

DOI: 10.55643/fcaptp.4.69.2026.5253

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Received: 15/05/2026

Accepted: 05/08/2026

Published: 31/08/2026

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STRATEGIC INSTITUTIONALISATION OF SUSTAINABILITY AND ESG-ORIENTED FINANCIAL ARCHITECTURE IN UKRAINE'S BUDGETARY POLICY

ABSTRACT

In the context of the global transformation of economic systems, the intensification of climate, social, and financial risks, as well as wartime challenges facing Ukraine, the study of sustainability as an integrated concept of long-term development and its financial implementation through ESG approaches in state budget policy has become particularly relevant. The purpose of the article is to reveal sustainability as a concept of global development through the combination of strategic and financial dimensions and to assess the extent to which ESG approaches are institutionalized in state strategies, transform the financial sector, and are manifested in the architecture of Ukraine's budget policy. The study employs a combination of philosophical-normative, institutional-comparative, and economic-mathematical approaches. The main results demonstrate that sustainability should be interpreted not only as a value-based or normative category, but also as an institutionally and financially relevant foundation for strategic planning, budget design, and financial regulation. It is established that the strategic institutionalization of ESG approaches in contemporary international practice is primarily implemented through a set of sectoral strategies, regulatory regimes, disclosure standards, and budgetary mechanisms. The empirical analysis for Ukraine shows that, under wartime conditions, the quality of the budget revenue architecture becomes especially important for the market perception of public financial stability. A refined dynamic model incorporating a one-quarter expenditure lag, exchange-rate dynamics, and changes in global market volatility confirms the positive wartime effect of the revenue index and identifies a negative short-run association between the lagged expenditure index and the market valuation of sovereign obligations. It is concluded that sustainability at the state level is shifting from the sphere of a declarative idea to the domain of concrete budgetary and financial policy, while an ESG-oriented budget architecture serves as an important factor in strengthening fiscal resilience and public trust in the state.

Keywords: budget policy, ESG, fiscal resilience, public finance, sustainability, sustainable finance

JEL Classification: Q01, Q56, G28, H50, H61

INTRODUCTION

In contemporary scholarly discourse, sustainability is increasingly understood not merely as a narrative imperative or a set of global development guidelines, but as an integrated concept for organising economic, social and environmental order. Such an interpretation moves sustainability beyond applied environmental or corporate concerns and assigns to it the status of a general principle of long-term societal development. In this sense, sustainability reflects the existence of objective limits to economic activity associated with biophysical constraints, social justice, responsibility for the consequences of managerial decisions and, at the same time, the need to preserve the conditions for human life and well-being.

The theoretical understanding of sustainability has gradually shifted into the domains of strategic management, public policy and financial regulation. As a result, sustainability has ceased to be perceived solely as an ethical or philosophical category and has

acquired the features of an institutionally embedded approach to the design of strategies, regulatory regimes and mechanisms of financial redistribution. A particular role in this process has been played by environmental, social and governance criteria, ESG, which have become an operational instrument of sustainability in public administration, the activities of financial institutions, corporations and investors.

International practice demonstrates that ESG approaches are being increasingly integrated not only into corporate governance and investment decision-making, but also into strategic planning of national development, central bank regulatory policy, the architecture of capital markets and the principles of public finance formation. Accordingly, sustainability acquires a dual meaning. On the one hand, it functions as a strategic model for coordinating societal development; on the other hand, it provides a basis for transforming the financial system, within which risk assessment, lending directions, investment priorities and budgetary decisions are increasingly aligned with long-term environmental, social and governance effects.

For Ukraine, this issue is of particular importance, since under conditions of wartime challenges, macrofinancial instability and the need for recovery, budgetary policy becomes one of the key channels for the practical implementation of sustainability principles. Through the budget, the state not only accumulates and redistributes financial resources, but also sets priorities for economic development, supports social resilience, finances socially significant expenditures and generates signals for domestic and external financial market participants. In this context, sustainability should be examined not only as an ideational or strategic category, but also as a financially measurable characteristic of the state's budgetary architecture.

LITERATURE REVIEW

The contemporary stage of sustainability research demonstrates a pronounced shift from a predominantly normative and value-oriented interpretation of this concept towards its understanding as an institutional and financial foundation of long-term development. Recent literature increasingly treats sustainability not as a set of separate environmental or social priorities, but as an integrated logic for organising the economic system, within which risks, incentives, investment decisions and public policies must be aligned with the requirements of the economy's long-term viability. In this context, the financial dimension of sustainability is no longer derivative of corporate social responsibility; rather, it has become an autonomous analytical field that brings together issues of financial market development, regulatory policy, budgetary redistribution and market-based risk assessment (De Giuli et al., 2024; Joshipura et al., 2024; Akhtar & Rashid, 2024).

Systematic studies of recent years show that ESG research has been expanding rapidly, moving from a narrow focus on non-financial reporting towards an analysis of ESG as a factor shaping financial resilience, risk reduction and investor behaviour. De Giuli, Grechi and Tanda demonstrate that ESG is increasingly associated with credit, market, reputational, climate-related and transition risks. Consequently, ESG should be regarded as part of the financial management system rather than merely as a communication or ethical instrument (De Giuli et al., 2024).

Joshipura, Mathur and Kedia, in turn, show that sustainable investing and sustainable financing have already formed a distinct research field in which capital is allocated not only to achieve financial returns, but also to support structurally balanced development (Joshipura et al., 2024). A similar conclusion is reached by Akhtar and Rashid, who, while analysing the relationship between financial development and sustainable development, emphasise that the impact of the financial system depends not so much on the scale of financial depth as on institutional quality, the direction of resource allocation and the capacity of the financial sector to serve productive, socially beneficial and environmentally compatible activities (Akhtar & Rashid, 2024).

As a result of this shift, environmental, social and governance criteria, ESG, increasingly function not only as indicators of corporate behaviour, but also as an instrument for the strategic institutionalisation of sustainability. This is particularly evident in studies devoted to the regulatory formation of sustainable finance. Cosma, Cucurachi, Gentile and Rimo show that disclosure regimes in sustainable finance already affect not only the transparency of funds, but also their performance under crisis conditions, including the COVID-19 pandemic and the Russian-Ukrainian war. According to the authors, the regulatory architecture of disclosure is increasingly becoming a mechanism for reallocating capital towards financial products with clearly defined sustainability objectives (Cosma et al., 2024). This approach is important for the present study, as it demonstrates that the ESG agenda is shifting into the domain of formalised rules rather than remaining at the level of voluntary initiatives.

The further development of this logic is represented in studies of green finance policy as a distinct area of public regulation. Wang, Shu and Cui, examining the policy of green finance reform and innovation pilot zones, demonstrate that financial policy aimed at supporting environmentally friendly industries may serve as a driver of green economic transformation

through technological upgrading, improvements in carbon efficiency and agglomeration effects (Wang et al., 2024). Shen, Ma and Chen reach a comparable conclusion, showing that the effectiveness of green finance policy in achieving environmentally sustainable development depends substantially on government attention to environmental priorities and on the ability to adapt reforms to local conditions (Shen et al., 2024). Thus, the literature increasingly confirms that financial instruments of sustainability do not by themselves guarantee the desired effect; their productivity is determined by the institutional capacity of the state, the quality of coordination and the degree of policy integration.

The institutional dimension of green finance policy is examined in greater depth by Cojoianu, French, Hoepner, Sheenan and Vu, who analyse the conditions under which green financial policies emerge across a broad international sample. The authors demonstrate that the introduction of such policies is neither accidental nor purely ideological, but is shaped by the structure of the energy economy, the level of climate awareness and the role of the financial sector in the political cycle. Particularly important is their conclusion that green finance policies often arise as a response to accumulated systemic tensions between traditional financing of the fossil fuel sector and the need for long-term economic stabilisation (Cojoianu et al., 2025). For the present study, this conclusion is of fundamental importance, as it provides grounds for interpreting ESG institutionalisation not as a fashionable regulatory trend, but as a form of adaptation of financial policy to a new configuration of risks and societal expectations.

A significant strand of the literature transfers the issue of sustainability into the domain of public finance. Athari considers sustainable public green finance as a separate object of analysis and shows that its dynamics in OECD countries depend on the combination of domestic and global political uncertainty, as well as on the stringency of environmental policy (Athari, 2025). Hassan, Lee, Rouge and Kouzez further develop this line of research by demonstrating that green public finance and green taxes have different effects on innovation. In the short run, their effects may be weak or statistically unclear; however, over a longer horizon, tax instruments may stimulate both environmental and non-environmental innovation, whereas green public finance primarily supports environmentally oriented technological change (Hassan et al., 2025). These findings lead to a preliminary conclusion that the budgetary and tax architecture of sustainability should be assessed not only by the direction of expenditure, but also by the type of long-term effects it generates.

At the corporate and market levels, the financial channel of ESG influence is particularly clearly outlined by Chen and Xie. Investigating the impact of ESG disclosure on corporate financial performance, the authors establish that ESG transparency is positively associated with financial performance, and that this relationship strengthens when investors sensitive to ESG parameters are present (Chen & Xie, 2022). In theoretical terms, this conclusion is important for the subsequent transition to the state level, since it confirms that the market does not simply “reward virtue”, but responds to reduced information asymmetry, greater predictability and stronger trust in an entity that discloses relevant non-financial information. In broader financial logic, ESG acts as a signal of governance quality, adaptability and long-term orientation, which may reasonably be extended to the level of public finance.

The body of literature most relevant to this article concerns the relationship between sustainability factors and sovereign risk. Pineau, Le and Estran show that ESG factors are increasingly incorporated into sovereign credit ratings, although their weight differs across groups of countries and changes over time. Particularly noteworthy is their finding that the importance of ESG components is increasing in developed economies, whereas in emerging markets their role in creditworthiness assessments remains more heterogeneous (Pineau et al., 2022). Anand, Vanpée and Lončarski demonstrate that higher sustainability standards are associated with lower sovereign credit risk; however, the magnitude and even the direction of this relationship may vary depending on the provider of ESG assessments, which points to the problem of incomplete standardisation of sustainability metrics (Anand et al., 2023). These studies are especially important for shaping the logic of the present article, as they make it possible to move from a general discourse on sustainability to an analysis of how markets interpret state capacity through the prism of both financial and non-financial characteristics.

