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Architecture of International Financing for Ukraine's Recovery

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ABSTRACT

Ukraine's post-war recovery creates an unprecedented demand for investment and budget support, but available financing channels differ in cost, conditionality, mobilisation speed and fiscal implications. An additional constraint is the need to align the investment cycle with budget rules, transparency and accountability of fund use. The study aims to build an applied financing-gap model based on RDNA4 needs estimates and to develop a matrix of international financial instruments suitable for selecting a financing mix under scenarios of resource availability and debt sustainability constraints. A scenario framework is proposed where the average annual need is derived from the total need divided by the assessment horizon, and the financing gap is computed as the difference between the need and the sum of external and domestic resources. Using demonstrative parameters, three scenarios are constructed, illustrating the shift from near-balanced financing to a systemic deficit that requires sector prioritisation and phased reconstruction. An instrument matrix (grants, concessional IFI loans, state guarantees, blended finance, war-risk insurance/risk-sharing, and public-private partnerships) is developed with application conditions, key risks and control indicators to align the "gap – instrument – control" logic within a single investment cycle. The minimum preconditions for implementing the mechanism are outlined (priority project portfolio, debt framework, selection rules, monitoring and audit). The effectiveness of international financing is determined not by the list of sources but by the architecture of their combination: budget support should be complemented by private capital mobilisation and risk-premium reduction tools, while fiscal rules, transparency and stage-gated project selection are necessary conditions for a viable recovery portfolio. The proposed approach can serve as an analytical template for configuring financing programmes and monitoring recovery performance.

KEYWORDS

international financing, Ukraine's recovery, financing gap, debt sustainability, state guarantees, blended finance, war-risk insurance, public-private partnership.

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АНОТАЦІЯ

Післявоєнне відновлення України формує безпрецедентний попит на інвестиції та бюджетну підтримку, але наявні канали фінансування різняться за вартістю, умовами, швидкістю залучення та фіскальними наслідками. Додатковим обмеженням виступає необхідність узгодження інвестиційного циклу з бюджетними правилами, прозорістю та підзвітністю використання коштів. Мета дослідження полягає в побудові прикладної моделі фінансового розриву відбудови на базі оцінки потреб RDNA4 та формуванні матриці міжнародних фінансових інструментів, придатної для вибору портфеля рішень за сценаріями доступності ресурсів і обмежень боргової стійкості. Запропоновано сценарний підхід, у якому середньорічна потреба відновлення визначається як відношення сукупної потреби до горизонту оцінювання, а фінансовий розрив – як різниця між потребою та сумою зовнішніх і внутрішніх ресурсів. На демонстраційних параметрах сформовано три сценарії, що показують перехід від майже збалансованого фінансування до системного дефіциту, який потребує пріоритизації секторів і поетапності відбудови. Розроблено матрицю інструментів (гранти, пільгові позики МФО, державні гарантії, змішане фінансування, страхування/розподіл воєнних ризиків, публічно-приватне партнерство) з умовами застосування, ключовими ризиками та контрольними індикаторами, а також окреслено мінімальні передумови реалізації механізму (портфель пріоритетних проєктів, боргова рамка, правила відбору, моніторинг і аудит). Ефективність міжнародного фінансування визначається не переліком джерел, а архітектурою їх поєднання: бюджетна підтримка має доповнюватися інструментами мобілізації приватного капіталу та механізмами зниження премії ризику, тоді як фіскальні правила, прозорість і стадійність відбору проєктів виступають умовами життєздатності портфеля відбудови. Запропонований підхід придатний як аналітичний шаблон для налаштування програм фінансування та контролю результативності відбудови.

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міжнародне фінансування, відбудова України, фінансовий розрив, боргова стійкість, державні гарантії, змішане фінансування, страхування воєнних ризиків, публічно-приватне партнерство.

1. Introduction

Ukraine's reconstruction needs are long-term in nature and include the restoration of housing and critical infrastructure, maintaining the continuity of public services and macro-fiscal resilience, as well as modernization investments. The World Bank's assessment captures the scale of aggregate needs over a ten-year horizon and forms the basis for quantifying the financial recovery gap. In practice, the key problem is not only the number of resources, but their structure: grant and concessional instruments have a quick effect on budget financing, while scaling up reconstruction is impossible without mobilizing private capital, insuring war risks, and public-private forms of infrastructure projects.

Despite the availability of numerous sources and support programs, the key bottleneck in the practice of reconstruction is the lack of a unified logic that combines needs assessment with the rules for the selection of financing instruments, as well as with benchmark performance indicators. As a result, the discussion of financing often remains at the level of lists of sources, while the manageability of the portfolio is determined by the architecture of the combination of instruments, their impact on debt sustainability, and the ability to mobilize private capital in the face of war risk.

