requires assessment and regulation of budgetary, resource and time constraints, taking into account the specifics of national security actors. Mechanisms for achieving economic, energy, social and environmental security through the implementation of appropriate policies should ensure the maximum level of national security. The environmental taxes implementation requires defining the budget and time constraints as the leading parameters in the field of tax regulation of environmental quality and efficiency of natural capital on an entrepreneurial and innovative basis.

The formation of budgetary and time constraints in the environmental taxes implementation in the format of maximizing national security should

be carried out from the perspectives of integrated social, environmental and economic policy (economic, energy, social and environmental), and is largely influenced by political processes as well as international initiatives for the practical implementation of the principles of sustainable development [2–4]. The relationship between national security and sustainable development requires the definition of strategic and tactical strategies within a policy, regulation of the system of environmental taxes implementation from the standpoint of effective implementation of their target functions, as well as economic sectors ecologization. Thus, improving the environmental taxation development comes down to the transformation of the mechanism of state environmental and economic regulation of tax system in the field of environmental protection and entrepreneurial nature management.

Accordingly, the defining components of the environmental taxation system implementation are schematically presented in figure 1. Assessment of the effectiveness of target functions in the national security system can be detailed in certain areas (energy, economic, environmental and social security), as well as depending on the tasks of management decisions for individual actors of national security and management at different hierarchical levels of spatial development.

The formation of a budgetary and time constraints system in the environmental taxation system from the perspectives of maximizing national security should be based on the existing principles of environmental and economic security.

The basic principles of environmental security in the context of the formation and regulation of the environmental taxation system can be presented as follows:

1. Definition of environmental (environmental and economic) security as a priority component of national security in the context of gradual practical implementation of sustainable development principles, in particular, through strengthening the environmental taxation system.

2. Recognition of environmental security as a priority component of the general national policy, as well as economic, social and environmental policy at different hierarchical levels of management (national, regional and local).

3. Formation of a system of indicators and target parameters that provide the effectiveness (objectivity) of environmental security assessment in the

indicators system of sustainable development and efficiency indicators of target functions of environmental taxes [5].

4. Creation of effective functional subsystems for support (legislative, financial, personnel and information) in the system of achieving social, environmental and economic security and the mechanism of environmental taxation functioning.

5. Ensuring effective state environmental and economic (sustainable) management in the system of national (economic, social, energy and environmental) security on the basis of tax regulators.

6. Gradual achievement of full compensation of economic damage from eco-destructive impact on the environment on the basis of the environmental taxation mechanism and social responsibility.

7. Introduction of a normative and legal field on ecological restriction of eco-destructive management by national security actors.

8. Guaranteeing an increase in the level of national (economic), social, environmental, energy security and environmental taxation efficiency through the introduction of a comprehensive system of appropriate control, in particular, environmental and economic.

3. Structural and functional approach to studying the effectiveness of environmental taxation based on world experience

It is worth emphasizing that revenues from environmental taxation should provide funding for environmental measures, as well as correspond to the magnitude of environmental and economic damage from environmental pollution. This indicates the non-tax nature of environmental taxes, as compensation is a sign of non-tax payments. Thus, the environmental tax in its economic essence is compensation for environmental and economic damage from environmental pollution. Environmental payments are levied on companies-users as part of socio-environmental and economic responsibility for pollution. The main target function of environmental taxes for pollution is compensation of damage to the state from lawful environmental damage, funds accumulation for the environmental measures implementation of territorial and spatial nature, stimulating environmental entrepreneurial activities [6].

In terms of focusing of the environmental taxation system on the regulation of environmental problems of spatial management, as well