Methodologically significant for the present research are studies that laid the empirical foundation for analysing the relationship between ESG and sovereign borrowing costs. Crifo, Diaye and Oueghlissi were among the first to show, using evidence from OECD countries, that better ESG ratings are associated with a lower cost of sovereign borrowing (Crifo et al., 2017). Capelle-Blancard, Crifo, Diaye, Oueghlissi and Scholtens further developed this finding by demonstrating that stronger country-level sustainability parameters are associated with lower sovereign bond spreads, with the social and governance components exerting the most pronounced effects (Capelle-Blancard et al., 2019). In a similar vein, Margaretic and Pouget show that, for emerging markets, social and governance characteristics are capable of reducing sovereign spreads, whereas the environmental component does not always produce an equally direct pricing effect (Margaretic & Pouget, 2018). Taken together, these studies provide a robust empirical background for analysing Ukraine, since they confirm that sovereign debt markets are sensitive not only to macrofinancial variables, but also to the institutional and social quality of the state.

The review of the literature allows several conclusions to be drawn. First, contemporary research treats sustainability as a financially relevant category that affects risk, investment priorities and mechanisms of public regulation. Second, ESG approaches are increasingly institutionalised through disclosure regimes, green finance policies and public finance instruments. Third, financial markets, including the sovereign segment, respond to sustainability factors, especially those related to governance, social resilience and policy predictability. At the same time, the question of how these three vectors converge within the budgetary architecture of the state remains insufficiently explored, particularly under conditions of war, macrofinancial shocks and heightened dependence on external financing. This gap defines the research field for analysing the strategic institutionalisation of ESG approaches and the financial architecture of Ukraine's budgetary policy.

AIMS AND OBJECTIVES

The purpose of this article is to reveal sustainability as a concept of global development through the integration of its strategic and financial dimensions, as well as to assess the extent to which ESG approaches are institutionalised in public strategies, transform the financial sector, and are manifested in the architecture of Ukraine's budgetary policy.

To achieve this purpose, the article addresses the following research objectives:

1. To systematise conceptual approaches to sustainability as a category of responsibility, strategic development and institutional transformation.
2. To examine the forms of strategic institutionalisation of ESG approaches in public governance practice.
3. To analyse the response of the international and domestic financial sector to the diffusion of the sustainability concept and ESG principles.
4. To assess Ukraine's budgetary policy from the standpoint of the financial implementation of ESG approaches and to determine its relationship with the parameters of fiscal sustainability.

METHODS

The methodological basis of the study rests on the combination of philosophical-normative, institutional-comparative, and econometric approaches. This made it possible to examine sustainability simultaneously as a category of the value order, as a principle of strategic planning and as an object of quantitative measurement. Such a research design is determined by the nature of the problem itself, since sustainability cannot be reduced either to purely environmental issues or to separate instruments of corporate responsibility. Rather, it encompasses a complex system of social, economic, institutional and financial interrelations. Accordingly, the logic of the study was built as a sequential transition from the conceptual interpretation of sustainability to the analysis of strategic practices of its implementation and, subsequently, to the empirical verification of the impact of ESG-oriented budgetary architecture on the market valuation of Ukraine's sovereign debt instruments.

At the first stage, the methods of scientific abstraction, logical generalisation, analysis and synthesis were applied. These methods made it possible to systematise the basic approaches to the interpretation of sustainability in philosophical, economic and managerial dimensions. Through a hermeneutic reading of the ideas of responsibility, intergenerational justice, biophysical limits and practical rationality, the content of sustainability was specified as an integral norm of societal development. This approach enabled the transition from a descriptive interpretation of the category to its analytical structuring within the coordinates of economic, environmental and social interdependence.

At the second stage, systemic, institutional and comparative methods were used. Their application made it possible to examine the forms through which sustainable development principles are integrated into public strategic planning, as well as to trace how national governments, regulators and financial institutions transform their governance models under the influence of ESG logic. A comparative analysis of the cases of the United States, the United Kingdom, the European Union and Ukraine allowed different forms of sustainability institutionalisation to be identified, ranging from centralised strategic documents to integrated sectoral frameworks. For this purpose, the study employed document analysis and content analysis of strategies, regulatory acts, official reports and policy materials issued by international organisations, central banks, government bodies and systemically important banking institutions. This approach made it possible not only to describe individual examples, but also to identify recurring institutional mechanisms through which sustainability moves into the domain of concrete financial and public policy.

At the third stage, an empirical assessment was conducted of the extent to which ESG-relevant components of Ukraine's State Budget are associated with the market valuation of sovereign foreign-currency obligations. The balanced quarterly dataset covers 2018Q1–2025Q2 and contains 30 observations. Ten revenue series and seven expenditure series were selected in accordance with Table 2. Budget execution values were drawn from quarterly State Budget execution reports published by the Ministry of Finance of Ukraine on the basis of State Treasury reporting. As the source tables are reported cumulatively from the beginning of each year, Q2–Q4 flows were obtained as first differences within the corresponding year, whereas Q1 values were used directly; no missing fiscal observations were imputed (Ministry of Finance of Ukraine, 2026).

All fiscal series were recorded in nominal hryvnias and converted into US dollars using the official National Bank of Ukraine exchange rate at the end of the corresponding quarter before normalisation (National Bank of Ukraine, 2026). The Cbonds Ukraine Sovereign USD Index was assigned to each quarter at the quarter end or, when necessary, on the last available trading day. Values for 2018Q1–2021Q2 were recovered by digitising the public Cbonds chart to the nearest index point, whereas observations for 2021Q3–2025Q2 were taken from the authors' archived Cbonds series. The digitised and directly observed segments were flagged separately in the working dataset, and no interpolation was applied (Cbonds, n.d.).

The dependent variable is the Cbonds total-return index for a portfolio of Ukrainian sovereign fixed-coupon securities denominated in US dollars. According to the provider's methodology, eligible instruments have a remaining maturity of at least 360 days, an issue volume of at least USD 500 million, and quotations on at least 16 trading days in the preceding month; the index composition is reviewed monthly (Cbonds, n.d.). Accordingly, the dependent variable is interpreted as a market-based proxy for the valuation of sovereign obligations rather than as a direct measure of fiscal sustainability.

Given the different measurement scales of the initial indicators, the first step of the quantitative analysis involved their normalisation using the min–max transformation:

$$\tilde{x}_{k,t} = \frac{x_{k,t} - \min(x_k)}{\max(x_k) - \min(x_k)},$$

where $\tilde{x}_{k,t}$ is the normalised value of the k -th indicator in quarter t ; $x_{k,t}$ is its actual value; $\min(x_k)$ and $\max(x_k)$ denote the minimum and maximum values of the corresponding indicator within the sample.

This transformation ensures the comparability of all variables and eliminates distortions caused by differences in their scale.

At the second step of the integral assessment, the entropy weighting method was applied. This choice is justified by the fact that this approach minimises researcher subjectivity in determining weights and assigns greater importance to indicators with higher informational variability in the time series. For each normalised indicator, proportional values were calculated as follows:

$$p_{k,t} = \frac{\tilde{x}_{k,t}}{\sum_{t=1}^T \tilde{x}_{k,t}}, \text{ after which the entropy of the indicator was determined:}$$

$$h_k = -\frac{1}{\ln T} \sum_{t=1}^T p_{k,t} \ln p_{k,t}, \text{ and its informational weight was then calculated:}$$

$$w_k = \frac{1-h_k}{\sum_{k=1}^K (1-h_k)}. \text{ On this basis, two integral indices were constructed:}$$

$$R_t = \sum_{i=1}^n w_i^R \tilde{r}_{i,t}, E_t = \sum_{j=1}^m w_j^E \tilde{e}_{j,t},$$

where R_t is the integral index of the ESG-relevant revenue component of the budget, and E_t is the integral index of the ESG-relevant expenditure component of the budget.

This construction enables the transition from a fragmented set of budgetary indicators to compact synthetic characteristics suitable for further econometric analysis.

To account for the structural change in the operating conditions of public finance after the beginning of the full-scale war, a dummy variable was introduced:

$$D_t = \begin{cases} 0, & \text{for 2018Q1–2021Q4,} \\ 1, & \text{for 2022Q1–2025Q2.} \end{cases}$$

The inclusion of this variable is explained by the fact that, after 2022, Ukraine's budgetary system has been functioning under fundamentally different macrofinancial, security and institutional conditions. Consequently, the market response to the parameters of budgetary policy cannot be assumed to remain unchanged relative to the pre-war period.

The baseline econometric model was estimated using the ordinary least squares method in the following specification:

$$Index_t = \alpha + \beta_1 R_t + \beta_2 E_t + \beta_3 D_t + \beta_4 (R_t \cdot D_t) + \varepsilon_t.$$

The proposed model specification makes it possible to address several research tasks simultaneously. First, it separates the contribution of the revenue and expenditure ESG contours of the budget. Second, it formalises the very fact of the wartime structural break. Third, it allows verification of whether the role of the revenue component of the budget changes under wartime conditions, when the market becomes considerably more sensitive to signals of fiscal capacity, stability of rules and institutional predictability.

A separate research hypothesis assumed that the impact of the expenditure component of the budget on the market valuation of sovereign securities may not materialise immediately, but with a time lag. To test this hypothesis, an additional lagged model was estimated:

$$Index_t = \alpha + \beta_1 R_t + \beta_2 E_{t-1} + \beta_3 D_t + \beta_4 (R_t \cdot D_t) + \varepsilon_t,$$

where E_{t-1} denotes the expenditure index lagged by one quarter.