Next, we summarize the approaches of the literature on debt sustainability, public investment management, and private capital mobilization tools to justify an integrated model of financing architecture.

2. Literature Review

The problems of the architecture of international reconstruction financing in modern literature are interpreted as a combination of macrofiscal sustainability, the investment cycle, and private capital mobilization mechanisms, which should work in conditions of high uncertainty and war risks. In the work of Bogdan [1], it is emphasized that even with the presence of significant packages of international support, the risks of external financing gaps and the need to align deficit financing with the long-term recovery trajectory remain in the budget circuit. De Haas and Pivovarsky [2] show that the financial sector in the post-war period plays not only the role of a "channel" for the redistribution of resources, but also an institutional shock absorber; Therefore, reconstruction requires the restoration of trust, the quality of supervision and the balancing of public and private presence in the banking system.

In the political and institutional plane, the literature emphasizes the need to synchronize investment decisions with technical assistance and EU standards. Karaki et al. [3] argue that an effective combination of investment and technical assistance is critical for scaling the reconstruction portfolio, as well as for integrating projects into EU procedures and requirements. The "strategic guidelines" of the Ukraine Investment Framework record the logic of transition from fragmentary "project lists" to a single pipeline and strengthening the stage of preparation, selection and monitoring of investments [4]. The World Bank's Public Investment Management Diagnostics Report for Ukraine describes PIM problems as systemic (fragmentation, poor project preparation, gaps in evaluation and control), which directly increases transaction costs and limits investment returns [5]. The PIM reform roadmap prepared by the Ministry of Finance of Ukraine specifies institutional steps (procedures for selection, prioritization, preparation and transparent support of projects) as a prerequisite for attracting blended financing and guarantee instruments [6].

Scientific research and analytics of international organizations have formed a separate array of works on mixed finance as a mechanism for "recapitalization" of reconstruction through risk-sharing and catalyzing private investments. The OECD summarizes the key problems of scaling blended finance: high transaction costs, fragmentation of instruments, information asymmetry, and the risk of crowding out private resources in the absence of transparent additionality criteria [7]. A bibliometric review by Sharma et al. [8] and co-authors systematizes the evolution of research on blended finance and partial risk guarantees (PRGs), emphasizing their role as tools for derricking and multiplication of private capital. An empirical study by Kim and Jun [9] shows that the effectiveness of blended finance depends on the institutional quality and characteristics of recipient countries, as well as on the ability of official resources to act as a catalyst for private flows. Flammer et al. [10] propose a formalized framework for decision-making by development institutions regarding the combination of public and private resources, emphasizing that effectiveness depends on the design of incentives and risk-sharing mechanisms.

A separate area of work is devoted to measuring the mobilization of private financing and the instrumental conditions for its growth. The Joint Report of the Group of Multilateral Development Banks on the mobilization of private finance contains methodological approaches to accounting for mobilized volumes and demonstrates that guarantees, credit amplifiers and structured instruments are key channels for leverage effect growth [11]. The OECD emphasizes that the standardization of instruments (in particular guarantees and insurance) and their linkage to sectoral and country risk profiles is a prerequisite for scaling private finance mobilized without losing transparency and manageability [12].

The focus of academic discussions is also on the influence of development institutions on credit supply and the behavior of financial intermediaries. Léon, based on banking data and the database of intermediate lending programs, shows that DFI support can have ambiguous effects on lending, in particular due to the limited absorption capacity of recipients and the shift in banks' priorities [13]. In Léon's literature review, DFIs are considered as a separate segment of the development landscape that combines financing, ESG standards, and institutional "conditionality", but requires clear criteria for effectiveness and complementarity [14].

For Ukraine, specialized literature focuses on war risks as a key constraint on private capital and on the need for insurance and guarantee infrastructure. Nagurney et al. propose a model of integrated war risk insurance (cargo and crops), demonstrating the potential of combining insurance premium, state support, and networked trade models to maintain flows and revenues in war scenarios [15]. The practical outline of political and military risk insurance for Ukraine is disclosed in the DFC materials, where insurance/guarantees are positioned as a tool for restoring investment activity in conditions of high losses and uncertainty [16]. In Ukrainian peer-reviewed publications, Pryimak and Tymkiv [17] substantiate the need to insure investments against war risks as a prerequisite for intensifying domestic investments and investment security, and Baranov and Zimenkov [18] systematize international approaches to ensuring military-political risks and assess the possibilities of their implementation in Ukraine.

In the applied plane of instrumental design of reconstruction, an important place is occupied by public-private partnership as a form of infrastructure project implementation and a mechanism for distributing risks. Dombrovska et al. [19] propose a methodical approach to assessing the financial result of PPP projects using the example of concession using simulation modeling, which emphasizes the need for formalized evaluation and forecasting procedures for investment decisions.