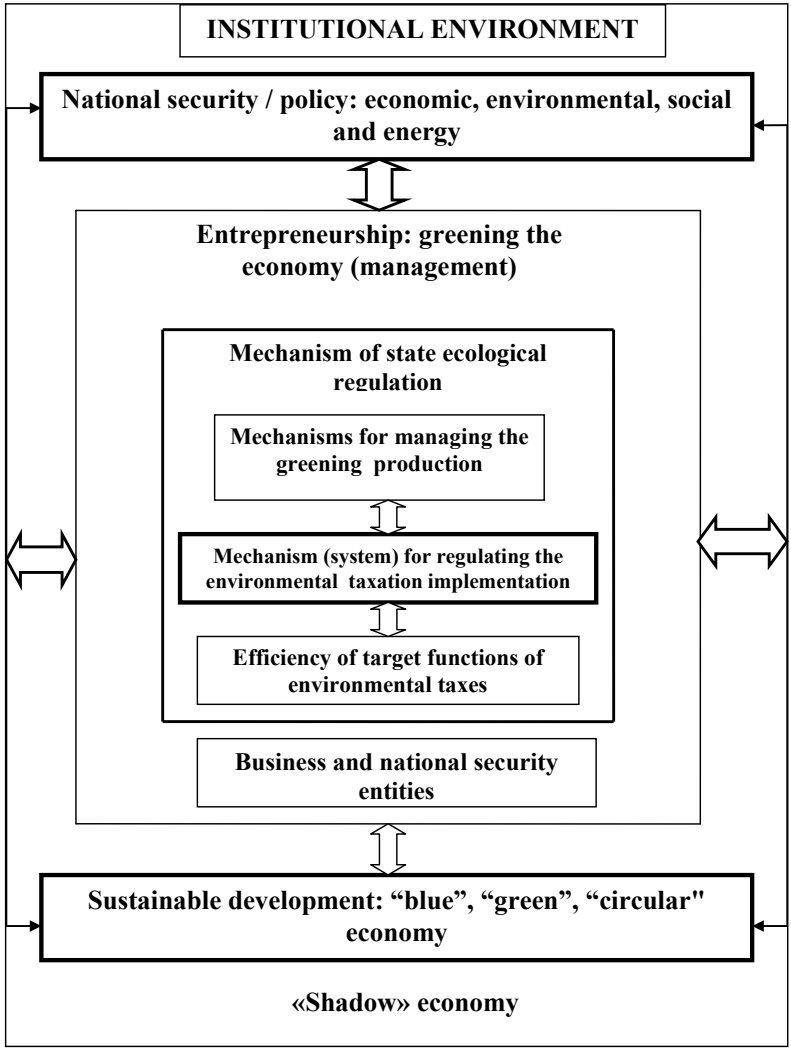

Figure 1. Determining components of environmental taxes implementation in the format of the mechanism (system) for environmental taxation regulation

Source: formed by Yarova I.

as ensuring national social, environmental and economic security, the *fiscal* and *regulatory* functions of environmental taxes are classically distinguished [7]. In [8], in addition to *fiscal*, there are also *resource – saving* and *control – stimulating* functions. It is argued that the resource – saving function is most conducive to the regulation mechanism of environmental processes in the state [9]. By setting environmental taxes (natural resource payments), the state, thus, limits excessive pollution and the use of natural (environmental) resources.

At the same time, the implementation of the *regulatory* function by environmental taxes is accompanied by state control over the environmental entrepreneurial activities, taking into account, the cyclical nature of greening the production, in particular, on the basis of "clean" production, innovative development of green economy, etc., that means inexpediency of purely *control function* separation.

The *stimulating (motivational)* function of environmental taxes is, in particular, to influence the investment and innovation processes of national security (for example, in the case of lower tax rates); to accelerate the green economy growth and to increase effective demand for environmentally friendly products. Thus, the *regulatory* and *incentive* functions of environmental taxes are closely linked, so the implementation of one of them can be combined with the process of implementing another function. At the same time, there are differences between them, not coincidence in the process of their implementation, so these functions are appropriate. Thus, the establishment of high tax rates on corporate profits means the performance of one of the distribution functions (redistribution of the national income share), but does not stimulate investment processes.

Strategic guidelines for the implementation of *regulatory* and *incentive* functions of environmental taxes in the national social, environmental and economic security system should address the following issues [6]:

– creation of optimal economic conditions for further development of civilized market relations in the system of sustainable spatial nature management in accordance with the European experience of environmental taxation system functioning;

– stimulating the production ecologization in various economic sectors and integrated, rational use of natural resources (natural and environmental capital);

– ensuring sufficient and sustainable funding of measures for the protection and reproduction of natural resource potential in the spatial and time dimension, strengthening the social and environmental services of natural resources on this basis;

– equalization of economic conditions in the spatial and time dimension at territorial (regional) use and reproduction of natural resources of different ecological quality and accessibility;

– expansion of investment opportunities for territorial communities in the matter of balanced socio-economic development in the context of ensuring national economic security;

– ensuring the coherence of national interests with the interests of local communities through a balanced distribution of funds from the environmental tax system functioning between budgets of different hierarchical levels;

– prevention of eco-destructive state of the environment and natural resource potential.