The comparison of the baseline and lagged specifications makes it possible to test the robustness of the results and to determine whether expenditure policy has a delayed effect on the market valuation of sovereign obligations.

Lag-order selection was based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC), alongside the adjusted coefficient of determination and parameter significance. Since each additional lag otherwise shortens the sample and changes the likelihood base, the specifications with expenditure lags from zero to four quarters were re-estimated over a common window, 2019Q1–2025Q2 ($n = 26$). This makes the information criteria directly comparable across all five models. For Gaussian regression residuals, the criteria were calculated as follows:

$$AIC = n[\ln(2\pi) + 1 + \ln(RSS/n)] + 2k; BIC = n[\ln(2\pi) + 1 + \ln(RSS/n)] + k \ln(n).$$

To account for persistence in the sovereign index and for factors that may jointly affect market pricing, the preferred specification extends the selected one-quarter expenditure-lag model by introducing the lagged dependent variable and two controls. The first control is the standardised quarterly logarithmic change in the official UAH/USD exchange rate, $Z(FX)_t$, where a positive value indicates hryvnia depreciation. The second is the standardised logarithmic change in the quarterly average of the daily CBOE Volatility Index, $Z(VIX)_t$, which captures changes in global risk aversion (National Bank of Ukraine, 2026; Federal Reserve Bank of St. Louis, 2026). The refined dynamic specification is:

$$Index_t = \alpha + \rho Index_{t-1} + \beta_1 R_t + \beta_2 E_{t-1} + \beta_3 D_t + \beta_4 (R_t \times D_t) + \gamma_1 Z(FX)_t + \gamma_2 Z(VIX)_t + \varepsilon_t.$$

Prior to estimation, the stochastic input variables were examined using augmented Dickey–Fuller tests with zero to three lags selected by AIC. Because the dependent series contains a substantively known level shift in 2022Q1, a break-augmented ADF regression with the wartime level-shift dummy was also estimated. Finite-sample p-values were obtained from 30,000 bootstrap replications. Model residuals were assessed using the Jarque–Bera and Shapiro–Wilk normality tests, the Durbin–Watson statistic, the Breusch–Godfrey LM(1) and Ljung–Box Q(4) autocorrelation tests, the Breusch–Pagan heteroscedasticity test and the Ramsey RESET functional-form test. Newey–West HAC standard errors with a Bartlett kernel and one-quarter bandwidth were used for final inference whenever residual variance was non-constant or serial dependence remained possible.

The static no-lag and lagged models are retained as transparent benchmarks. The preferred inferential model is the dynamic controlled specification with E_{t-1} , selected by the common-sample information criteria and evaluated using the full stationarity and residual-diagnostic protocol. The wartime marginal effect of the revenue index is calculated as $\beta_1 + \beta_4$; the steady-state multiplier is reported as $(\beta_1 + \beta_4)/(1 - \rho)$, subject to the stability condition $|\rho| < 1$.

Thus, the proposed methodology combines conceptual analysis of sustainability, comparative examination of strategic practices of its institutionalisation, and formalised measurement of the relationship between ESG-oriented budgetary policy and the market valuation of the state's sovereign obligations. Such a research design allows sustainability to be considered not only as a normative objective of global development, but also as a measurable characteristic of the fiscal and financial capacity of the state under conditions of institutional transformation.

RESULTS

The rational core of sustainability lies in the fact that economic activity is assessed not only by its immediate effects, but also by its compatibility with the long-term conditions for the reproduction of human life, the economy and the natural environment. In this sense, sustainability emerges as a form of practical rationality that constrains short-term gain by the requirement to preserve future development opportunities.

This understanding is consistent with the logic of the categorical imperative, which requires that human beings be treated as ends in themselves rather than merely as means. Transposing this principle to the domain of intergenerational relations implies that the depletion of resource-based and social conditions of the future for the sake of present benefit contradicts not only an ethical norm, but also the very logic of social reproduction (Johnson & Cureton, 2025). Accordingly, sustainability acquires the meaning not simply of a moral imperative, but of a broader civilisational principle that integrates the requirements of social justice, ecological balance and economic well-being (Figure 1).

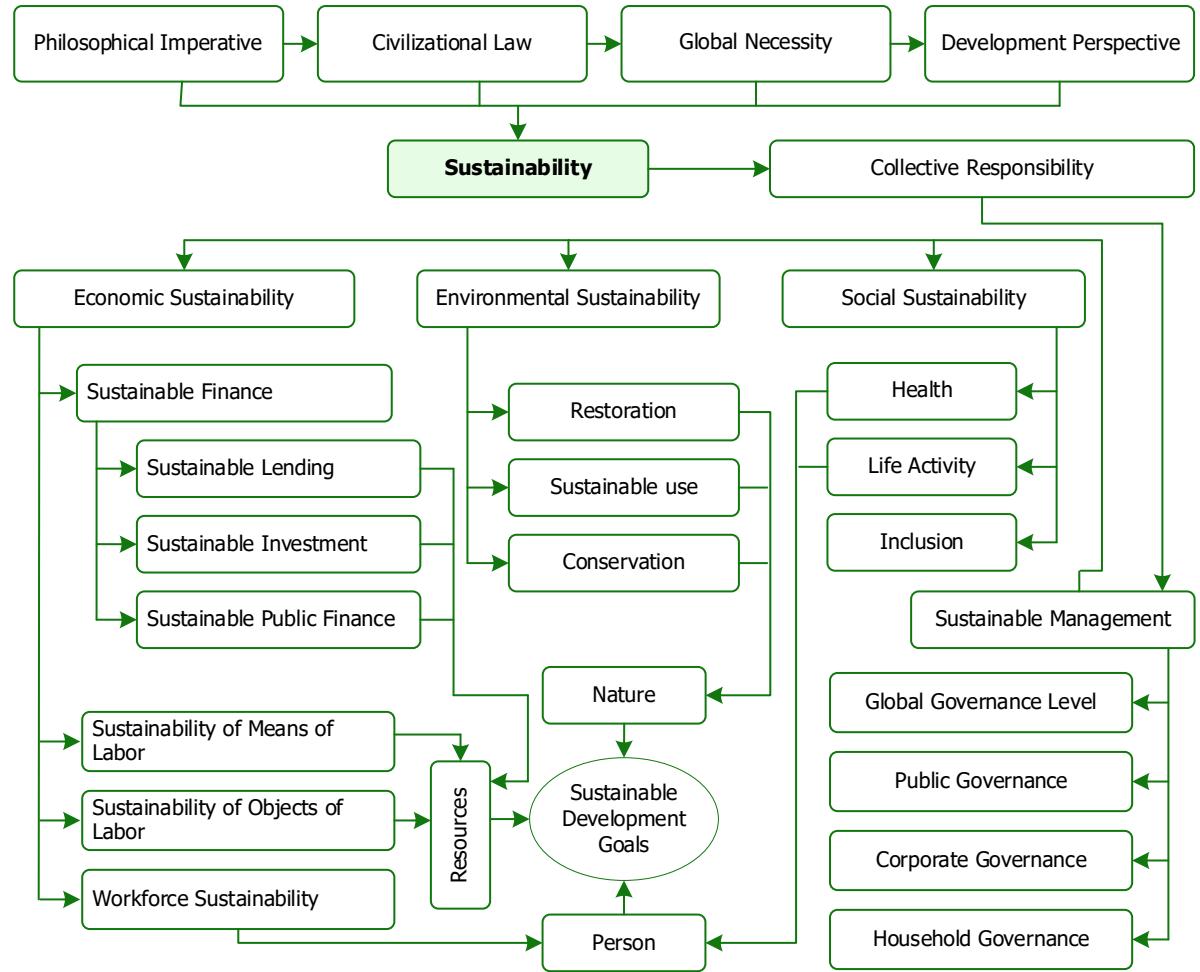


Figure 1. The concept of sustainability in the pragmatics of implementing the Sustainable Development Goals.

This logic is reinforced by the concept of responsibility, which asserts that human actions must be compatible with the preservation of the conditions for long-term human existence. In this dimension, sustainability rests not only on a system of values, but also on the convergence of scientific approaches that identify the transgression of planetary boundaries, the accumulation of global risks and the deepening of socio-economic imbalances. For this reason, it is appropriate to consider

sustainability both as a methodology for limiting the destructive consequences of economic activity and as a guideline for long-term development (Berdinesen, 2017).

The further elaboration of this category requires a transition from the individual to the collective dimension of responsibility. The issue is no longer confined to personal moral choice; rather, it concerns the capacity of institutions to formulate policy, coordinate actions and assume responsibility for their consequences. In this interpretation, responsibility acquires a managerial meaning and becomes a principle for organising interaction among the state, business and society in the pursuit of long-term socially significant objectives (Figure 2).