Assessment of the *target* functions of the environmental taxation system requires an analysis of their effectiveness and efficiency. It should be noted that to analyze the results of the tax system as a whole the following indicators can be used: total tax burden, the elasticity coefficient of the tax system, the tax selectivity coefficient, the ratio of tax payments to public goods and transfer payments funded by the state.

It is worth focusing on the fact that the effectiveness of environmental taxes is due to the following: first, environmental taxes, as mandatory regular payments, replenish the revenue budget part, ie perform a fiscal function; second, eco-taxes help to minimize the level of environmental hazards, encouraging rational tax agents to introduce safe technologies that are environmentally friendly, ie perform an *eco-attributive function*. Thus, we propose to study the environmental taxation effectiveness through the prism of the analysis of their inherent functions and dysfunctions (Figure 2).

The main effect of the application of environmental taxes should be a reduction in the tax base due to the new technologies transition (substitution effect). Low environmental quality standards do not encourage economic agents to implement environmental investment projects.

It is revealed that in the national nature management practice the substitution effect is not appeared due to low, in comparison with European,

environmental taxes rates. It is against this background that the fiscal function of environmental taxes also does not work.

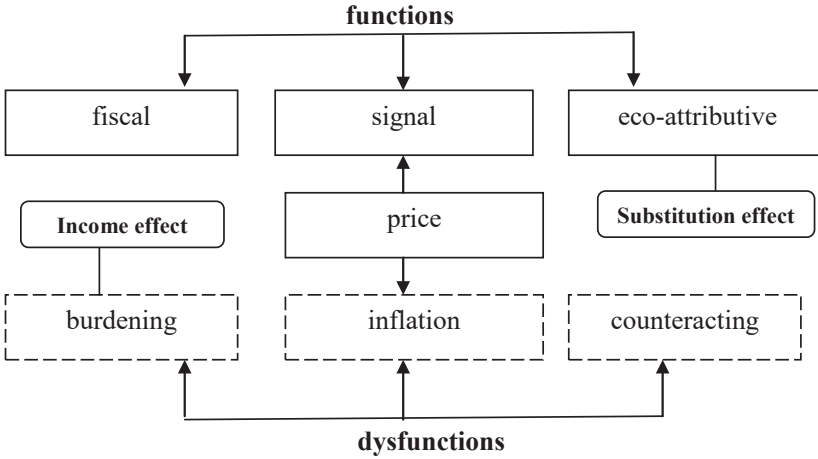

Figure 2. Functions and dysfunctions of environmental taxes

Source: author's approach

Thus, it was found that during the study period the average value of the environmental tax share in GDP was 0.11%, in budget revenues – 0.39%, tax revenues – 0.53% [10, p. 4]. Negative functions, or dysfunctions, are manifested through the tax burden (burden, income effect, and solvency trap), inflation and the threat of a radically opposite result (opposition to state tax authorities).

Research on the effectiveness of the environmental tax system must be carried out taking into account the specifics of environmental regulation. In general, the criterion for the environmental taxation optimality is the ecological and economic efficiency of nature management, which ultimately comes down to ensuring national social, environmental and economic security. There are proposals for multi-criteria assessment of environmental taxation based on the certain indicators as follows: efficiency, equality, administration, compliance with legislation, the use of tax revenues [13].

The positive functions and effects of the environmental taxes application are shown in table 2.

Table 1

Estimation of the environmental taxes functions on a global scale

Function	Economic effect	Country	National specifics
Fiscal	Budget replenishment	Ireland (carbon tax)	The goal is to get out of the budget crisis after the global default of 2008-2010.
Eco-attributive	Substitution effect	EU countries (energy tax)	Reduction of primary energy resources consumption through the transition to safe technologies by 82% due to the environmental tax
Price	Rising prices and declining demand for environmentally harmful products	United Kingdom (tax on sand, gravel and rubble)	The total tax performs a purely market function, as it is 0.07 % of total revenues
Burdening	Decrease of the purchase power	There is no carbon tax at the federal level in the United States	The country has not ratified the Kyoto Protocol, despite its significant contribution to global warming
Counteracting	Tax abolition	Australia (carbon tax)	Government efforts to counter the negative effects of climate change have resulted in tax strikes, which led to the carbon tax abolition in 2014, which lasted only 2 years.

Source: compiled by Marekha, I. based on [9; 11; 12]

Such a criterion assessment can be the subject of a separate study. In the current paper, taking into account the existing proposals [14], the emphasis is on the following criteria (indicators): effectiveness assessment of revenues from environmental taxation (in this case, the ratio of tax revenues and public environmental costs); fiscal efficiency (effectiveness); assessment of the motivational nature of environmental taxation [5; 15].

1. The efficiency of the use of revenues from environmental taxation (E_{et}) by national security actors (environmental entities) is determined as follows:

$$E_{et} = \frac{C_{be}}{R_{et}}, \quad (1)$$

Table 2

The effectiveness of environmental payments in foreign countries

Environmental tax	Effectiveness	Function
Climate change tax (introduced in the UK in 2001)	Greenhouse gas emissions decreased by 6-8%	Stimulating
Pollution tax group: – tax on sulfur oxide emissions (introduced in Sweden in 1991). – tax on carbon dioxide emissions (introduced in Norway in 1991)	– in Sweden, emissions have been reduced by 15-20 % for 4 years after the introduction of the tax; – in Norway emissions decreased by 3–4 %	
Toxic waste taxation (introduced in Germany in 1991)	The generation of toxic waste decreased by 15 % in 3 years after the introduction of the tax	
Various taxes on transport (per kilometer, annual – from the owner, excise duty, when buying a car) in all European countries	Increased tax revenues from the total amount of taxes received, eg. in Italy – by 4.5%, in Ireland – by 10.2%	Fiscal
Payments for the natural resources use – introduced in all European countries	Make up a significant share of budget revenues (from 3 % to 12 %)	

Source: formed by authors based on [9, p. 44]

where C_{be} – environmental costs at the expense of budget funds of different hierarchical levels; R_{et} – the amount of revenues from environmental taxation.

A constructive indicator of ecological and economic efficiency of environmental taxation can be an assessment of the ratio of ecological and economic damage from pollution, eco-destructive environment state, which is prevented with a certain amount of environmental tax revenues:

$$E_{et}^{d} = \frac{D_{ee}}{R_{et}}, \quad (2)$$

where D_{ee} – ecological and economic damage from pollution, eco-destructive state of the environment.

2. It is advisable to assess the fiscal efficiency (effectiveness) of environmental taxes by comparing the amount of revenues from environmental taxation (in particular, for a particular national security entity) with macroeconomic indicators, as well as the total amount of tax revenues.

3. Assessment of the manifestation degree of stimulating (motivational) properties of the environmental taxation system to some extent characterizes the share of costs for environmental protection measures in the total amount of environmental costs of the nature management entities (S_e).

$$S_e = \frac{EC_e}{\left(EC_e + \bar{T}_e\right)} \times 100 , \tag{3}$$

where EC_e – environmental costs of the entity; T_e – the paid environmental tax.

For the effective implementation of the *incentive (motivational)* function of environmental taxation, tax rates should be such that it would be more profitable for companies to carry out environmental modernization of production than to pay taxes. Determining the ecological and economic effect of environmental measures is calculated as follows [15]:

$$E = R - C , \tag{4}$$

where R – is the economic result, which consists of: savings on environmental taxes; compensation payments to the enterprise from environmental funds; increase in profits in the main production as a result of environmental measures; C – costs reduction for the environmental costs implementation.

If there are several options for environmental measures that have the same impact on the environment, but differ in the cost of their implementation, then choose the option with the lowest reduced costs (C).

$$C = \sum_{t=1}^{T} \frac{E_t}{\left(1+r\right)^t} + \sum_{t=1}^{T} \frac{I_t}{\left(1+r\right)^t} , \tag{5}$$

E_t – current expenses excluding depreciation in the t – year;

I_t – capital investments in the t – year;

r – normative coefficient of time expenses reduction;

T – calculating period.

Assessements of the environmental measures effectiveness taking into account the factor of environmental security at the enterprise level requires an evaluation of the environmental and economic risks for excessive emissions (discharges). The combination of difenitions such as “the probability of emissions”, “the mass of harmful substances and economic losses” (penalties and the so-called internal damage) makes it

possible to talk about environmental and economic risks in determining the environmental measures effectiveness, the entrepreneurial activities taking into account environmental component.

Considering the *ecological and economic risk* is an assessment of the probability of ecological and economic losses, which can be calculated with a certain adequacy in relation to possible environmental pollution at this stage of society development. The economic essence of *ecological risk* is due to a certain lack of society's knowledge level about ecological balance, the nature assimilation potential and the consequences of destabilizing the «nature – society – economy» system.

Therefore, *ecological and economic risk* must be taken into account when making economic decisions for environmental orientation, assessing the enterprise activities taking into consideration the environmental component and, thus, to some extent, considering the possibility of negative irreversible consequences for nature and society. It is also important to note that the assessment of environmental measures effectiveness is necessary to justify the concentration of the required amount of environmental costs through the system of environmental taxation (within certain environmental funds).