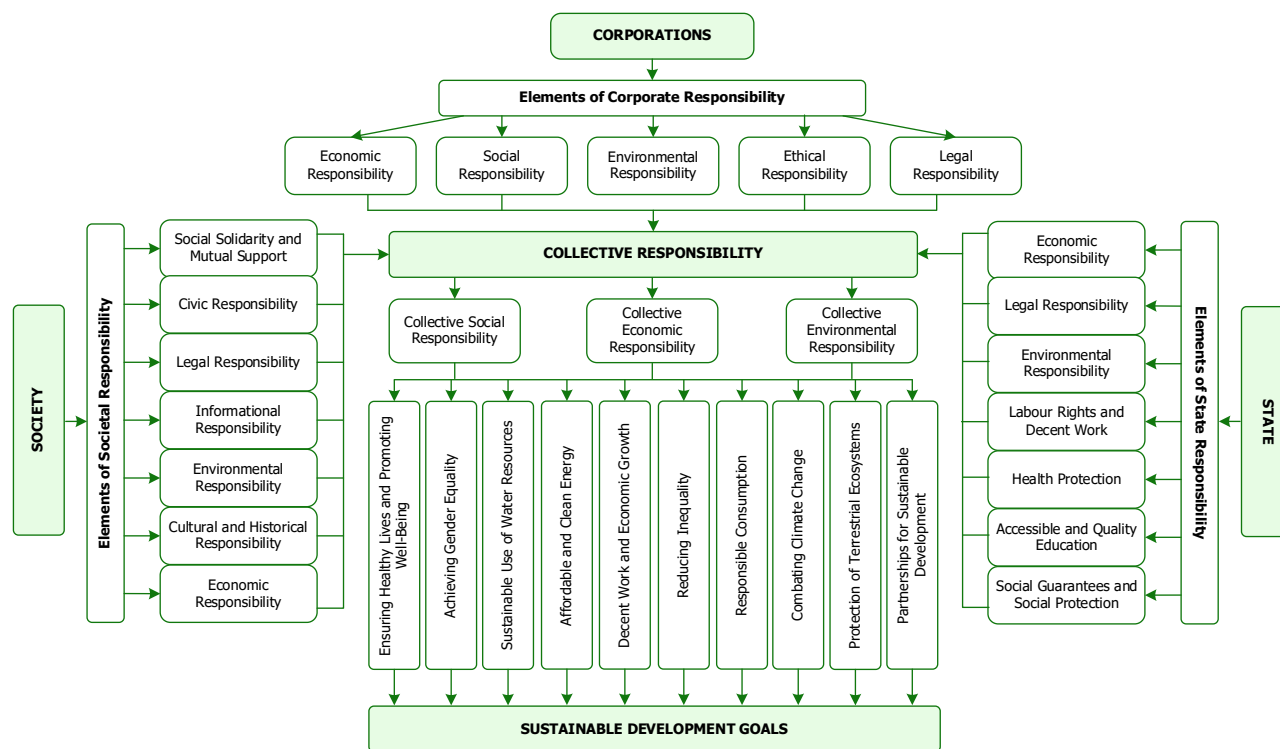


Figure 2. The place and role of collective responsibility in the implementation of the Sustainable Development Goals.

At the international, national and corporate governance levels, this approach is manifested in the spread of sustainable development strategies, ESG-oriented governance systems, non-financial reporting mechanisms and instruments for public policy coordination. The United Nations defines a national sustainable development strategy as a coordinated, participatory and iterative process of action aimed at achieving economic, environmental and social objectives in a balanced manner (United Nations, n.d.). The origins of this logic are associated with Agenda 21, which established the requirement to integrate economic, social and environmental priorities into a unified system of national strategic planning (United Nations, 1992).

Contemporary practice, however, shows that sustainability is increasingly less often implemented through a single isolated strategic document. Instead, it is embedded in a broader system of public governance, in which economic policy, social development, environmental regulation and financial mechanisms form an integrated architecture of long-term responsibility. It is precisely in this domain that the transition takes place from the general idea of sustainable development to the strategic institutionalisation of ESG approaches in public governance and the financial system.

In both scholarly and applied discourse, the notion of countries with national sustainable development strategies should be interpreted broadly. It refers either to the existence of a specialised National Sustainable Development Strategy, NSDS, or to the presence of an integrated national vision or programme-strategic system within which environmental, social and economic objectives are combined into a unified model of public governance. Such an approach makes it possible to assess contemporary practices more accurately, since in many countries' sustainability is implemented not through a single framework document, but through a set of interconnected strategies, regulatory regimes and financial-budgetary mechanisms.

The experience of the United States is illustrative in this regard. After the 1992 Earth Summit, the country supported the idea of Agenda 21, yet did not develop a single national sustainable development strategy in the classical sense. In the

1990s, an important coordinating role was played by the President's Council on Sustainable Development, while the document *A New Consensus for Prosperity, Opportunity, and a Healthy Environment* became the first attempt to conceptually frame this issue at the federal level (Council on Sustainable Development, 1996). Subsequently, however, the US model evolved not towards a single strategic document, but towards the sectoral integration of sustainability principles into climate, energy, infrastructure and social policy.

For this reason, the contemporary US model can be defined as a distributed model of sustainability institutionalisation, in which coordination is carried out through interagency mechanisms, while practical implementation occurs through a system of interrelated strategies (Table 1).

Table 1. Strategies for implementing the NSDS in the United States. (Source: compiled by the author based on U.S. Government (2021), Department of Energy (2025), and U.S. Government (2025))

Area	Sectoral strategy	Content of the strategy
Climate policy	U.S. National Climate Strategy (2021, updated in 2023)	Defines the framework for achieving climate neutrality by 2050; forms part of the Long-Term Strategy of the United States under the Paris Agreement.
Energy	U.S. National Energy Strategy / Clean Energy Plan	Provides for the decarbonisation of the energy sector, the development of renewable energy sources and the creation of green jobs.
Infrastructure and environment	Building Resilience through a Made in America Industrial Strategy	Represents a large-scale programme for green infrastructure, resilient transport systems and industrial modernisation.
Social equity	Justice40 Initiative (Executive Order 14008, 2021)	Requires that at least 40% of certain federal environmental investment benefits be directed to communities that have historically experienced socio-economic disadvantages.

After 2021, this logic was reinforced through a *whole-of-government approach*, according to which the principles of sustainable development are to be taken into account across all areas of public policy, investment planning and budgetary decision-making. Within this system, the Council on Environmental Quality performs a key coordinating role, while the financial and administrative dimension is ensured through reporting and planning requirements, including those established by Executive Order 14057. Thus, the American approach combines political coordination, sectoral implementation and budgetary-administrative control, although it is not formally based on a single NSDS document.

The United Kingdom was among the first European states to institutionalise sustainable development in the form of a separate national strategy. Beginning with *Sustainable Development: The UK Strategy* in 1994, and subsequently through *A Better Quality of Life* in 1999 and *Securing the Future* in 2005, the British model evolved from the programmatic consolidation of objectives towards the integration of sustainability principles into the entire system of public governance (HM Government, 1994; HM Government, 1999; HM Government, 2005). A turning point was marked by *Mainstreaming Sustainable Development: The Government's Approach*, after which sustainability ceased to be treated as a separate policy sector and began to function as a general principle of public planning (HM Government, 2011).

In its contemporary form, the British model is also integrated in nature. It is based not on a single framework document, but on a system of interrelated strategies and programmes, among which *The Net Zero Strategy: Build Back Greener*, *Levelling Up the United Kingdom*, the *25 Year Environment Plan* and the *Inclusive Britain Action Plan* occupy an important place (HM Government, 2021; HM Government, 2022; HM Government, 2018).

The British ESG-oriented strategic model makes it possible to combine climate policy, regional development, natural resource governance and social inclusion within a unified logic of public policy. Accordingly, in contemporary public governance, sustainability is increasingly implemented as an isolated strategy. Instead, it is institutionalised through a set of sectoral documents, monitoring systems, regulatory requirements and financial mechanisms which together form an integrated architecture of public responsibility. It is within this logic that the transition occurs from the general concept of sustainable development to the strategic institutionalisation of ESG approaches, covering not only the corporate environment, but also public governance, budgetary planning and the financial system.

In parallel, developed economies are experiencing a shift from traditional corporate social responsibility towards a broader model of ESG-oriented strategy. This transformation is associated not only with growing societal demand for responsible business conduct, but also with the increasing role of financial markets in selecting companies according to the criteria of long-term resilience. Consequently, business responsibility is increasingly assessed through the quality of risk management, transparency of non-financial information, environmental efficiency, social inclusion and the ability to integrate these parameters into financial decisions. For this reason, corporate responsibility is gradually moving from the periphery of public communication to the core of strategic and financial management.

The Sustainable Development Goals serve as a reference point for corporate management. Companies' participation in the Science-Based Targets initiative enables them to define science-based climate targets and link them with the modernisation of technologies, logistics, energy consumption and management systems. As a result, large transnational corporations systematically connect corporate social responsibility with the matrix of the Sustainable Development Goals, while the social dimension of responsibility gradually moves from the sphere of philanthropy into the domain of long-term human capital, education and inclusion policies.

For this reason, corporate responsibility is converted into stakeholder trust, reputational resilience and a higher quality of strategic management. Economic, environmental and social sustainability should therefore be understood as the capacity to ensure well-being and the continuity of human activity without depleting the resource potential, while ensuring a fair distribution of benefits and responsible treatment of the consequences of economic activity. In applied terms, this means that economic sustainability is not reduced merely to maintaining growth rates, but presupposes the alignment of financial and credit mechanisms, production resources, labour potential and managerial decisions with long-term social and environmental priorities.

Under these conditions, the concept of sustainable finance has emerged. It provides for the integration of environmental, social and governance criteria into financial decisions in order to direct capital towards long-term sustainable economic activity (World Bank Group, 2025). Under this approach, the financial system is no longer limited to ensuring profitability or liquidity; rather, it performs a broader function of aligning economic benefit with public value, environmental security and institutional resilience.

Central banks and financial regulators play an important role in the development of sustainable finance. A significant step in this direction was the establishment in 2017 of the Network for Greening the Financial System, NGFS, which brought together central banks and supervisory authorities to develop common approaches to incorporating ESG risks, integrating climate and social parameters into financial analytics and revising investment and credit policies in line with sustainability principles (NGFS, 2017).

At the same time, the European Union created a more stringent regulatory framework through the Sustainable Finance Disclosure Regulation, SFDR, together with the taxonomy of sustainable activities, which requires financial institutions to disclose the impact of their activities on the environment and society transparently (European Parliament & Council EU, 2019).

In response to these regulatory changes, financial and credit institutions after 2019 began to actively integrate ESG parameters into their business models, which directly affected their activities, above all lending, risk assessment and the structure of financial products. Therefore, the growth of ESG-oriented lending should be regarded not as a temporary market tendency, but as a manifestation of a deeper transformation of the financial sector towards the institutionalisation of sustainable development principles (Figure 3).

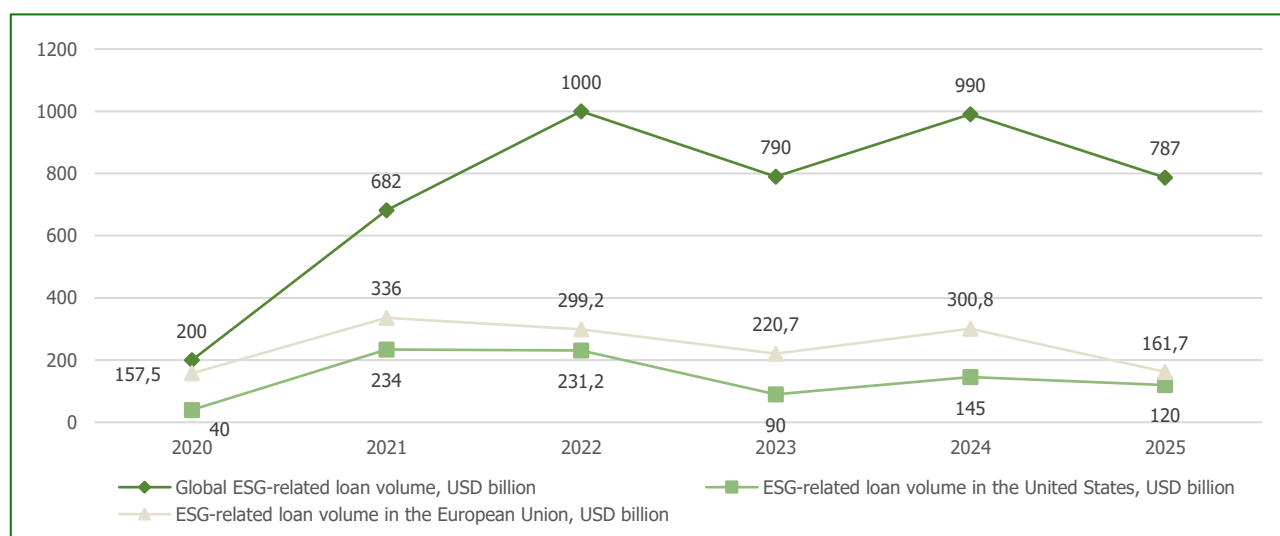


Figure 3. Global ESG lending volumes, 2020–2025. (Source: compiled by the author based on UNCTAD (2021), KBC (2022), BBVA (2023), SustainableInvest (2026), International Finance Corporation (2022), Holmes and Kirk (2023), Gautam, Kemp and Wang (2024), ING (2025), and AFME (2026))

The dissemination of responsible banking principles has become one of the most visible manifestations of the institutionalisation of sustainable finance. In 2019, under the auspices of the United Nations, an initial group of 130 banks, now expanded to more than 350 institutions, signed the Principles for Responsible Banking, PRB, thereby committing themselves to aligning their portfolios with the Sustainable Development Goals and the Paris Climate Agreement (UNEP FI, 2019). As a result, financial institutions have introduced certain restrictions on the financing of projects that harm the environment or contradict the logic of long-term social resilience, while simultaneously expanding support for renewable energy, environmentally friendly transport, energy-efficient real estate, and other ESG-oriented areas.

In 2020–2025, notable shifts in this direction also occurred within the Ukrainian banking system. In November 2021, the National Bank of Ukraine presented the Sustainable Finance Development Policy until 2025, in which it outlined its vision for integrating ESG criteria into the activities of financial institutions and defined a roadmap for implementing the relevant requirements. The further development of this logic was reflected in Ukraine's inclusion in reports by the Sustainable Banking and Finance Network, SBFN, and the International Finance Corporation, IFC, as a country developing ESG-related regulatory requirements, as well as in the preparation and approval in June 2025 of the White Paper on the management of environmental, social and governance risks in the financial sector. This document establishes a phased approach to the implementation of ESG requirements, first for banks in 2025–2026 and subsequently for non-bank financial institutions in 2026–2030 (National Bank of Ukraine, 2025).

Therefore, a preliminary conclusion can be drawn that Ukraine has already formed the basic regulatory and market foundations for the development of sustainable banking. Its specific feature lies in the combination of the National Bank of Ukraine's regulatory initiative, the gradual adaptation of banking business models to ESG requirements, and the expansion of targeted financing practices for projects related to energy efficiency, social support, municipal development, and business resilience.

An integral component of this transformation of ESG approaches within sustainable finance is investment, which has turned sustainable finance from a segmental phenomenon into one of the leading areas of global investment. The growth in assets managed with regard to ESG criteria reflects not only a change in investment preferences, but also a deeper restructuring of the logic of financial intermediation, within which long-term sustainability is increasingly regarded as a factor of profitability, risk reduction and institutional reliability (Figure 4).

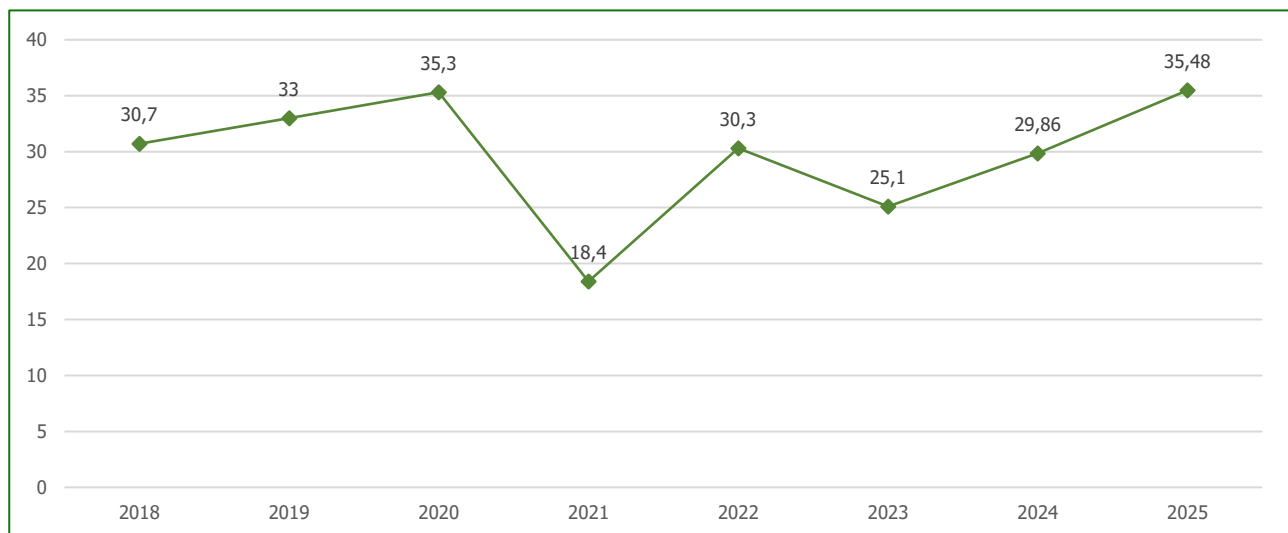


Figure 4. Global volume of ESG investments, 2018–2025 (USD trillion). (Source: compiled by the author based on World Economic Forum (2019), Jessop (2021), Fady (2024), Mazzolini et al. (2024), and Precedence Research (2026))

This dynamic indicates a systemic shift in investor priorities from purely financial performance towards the search for double or triple returns. The positive dynamics of the global investment market have been driven primarily by institutional investors focused on long-term outcomes, for whom sustainability is increasingly becoming synonymous with profitability.

Against the background of the expanding ESG investment market, the market for so-called green bonds has also demonstrated considerable activity, becoming one of the key financial indicators of sustainable development. The emergence of green bonds has been one of the most visible manifestations of the transition from declarative support for sustainable development to the creation of specialised financial instruments. The first significant step in this direction was taken by the European Investment Bank, which in 2007 issued the Climate Awareness Bond aimed at financing climate-related

projects. As early as 2008, the World Bank, in cooperation with Scandinavian pension funds, carried out its own green bond issuance, effectively initiating a new segment of the international capital market (European Investment Bank, 2025; World Bank, 2025).

The subsequent development of this instrument demonstrated that the green debt market had moved beyond the narrow circle of international financial institutions and had begun to be used by corporate issuers, banks, municipalities and the public sector. The expansion of the range of issuers created the need for market standardisation, the harmonisation of approaches to project selection and the prevention of so-called greenwashing practices. In response, the Green Bond Principles were introduced, while a taxonomy-based approach was further developed to identify projects that may be considered sustainable or environmentally relevant (World Economic Forum, 2022).

In Ukraine, the regulatory adaptation of the financial market to this logic began in 2020. Law No. 738-IX of 19 June 2020 incorporated the categories of "green bond" and "environmentally oriented project" into the national legal framework (Zakon, 2020). The next step was the approval in 2021 of recommendations by the National Securities and Stock Market Commission, NSSMC, on the implementation or financing of environmentally oriented projects through the issuance of green bonds (NSSMC, 2021). In 2022, the Cabinet of Ministers of Ukraine approved the Concept for the Introduction and Development of the Green Bond Market in Ukraine, which directly links this instrument to the achievement of balanced sustainable development and to addressing the low prioritisation of environmental issues in the financial system (CMU, 2022).

At the same time, the existence of a regulatory framework in itself has not led to the formation of a fully-fledged green bond market in Ukraine. The main reason lies in the gap between regulatory readiness and market capacity. In the absence of a sufficiently deep corporate debt market, and under the conditions of full-scale war, sharply increased uncertainty and the reorientation of the financial system towards the primary needs of macrofinancial stability, the legally established instrument has not received the necessary market base and, consequently, has not achieved broad application as a financial instrument. Thus, the legal recognition of green financial instruments is a necessary but insufficient condition for their development. Equally important are the depth of the capital market, investor confidence, the stability of the monetary and financial environment, and the availability of long-term projects suitable for market-based financing through such instruments.