4. Adaptation of world experience in the national environmental taxation system

In world practice, environmental taxes of the pan-European system have proved their effectiveness, namely: energy taxes [11]; transport taxes [16]; pollution taxes [17; 18]; resource taxes [9]. Based on the analysis of foreign experience, it becomes obvious that in world practice, two groups of environmental taxes are clearly defined depending on their functions: those that contribute to the budget replenishment, and those that change the level of the environment.

From these perspectives we can conclude that the tax system is effective if the environmental taxes in the financial system of the country correspond to their *functional purpose*. This necessitates the environmental payments structure optimization (Figure 3).

The fiscal group of environmental taxes in Ukraine should include transport and resource taxes. As Ukraine has a strong natural resource potential, the payment for resources will allow directing a significant part of funds to the budget. The high level of natural consumption of products

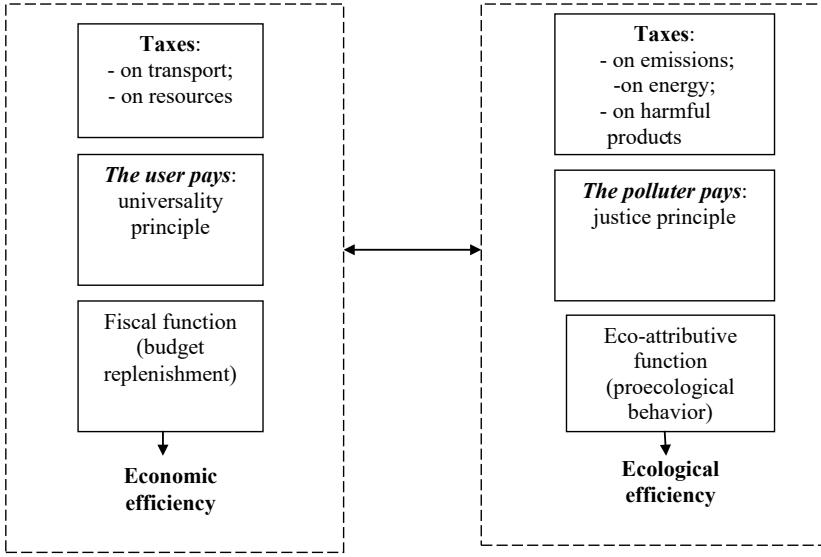

Figure 3. Optimization of the environmental taxes structure taking into account national specifics

Source: the author's proposition

indicates inelastic demand for resources, which allows to collect funds for fiscal purposes.

New cars are in similar inelastic demand in Ukraine, so the imposition of additional taxes on mobile sources of pollution will help increase budget profitability. Taxes on the emission of pollutants, energy and environmentally harmful goods should be introduced for environmental purposes, and their implementation will lead to the effect of replacing destructive activities with environmental behavior. This will contribute to energy saving processes and reduce demand for environmentally destructive goods.

Taking into account the national specifics of nature management in Ukraine, the selection of the list of environmental taxes should be based on the following principles:

1. *Deteriorization of the ecological state*, which is manifested primarily due to the high level of environmental pollution.

2. *Import dependence*, in particular significant dependence on energy import.

3. *High demand for environmentally destructive goods*, namely – for new cars as mobile sources of environmental pollution.

4. *Powerful natural and resource potential*, which causes a high nature intensity of national production.

The functional matrix of compliance of environmental tax instruments with national specifics and national security priorities is given in Table 3. Conformity assessment is based on the authors' expert opinion and is conducted on a scale from 1 to 4. The lowest score reflects low correlation of national features of nature management with national security priorities and vice versa. For example, dependence on energy imports is most closely correlated with economic security, so this correlation is assigned the highest score of 4. *Environmental security* primarily depends on the environment quality, so a score of 4 points is given in the quadrant «environmental security – environment deteriorization». By summing the scores for each column (dominant) we get a performance indicator that reflects the degree of interaction with the national security components. Additionally, we note that each dominant of national nature management is consistent with the relevant environmental tax instruments (Table 3).

Table 3

Score of compliance of environmental taxes with the peculiarities of nature management and national security

National security	**Dominants of national nature management in Ukraine**			
	Deteriorization of the ecological state	**Import dependence (dependence on energy imports)**	**Demand for destructive goods**	**Powerful natural and resource potential**
Economic security	1	4	3	2
Environmental security	4	3	2	1
Social security	4	1	3	2
Energy security	1	4	3	2
Totally (scores)	10	12	11	7
	Environmental tax instruments			
	Pollution taxes	Energy taxes	Transport taxes	Resources taxes

Source: formed and estimated by Marekha I.