Under these conditions, budgetary policy acquires primary importance, since it is through the budget that the state is able to transform strategic sustainable development priorities into concrete financial decisions. In the system of public finance, sustainability is implemented not abstractly, but through four interrelated functions:

1. The allocative function, through which resources are directed towards areas with long-term social effects, including education, healthcare, energy and the environment.
2. The redistributive function, which reduces social inequality and supports social cohesion through transfers, subsidies and targeted programmes.
3. The stabilisation function, which makes it possible to mitigate crisis shocks, support employment and prevent the degradation of human capital.
4. The institutional function, within which the budget ensures accountability, rules of financial planning and the assessment of public policy effectiveness.

For this reason, for Ukraine, which combines the need for recovery, social support and macrofinancial stability, budgetary architecture becomes the central instrument for the financial implementation of sustainability principles. It also forms the empirical component of this study, which is aimed at identifying the extent to which the ESG-oriented architecture of the state budget is associated with the market valuation of Ukraine's sovereign debt instruments.

The authors use the Cbonds Ukraine Sovereign USD Index as the dependent variable. Within the study, this index is interpreted as an aggregate market indicator of the condition of sovereign foreign-currency obligations and, therefore, as a proxy for external perceptions of the state's budgetary sustainability and financial reliability.

The information base consists of 30 aligned quarterly observations for 2018Q1–2025Q2. Fiscal flows, exchange-rate conversion, the method used to obtain each Cbonds observation, and the wartime-regime flag are recorded at the observation level in the working dataset, which permits the reported transformations and model estimates to be reproduced.

The composition of the integral indices and the corresponding entropy weights are presented in Table 2.

Table 2. Composition of the integral indices R_t and E_t with entropy weights of indicators. Note: entropy weights were calculated from quarterly State Budget execution data for 2018Q1–2025Q2 after currency conversion and min–max normalisation. (Source: data were obtained from the Ministry of Finance of Ukraine and the National Bank of Ukraine)

Component	Indicator	Entropy weight
Revenue component R_t	Penalties for violations of legislation on ensuring the efficient use of energy resources	0.319
	Receipts from payments by persons with disabilities of the partial cost of vehicles and proceeds from the sale of vehicles returned by persons with disabilities	0.144
	Rent payment for subsoil use	0.108
	Fee for issuing special permits for subsoil use and proceeds from the sale of such permits	0.103
	Levy for socio-economic compensation of risk to the population residing within the surveillance zone	0.068
	Pollution charge for environmental contamination	0.067
	Rent payment for special water use	0.053
	Environmental tax	0.052
	Monetary penalties for damage caused by violations of environmental protection legislation	0.050
	Rent payment for special use of forest resources	0.035
Expenditure component E_t	Reproduction of the mineral resource base	0.283
	Spiritual and physical development	0.272
	Environmental protection	0.155
	Education	0.091
	Fundamental and applied research and development in economic sectors	0.091
	Healthcare	0.064
	Social protection and social security	0.044

The structure of the weights provides grounds for two important conclusions.

First, in the revenue index, the highest weights are assigned to instruments related to resource regulation, penalty and sanction mechanisms, and socially sensitive revenues. These indicators reflect not merely the volume of budget revenues, but their institutional quality and their connection with the regulated behaviour of economic agents.

Second, in the expenditure index, the dominant items are those related to the reproduction of the resource base, human development and environmental protection. Therefore, the model captures not general budgetary activity, but specifically its ESG-relevant component.

The dynamics of the key variables on an annual basis are presented in Table 3. They make it possible to observe the empirical basis of the model before proceeding to regression estimates.

Table 3. Dynamics of the key variables of the model, 2018–2025. Note: 2025 covers Q1–Q2. Annual values are arithmetic means of the quarterly observations. (Sources: authors' calculations based on Ministry of Finance of Ukraine, National Bank of Ukraine and Cbonds data)

Year	Average value of the Cbonds Ukraine Sovereign USD Index	Average value of the revenue ESG index R_t	Average value of the expenditure ESG index E_t	Average gap $R_t - E_t$
2018	161.00	0.399	0.217	0.182
2019	191.50	0.315	0.293	0.022
2020	202.50	0.200	0.221	-0.020
2021	224.25	0.297	0.448	-0.151
2022	53.25	0.154	0.152	0.003
2023	93.25	0.168	0.129	0.039
2024	128.75	0.228	0.167	0.061
2025*	144.50	0.206	0.123	0.083

The annual dynamics confirm the presence of a pronounced structural break in 2022. While in 2018–2021 the average value of the sovereign USD index increased and reached 224.25 in 2021, in 2022 it declined sharply to 53.25. This reflects a radical change in the market perception of Ukraine's foreign-currency sovereign debt instruments after the beginning of the full-scale war.

At the same time, a substantial shift is observed in the relationship between the revenue and expenditure ESG components of the budget. Whereas in 2020–2021 the expenditure index exceeded the revenue index, after 2022 the situation changed, with the revenue component beginning to dominate systematically. This constitutes an important precondition for the subsequent regression results.

The estimation results for the baseline model and the model with a one-quarter lag of expenditures are presented in Table 4.

Table 4. Estimation Results for the Static Baseline Model and the Model with a One-Quarter Expenditure Lag. Note: ***, ** denote statistical significance at the 1% and 5% levels, respectively. Classical OLS results are retained as benchmarks; Table 6 reports the preferred dynamic controlled specification with HAC(1) inference.

Indicator	Baseline model	Model with expenditure lag $t - 1$
Specification	$Index_t = \alpha + \beta R_t + \beta_2 E_t + \beta_3 D_t + \beta_4 (R_t \cdot D_t) + \varepsilon_t$	$Index_t = \alpha + \beta_1 R_t + \beta_2 E_{t-1} + \beta_3 D_t + \beta_4 (R_t \cdot D_t) + \varepsilon_t$
Period	2018Q1–2025Q2	2018Q2–2025Q2
Number of observations	30	29
R ²	0.7722	0.7689
Adj. R ²	0.7358	0.7304
Prob(F-statistic)	0.000000099	0.000000238
const	203.993***	224.581***
R _t	-78.357	-62.029
E _t / E _(t-1)	49.410	-40.079
D _t	-166.524***	-174.981***
R _t ·D _t	371.072**	371.187**
p-value for E _t / E _(t-1)	0.1504	0.2148
p-value for R _t ·D _t	0.0178	0.0244
Cumulative effect of R _t γ during the wartime period, $\beta_1 + \beta_4$	292.715**	309.157**
p-value of the cumulative effect	0.0365	0.0316

The static baseline specification has substantial explanatory power for a quarterly macrofinancial sample: R² equals 0.7722, and the adjusted R² equals 0.7358. These values justify retaining the model as a transparent benchmark. They are not, however, sufficient to establish the preferred specification, because lag-order choice must be based on a common estimation window and the benchmark residuals exhibit serial persistence. The final interpretation therefore relies on the information-criterion comparison, control variables and diagnostics reported below.

First of all, attention should be paid to the negative and statistically significant coefficient of the wartime dummy variable. Its substantive meaning is that, after 2022, the market valuation of Ukrainian sovereign debt has been formed in a substantially more restrictive environment, in which security risks, the scale of external financing, fiscal adaptability and confidence in the state's institutional capacity have become decisive. Thus, the war acts not merely as an external shock, but also as a factor of structural break in the very logic of market valuation.

The separate coefficient of the revenue ESG index in the pre-war regime does not demonstrate statistical significance. This means that, under relatively stable conditions, the market did not attach decisive importance specifically to the ESG-relevant quality of the budget revenue base. However, once the interaction between this index and the wartime regime is taken into account, the situation changes fundamentally. The positive and statistically significant interaction coefficient, as well as the positive cumulative effect of the revenue index during the wartime period, indicate that, after 2022, the quality, predictability and institutional orderliness of the budget revenue architecture begin to function as a meaningful signal. This implies that, under wartime conditions, the market is concerned not only with the total volume of mobilised resources, but also with the nature of their formation. If the budget revenue base is grounded in transparent, legitimate and institutionally stable sources, this strengthens confidence in the state's fiscal capacity. Under such conditions, fiscal sovereignty appears not merely as the ability to accumulate funds, but as the capacity to maintain their structural quality, the stability of rules and the manageability of the budgetary process.

A different pattern is observed with regard to the expenditure index. In the baseline model, it does not reach statistical significance, although the sign of the coefficient is positive. This does not mean that expenditure policy is irrelevant to sustainable development in the Ukrainian context. Rather, the market does not perceive the current configuration of expenditures as a sufficiently strong and immediate signal of future state capacity. The likely reasons include the high share of protected current expenditures, the fragmentation of programmes, the time lag between budgetary allocation and measurable results, and the wartime dominance of expenditures aimed primarily at maintaining the basic viability of the state. This contemporaneous benchmark result should not be interpreted as evidence that delayed expenditure effects are absent; it motivates the common-sample lag comparison and the dynamic specification presented below.

To test the hypothesis of a possible delayed effect of expenditure policy, additional lagged specifications were estimated, the results of which are presented in Table 5.

Table 5. Common-sample comparison of lagged model specifications. Note: every specification is estimated over 2019Q1–2025Q2 ($n = 26$), so AIC and BIC are directly comparable; lower values indicate a preferred model. The lag refers to E_t , and the wartime revenue effect is $\beta_1 + \beta_4$.

Indicator	No lag	1-quarter lag	2-quarter lag	3-quarter lag	4-quarter lag
Estimation window	2019Q1–2025Q2	2019Q1–2025Q2	2019Q1–2025Q2	2019Q1–2025Q2	2019Q1–2025Q2
Number of observations	26	26	26	26	26
R^2	0.8149	0.8331	0.8127	0.8286	0.8118
Adjusted R^2	0.7796	0.8013	0.7770	0.7960	0.7759
AIC	254.009	251.313	254.316	252.001	254.439
BIC	260.300	257.604	260.606	258.291	260.729
Coefficient of E_t or E_{t-j}	47.768	–56.453	–31.575	–55.214	–29.717
p-value of expenditure coefficient	0.2696	0.0674	0.3230	0.0941	0.3483
Coefficient of $R_t \times D_t$	358.491	283.721	278.720	274.783	260.833
p-value for $R_t \times D_t$	0.0536	0.0867	0.1117	0.1011	0.1426
Wartime revenue effect $\beta_1 + \beta_4$	293.303	308.648	289.948	245.417	296.421
p-value of wartime revenue effect	0.0352	0.0202	0.0390	0.0727	0.0347
Prob(F-statistic)	<0.001	<0.001	<0.001	<0.001	<0.001

Holding the estimation window constant changes the model-selection conclusion. The one-quarter expenditure lag produces the lowest AIC (251.313) and BIC (257.604) and the highest adjusted R^2 (0.8013). The next-best information-criterion values are obtained for the three-quarter lag, but both criteria remain 0.687 points above the one-quarter specification. Although this difference is modest, AIC and BIC select the same lag length; E_{t-1} is therefore used in the preferred dynamic model.

In the common-sample static model, the coefficient of E_{t-1} is negative (–56.453) and marginally significant at the 10% level ($p = 0.0674$), whereas the expenditure coefficients at longer lags remain statistically weak. At the same time, the wartime marginal effect of the revenue index in the one-quarter-lag specification is positive, equals 308.648, and is significant at the 5% level ($p = 0.0202$). Thus, the lag comparison supports a differentiated interpretation: the revenue channel remains positive under wartime conditions, while the expenditure channel is delayed and may carry a short-run market cost.

The static comparison alone does not fully resolve serial dependence or omitted-variable concerns. A refined dynamic model was therefore estimated with Index_{t-1} , the selected E_{t-1} term, exchange-rate depreciation, and changes in global volatility. The results are presented in Table 6.

Table 6. Refined dynamic model with control variables and HAC(1) inference. Note: $Z(\text{FX})_t$ and $Z(\text{VIX})_t$ are standardised logarithmic quarterly changes. HAC standard errors use a Bartlett kernel with a one-quarter bandwidth.

Parameter/statistic	Estimate	HAC(1) standard error	p-value
Constant	106.754	28.208	0.0011
Index_{t-1}	0.7015	0.1171	<0.001
R_t	–68.978	56.492	0.2356
E_{t-1}	–107.318	45.219	0.0273
D_t	–88.919	28.125	0.0047
$R_t \times D_t$	229.647	81.084	0.0100
$Z(\text{FX})_t$	–3.752	3.420	0.2851
$Z(\text{VIX})_t$	–3.540	4.382	0.4282
Short-run wartime revenue effect $\beta_1 + \beta_4$	160.669	61.683	0.0165
Steady-state revenue multiplier $(\beta_1 + \beta_4)/(1 - \rho)$	538.294	161.884	0.0032
R^2 / adjusted R^2	0.9130 / 0.8840	—	—
AIC / BIC	263.199 / 274.137	—	—
F-statistic / Prob(F)	31.476 / <0.001	—	—

The refined specification materially improves the fit: R^2 rises to 0.9130 and the adjusted R^2 to 0.8840. The autoregressive coefficient is 0.7015, confirming substantial but stable persistence in the sovereign index. After controlling for this persistence, currency depreciation, and changes in global volatility, the interaction $R_t \times D_t$ remains positive and statistically significant (229.647; HAC $p = 0.0100$). The short-run wartime marginal effect of the revenue index equals 160.669 ($p = 0.0165$), while the corresponding steady-state multiplier is 538.294 ($p = 0.0032$). The negative signs of both control variables are economically consistent with adverse market pricing of depreciation and higher global risk, although their individual coefficients are not statistically significant in the joint specification.

The lagged expenditure coefficient is negative and statistically significant (-107.318 ; HAC $p = 0.0273$). This estimate should not be interpreted as evidence that ESG-relevant public expenditure reduces social welfare or long-term sustainability. Conditional on the revenue architecture, wartime regime, market persistence and risk controls, it indicates that a higher expenditure index in the preceding quarter is associated with a lower current sovereign total-return index. A plausible mechanism is the market's immediate pricing of financing pressure, implementation risk and the opportunity cost of fragmented programmes before their social, environmental and productivity benefits become observable. Given the short sample, the result remains associative rather than causal.

Table 7. Stationarity tests and residual diagnostics. Note: ADF lags were selected by AIC from zero to three. Stationarity p -values are finite-sample bootstrap values based on 30,000 replications. Residual tests refer to the refined model in Table 6.

Diagnostic	Statistic	p-value	Inference at 5%
Panel A. Stationarity of input variables			
ADF: Index_t in levels	-1.638	0.459	Unit root not rejected
Break-augmented ADF: Index_t , shift at 2022Q1	-5.181	0.002	Break-stationary
ADF: R_t	-4.783	0.001	Stationary
ADF: E_t	-5.203	<0.001	Stationary
ADF: $\Delta \ln(FX_t)$	-3.164	0.045	Stationary
ADF: $\Delta \ln(\text{VIX}_t)$	-3.585	0.017	Stationary
ADF: $\Delta \ln(\text{Index}_t)$	-5.770	<0.001	Stationary
Panel B. Residual diagnostics of the refined model			
Jarque–Bera normality test	0.818	0.664	Normality not rejected
Shapiro–Wilk normality test	0.976	0.737	Normality not rejected
Durbin–Watson statistic	2.048	—	No material first-order persistence
Breusch–Godfrey LM(1)	3.417	0.065	H_0 of no autocorrelation not rejected
Ljung–Box Q(4)	1.662	0.798	H_0 of no joint autocorrelation not rejected
Breusch–Pagan heteroscedasticity test	15.220	0.033	Heteroscedasticity detected
Ramsey RESET	0.683	0.517	Functional form not rejected

The ordinary ADF test does not reject a unit root in the unadjusted sovereign index, but the conclusion changes once the known 2022Q1 level shift is included: the break-augmented statistic is -5.181 with a bootstrap p -value of 0.002. The fiscal indices and the differenced controls are stationary. In the preferred model, residual normality and functional form are not rejected, the Durbin–Watson statistic is close to two, and neither the Breusch–Godfrey nor the Ljung–Box test detects autocorrelation at the 5% level. The Breusch–Pagan test does identify non-constant variance; consequently, coefficient inference in Table 6 is based on HAC(1) standard errors. Taken together, these checks substantially reduce the risk that the reported relationships are artifacts of an unmodelled break, residual serial dependence or scale-dependent variance.

Summarising the estimates, the market response under wartime conditions is differentiated rather than one-dimensional. A stronger ESG-relevant revenue architecture is associated with a higher sovereign total-return index even after dynamic persistence and external-risk controls are introduced. The expenditure signal is delayed: a higher E_{t-1} is associated with a lower current index over the observed short horizon. Hence, the policy implication is not to constrain sustainability-oriented expenditure, but to ensure that such expenditure is financed credibly, consolidated into coherent programmes and linked to measurable outcomes capable of offsetting the near-term fiscal risk perceived by investors.

From a practical standpoint, this implies the need to increase the share of expenditures that generate a long-term multiplier effect, particularly in the areas of energy resilience, human capital, healthcare, environmental security, science and technological modernisation.

At the same time, it is necessary to reduce the fragmentation of ESG-relevant programmes and move towards their deeper integration within medium-term budgetary planning.

It is also advisable to expand the practice of performance-based budgeting, whereby assessment focuses not only on the absorption of funds, but also on the actual socio-economic and environmental outcomes achieved.

In addition, expenditure policy should be linked to the logic of financial stability, avoiding mutual crowding-out among social support, defence capacity, infrastructure recovery and development-oriented investment.

No less important is the institutionalisation of ESG tagging of budgetary programmes and the regular publication of its results. This would increase the transparency of the budgetary process and strengthen confidence in public finance among both domestic and external stakeholders.

DISCUSSION

The results obtained confirm that sustainability should be interpreted not as a peripheral element of environmental policy or corporate management, but as an institutionally and financially relevant category that changes the logic of strategies, financial intermediation and approaches to risk assessment. This conclusion is consistent with the argument that the ESG concept is increasingly integrated into the financial dimension of risk and is no longer confined to the role of an ethical or communication instrument (De Giuli et al., 2024).

In a broader context, this corresponds to the fact that sustainable investing and sustainable financing have already formed a distinct research domain in which capital is considered not merely as a vehicle for short-term financial return, but as an instrument for maintaining long-term balanced development (Joshi et al., 2024). Accordingly, the present study develops the thesis that, at the state level, sustainability moves from the sphere of normative declaration into the domain of concrete budgetary and financial policy.

The comparative analysis of international practices has shown that the strategic institutionalisation of ESG approaches today occurs primarily not through a single framework document, but through a set of sectoral strategies, disclosure regimes, budgetary rules and regulatory standards. This conclusion is well aligned with the findings of Cojoianu et al. (2025), who demonstrate that green finance policies emerge as a response to deeper structural contradictions between traditional financing models and the new configuration of climate-related and financial risks. A similar logic is developed by Cosma et al. (2024), who show that sustainable finance disclosure regulation affects not only transparency, but also the behaviour and performance of financial products under crisis conditions. Therefore, the transition identified in this article from the general idea of sustainable development to the strategic institutionalisation of ESG approaches should be considered part of a broader international trend.

The results obtained for the financial sector are also consistent with recent scholarly contributions, since the increasing importance of ESG-oriented lending, responsible banking and regulatory pressure demonstrated in this article corresponds to the conclusions of Chen and Xie (2022), who link ESG disclosure to stronger financial performance and lower information asymmetry.

At the same time, studies in the field of public finance show that green public finance and green taxes do not produce identical effects in the short and long run, while their effectiveness depends on the institutional environment and the nature of environmental policy (Athari, 2025; Hassan et al., 2025). In this regard, the Ukrainian case is particularly indicative, since the sustainable finance agenda has already acquired features of institutional formalisation, although not all of its elements are equally capable of being rapidly transformed into market-relevant outcomes.