As can be seen from table 3, the highest threat to national security is *import dependence* (12 points), and therefore energy taxes should be a priority tax instrument for resolving the situation. Thus, *energy taxes* correspond to the specifics of nature management in Ukraine and the peculiarities of its national security. *Demand for destructive goods*, namely new cars, is also threatening (11 points), but transport taxes at this stage of development will not reduce the demand for cars, as their use in Ukraine can be described as status consumption. Deteriorating the environmental quality is a significant threat to national security (10 points), so pollution taxes must be carefully levied on issuers. It was found that the nature intensity of production has an average impact on state security (7 points).

Additionally, we construct a matrix of compliance of environmental taxes with the criteria of fiscal and eco-attributive efficiency (Figure 4), taking into account the study results of O. Veklych [19].

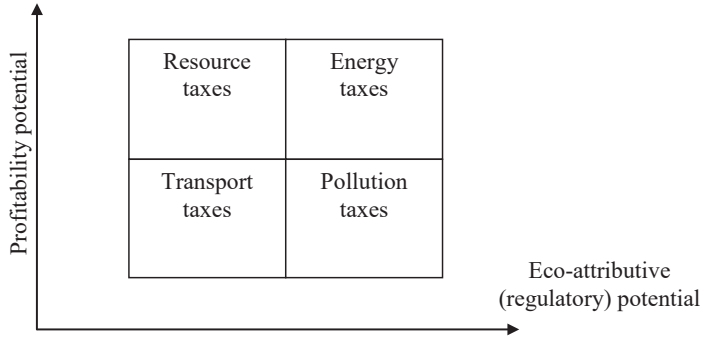

Figure 4. Matrix of environmental taxes compliance with the criteria of fiscal and eco-attributive efficiency

Source: proposed by the author for Ukraine

As can be seen from Figure 4, in the total tax portfolio of Ukraine, formed according to the normative classification requirements of Eurostat, energy taxes have the maximum profitability potential and the highest eco-attributive efficiency. In addition to the purely fiscal function, energy taxes have the character of targeted financing of expenditures for the protection and preservation of the environment. Pollution taxes will rather perform

an eco-attributive function in Ukraine, and resource taxes will play a fiscal function due to a strong supply of natural resources.

5. Conclusions

The current unsatisfactory state of national social, environmental and economic security of spatial development indicates the inefficiency of the environmental taxation system. This necessitates the formation of strategic guidelines for the development of state regulation of environmental taxation in the context of assessing the effective implementation of the main target functions of environmental taxes (in particular, fiscal, regulatory and incentive). A systematic assessment of the environmental taxation effectiveness requires appropriate macroeconomic analysis, as it forms the basis for strategic guidelines for achieving environmentally sustainable spatial development. The proposed system of ecological and economic indicators for effectiveness assessing of the implementation of the main functions of environmental taxes is a necessary information and analytical basis for substantiation of strategic management decisions.

The criterion basis of the analysis of efficiency of realization of target functions of environmental taxes in the context of the further implementation of environmental taxation in Ukraine, and also an estimation of ecological and economic efficiency of nature protection measures is formed.

Taking into account the existing problem situations and proposals for reforming the environmental taxation system in Ukraine [20; 21] emphasis is placed on the main principles on which the mechanism for establishing and collecting environmental taxes should be based on:

– the use of two types of tax payment standards: first, within the permissible (including temporarily agreed with environmental authorities) volumes of emissions and discharges of harmful substances; and second, for exceeding the permissible pollution level;

– the taking into account when setting tax rates the qualitative composition of emissions and discharges, as well as the severity of the environmental situation in the certain region. It is necessary to bring in line the tax rate for emissions of pollutants into the atmosphere by the name and hazard class of pollutants;

– the granting territorial communities the right to adjust tax revenues for environmental entities, taking into account their implementation of environmental protection measures;

– the funds accumulation in nature protection funds and their targeted use under the territorial communities control.

Thus, the process of greening the tax system, which began in European countries several decades ago as an experiment, has gradually spread to other countries. In the modern context, it should be a question of forming an effective environmental taxation system, which is ensured by optimizing their structure. Thus, taking into account the world experience and national peculiarities of economic development, the question arises about the formation of fiscal and eco-attributive group of environmental taxes.

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