The most significant empirical result is the persistence of the positive wartime revenue channel after the model is refined. In the preferred specification, the interaction between the revenue index and the wartime regime equals 229.647 (HAC $p = 0.0100$), and the short-run wartime marginal effect equals 160.669 ($p = 0.0165$). This is consistent with studies showing that sustainability and governance factors are incorporated into sovereign ratings and the pricing of sovereign instruments (Pineau et al., 2022; Anand et al., 2023), while adding evidence that the quality of resource mobilisation becomes especially informative under a regime of military and fiscal stress.

At the same time, a number of empirical studies demonstrate that stronger ESG or extra-financial country characteristics are associated with lower sovereign borrowing costs and narrower spreads, with the social and governance components producing the most pronounced effects (Crifo et al., 2017; Capelle-Blancard et al., 2019; Margaretic & Pouget, 2018). The contribution of the present study lies in specifying this logic for Ukraine. Under the conditions of a wartime shock, the key

channel of the market signal is the revenue component of the budget, which reflects institutional orderliness, predictability of resource mobilisation and the state's capacity to maintain fiscal governability.

The expenditure result requires a more nuanced interpretation than the static model permits. Once the information criteria select E_{t-1} and market persistence, exchange-rate dynamics and global volatility are controlled for, the lagged expenditure coefficient becomes negative and statistically significant. Such a short-run association does not contradict research showing that the effects of green and socially oriented public finance are delayed, heterogeneous and institution-dependent (Athari, 2025; Hassan et al., 2025). In wartime Ukraine, budget allocations may be priced immediately through their financing burden and implementation risk, while benefits in human capital, environmental quality, resilience and productivity emerge over a longer horizon. The result therefore strengthens the case for performance-based budgeting, programme consolidation and transparent ESG tagging rather than for a mechanical reduction in sustainability-related expenditure.

The theoretical contribution of the article lies in combining three analytical vectors that are often treated separately in the literature: the philosophical understanding of sustainability, the strategic institutionalisation of ESG approaches and the financial-economic assessment of budgetary architecture. As a result, sustainability appears not only as a normative benchmark, but also as a measurable characteristic of state capacity manifested through the budgetary system. The applied contribution lies in demonstrating, for Ukraine, the particular importance of the quality of the revenue component of the budget as a factor of external financial confidence. The methodological contribution is the integration of a common-sample lag comparison, break-aware stationarity testing, dynamic controls, and explicit residual diagnostics into the assessment of ESG-oriented budgetary architecture.

The estimates obtained provide sufficient grounds to argue that, for Ukraine, sustainability as a financial category is most clearly manifested at the level of the state's budgetary architecture.

The study has several limitations that should be considered when interpreting the results. First, the quarterly sample contains 30 observations, which constrains the number of admissible controls and limits the power of time-series tests. Second, Cbonds observations for 2018Q1–2021Q2 were recovered from the provider's public chart and rounded to the nearest index point, whereas the later segment was directly observed in the authors' archived series; digitisation may therefore introduce limited measurement error. Third, the Cbonds Ukraine Sovereign USD Index is a market proxy that also reflects military events, liquidity conditions and geopolitical news. Exchange-rate and VIX controls reduce, but cannot fully remove, these influences. Fourth, the ESG-relevant revenue and expenditure indices are mapped from the existing budget classification, which does not yet provide formal ESG tagging. Finally, the estimates identify conditional associations rather than structural causal effects. The results should therefore be read as a reproducible empirical approximation of the budgetary manifestation of sustainability under wartime conditions.

CONCLUSIONS

The article conceptualises sustainability as a global development paradigm that integrates normative, strategic and financial dimensions. It is argued that, in contemporary scholarly and applied discourse, sustainability can no longer be interpreted merely as an ethical imperative or a set of environmental benchmarks. At present, it manifests itself as an integrated logic for organising public governance, financial regulation and the long-term redistribution of resources.

The synthesis of scholarly approaches made it possible to identify three interrelated strands of contemporary research. The first concerns the transformation of sustainability into a financially relevant category associated with risk, investment behaviour and the structural resilience of the economy. The second covers the strategic institutionalisation of ESG approaches through green finance policies, disclosure regimes and public finance instruments. The third focuses on the impact of sustainability factors on corporate and sovereign risk. At the same time, the study establishes that insufficient attention has been paid to the domain in which these three lines converge in the analysis of the state's budgetary architecture, particularly under conditions of war, macrofinancial shocks and high dependence on external financing.

The comparative analysis of international experience has shown that sustainability is increasingly less often implemented as an isolated strategy and increasingly more often embedded in a broader system of public strategy, reporting, sectoral policies and financial mechanisms. This conclusion provides grounds for interpreting the strategic institutionalisation of ESG approaches as a component of the contemporary model of public governance, rather than merely as an auxiliary instrument of corporate responsibility.

The analysis of sustainable finance and the banking sector demonstrates that the financial system is moving towards a model in which ESG criteria increasingly influence lending, investment, risk assessment and the structure of financial

products. In Ukraine, this process has already acquired institutional features through the National Bank of Ukraine's sustainable finance policy, the White Paper on ESG risk management and the gradual adaptation of systemically important banks to new standards. At the same time, the case of green bonds shows that the regulatory recognition of an instrument does not yet imply its actual development, since regulatory readiness must be supported by capital market depth, investor confidence and a stable macrofinancial environment.

The principal scientific result is obtained in the refined empirical model. The dynamic controlled specification explains 91.30% of the quarterly variation in the sovereign index, while the adjusted R^2 equals 88.40%. The wartime interaction of the revenue ESG index is positive and statistically significant (229.647; HAC $p = 0.0100$), and the short-run wartime marginal effect equals 160.669 ($p = 0.0165$). Accordingly, the positive association between the quality of the ESG-relevant revenue architecture and the market valuation of Ukraine's sovereign foreign-currency obligations is not eliminated by index persistence, exchange-rate depreciation, or changes in global volatility.

The expenditure channel is delayed and conditional. The one-quarter lag is selected by both AIC and BIC on a common sample, and E_{t-1} has a negative coefficient in the preferred model (-107.318 ; HAC $p = 0.0273$). This result should not be understood as a negative welfare assessment of ESG expenditure. It indicates that the market prices the near-term financing and implementation burden before longer-run social, environmental and productivity gains become visible. The empirical conclusion therefore reinforces the need for coherent programme design, measurable performance indicators and credible medium-term financing.

The practical significance of the study lies in substantiating the need to move from the formal inclusion of ESG priorities in public policy towards their budgetary institutionalisation. For Ukraine, this means strengthening the transparency of the budget revenue base, developing ESG tagging of budgetary programmes, consolidating and better coordinating expenditure priorities, and shifting towards performance-based budgeting, within which the financing of sustainability priorities is linked to measurable economic, social and environmental outcomes.

Thus, under contemporary conditions, sustainability should be regarded not only as a concept of global development, but also as a financially measurable characteristic of state capacity. In the case of Ukraine, its key carrier is the budgetary architecture through which strategic sustainable development priorities are transformed into instruments of fiscal resilience, institutional trust and the market valuation of sovereign finance.

Further research should extend the quarterly database with post-war and recovery-period observations, replace digitised index values with a fully licensed historical Cbonds series and formalise ESG tagging at the programme level. The preferred model should also be tested against alternative sovereign-risk measures, including Eurobond spreads, credit default swaps and sovereign ratings, and augmented with direct indicators of military intensity, external financing and market liquidity. A longer series would permit state-space, Bayesian and regime-switching specifications capable of separating short-run financing pressure from the long-run productivity effects of ESG-oriented public expenditure.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

FUNDING

The Authors received no funding for this research.

CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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СТРАТЕГІЧНА ІНСТИТУЦІОНАЛІЗАЦІЯ СТАЛОСТІ Й ФІНАНСОВА ESG-АРХІТЕКТУРА БЮДЖЕТНОЇ ПОЛІТИКИ УКРАЇНИ

У сучасних умовах глобальної трансформації економічних систем, посилення кліматичних, соціальних і фінансових ризиків, а також в умовах воєнних викликів для України особливої актуальності набуває дослідження сталості як інтегрованої концепції довгострокового розвитку та її фінансової імплементації через ESG-підходи в бюджетній політиці держави. Метою дослідження є розкриття сталості як концепції глобального розвитку через поєднання стратегічного та фінансового вимірів, а також оцінка того, якою мірою ESG-підходи інституціоналізуються в державних стратегіях, трансформують фінансовий сектор і проявляються в архітектурі бюджетної політики України. У дослідженні використано поєднання філософсько-нормативного, інституційно-порівняльного та економіко-математичного підходів. Основні результати засвідчили, що сталість доцільно трактувати не лише як ціннісну або нормативну категорію, а й як інституційно та фінансово релевантну основу формування стратегії, бюджетного планування й фінансового регулювання. Установлено, що стратегічна інституціоналізація ESG-підходів у сучасній міжнародній практиці відбувається переважно через сукупність секторальних стратегій, регуляторних режимів, стандартів розкриття інформації та бюджетних механізмів. Емпіричний аналіз для України показав, що в умовах війни особливого значення для ринкового сприйняття державної фінансової стійкості набуває якість дохідної архітектури бюджету. Уточнена динамічна модель з одноквартальним лагом видатків, курсовою динамікою та зміною глобальної ринкової волатильності підтвердила позитивний воєнний ефект дохідного індексу та виявила негативний короткостроковий зв'язок лагованого видаткового індексу з ринковою оцінкою суверенних зобов'язань. Зроблено висновок, що сталість на державному рівні переходить із площини декларативної ідеї в царину конкретної бюджетної та фінансової політики, а ESG-орієнтована бюджетна архітектура виступає важливим чинником зміцнення фінансової стійкості й довіри до держави.

Ключові слова: бюджетна політика, ESG, фінансова стійкість, публічні фінанси, сталість, сталі фінанси

JEL Класифікація: Q01, Q56, G28, H50, H61