Despite significant improvements, the literature is dominated by either macrofiscal assessments of needs and budget risks, or instrumental descriptions of individual mechanisms (guarantees, insurance, blended finance, PPP) without a single relationship between the financial gap model, the rules for the selection of instruments and the control indicators of their effectiveness, which necessitates an integrated organizational and economic model that "closes" the chain "need – gap – instruments – portfolio – implementation – control – correction" in conditions for the reconstruction of Ukraine.

3. Problem Statement

The article is aimed at substantiating the architecture of international financing for the reconstruction of Ukraine by combining the scenario model of the financial gap with a matrix of instruments for its reduction and a set of control indicators. To achieve the goal, the following tasks are solved: to operationalize the need for reconstruction and the funding gap in average annual parameters; set scenario assumptions about the share of internal mobilization and the availability of external support; systematize international financing instruments by role in the model, conditions of application, risks and control indicators; determine the minimum prerequisites for launching the mechanism related to the project portfolio, debt restrictions and transparency. The scientific contribution consists of the formalization of the relationship "need – gap – tools – control" and the identification of minimum institutional prerequisites under which control indicators become a valid basis for instrument correction.

4. Methods and Materials

The study is based on a scenario approach to assessing the financial gap of reconstruction. As a baseline value of the need, the cumulative assessment of recovery and reconstruction needs on a ten-year horizon according to RDNA4 was used [20]. The average annual requirement $\bar{N}$ is defined as N/T,

where N is the aggregate need, and T is the estimation horizon (years). Coverage of needs is formalized as the sum of the average annual external financing $\bar{E}$ and the average annual mobilization of internal resources $\bar{I}$. The funding gap $\bar{G}$ is defined as the difference between $\bar{N}$ and ($\bar{E}$ + $\bar{I}$). For scenario analysis, the parameter s is used – the share of internal funding, which specifies $\bar{I}$ = s· $\bar{N}$, as well as the scenario values of $\bar{E}$, which are interpreted as an aggregate of external channels: EU support, financing of international financial organizations, bilateral resources, guarantee and insurance instruments and private investment. To avoid mixing of flows, the indicator $\bar{E}$ is interpreted as the sum of public external resources and mobilized private capital induced by guarantee/insurance and structured instruments: Accordingly, derisk-taking instruments do not affect the gap "directly", but through an increase in $\bar{E}_{mob}$ and/or a decrease in the risk premium $\bar{E} = \bar{E}_{pub} + \bar{E}_{mob}$.

5. Results and Discussion

Scenario staging is needed not for an accurate forecast, but for a controlled classification of the reconstruction situation according to the scale of the deficit. Table. 1 captures a minimum set of parameters that translates the RDNA4 needs estimate into an operational metric of the average annual gap, suitable for selecting a set of instruments.

Table 1. Scenario parameters for determining funding needs and funding gap (based on RDNA4)

Script	N (USD billion)	T (years)	$\bar{N}$ (billion/year)	S (part of the inside)	$\bar{I}$ = s· $\bar{N}$ (billion/year)	$\bar{E}$ (billion/year)	$\bar{G}$ (billion/year)
Optimistic	524	10	52.4	0.35	18.3	31.4	2.7
Realistic	524	10	52.4	0.30	15.7	23.6	13.1
Pessimistic	524	10	52.4	0.25	13.1	18.3	21.0

Source: Developed by the author based on data [20]. Note: the aggregate requirement N is taken as RDNA4 [20]. The parameters s and $\bar{E}$ are given as scenario assumptions. The calculations are modeling in nature and show the sensitivity of the funding gap to the availability of external resources and internal mobilization.

The parameter s is interpreted as the share of internal mobilization (tax revenues, internal borrowings, quasi-fiscal sources), which can grow only under the condition of macro-fiscal stabilization. The $\bar{E}$ parameter reflects not only budget support, but also the ability of the financing architecture to mobilize private capital through risk-cutting, guarantees, and structured mechanisms.

Scenario estimates show that even with the same aggregate need, the average annual gap $\bar{G}$ ranges from USD 2.7 billion. to USD 21.0 billion. depending on the availability of external support and the share of domestic funding. The realistic scenario forms a deficit of USD 13.1 billion. per year, which shifts the issue of international financing from a purely budgetary plane to the plane of instrumental portfolio design: a combination of budget support and instruments capable of attracting private funds without destroying debt sustainability is required.

For the applied interpretation of the $\bar{E}$ parameter, the balance sheet specification is used, in which external financing consists of EU resources, international financial organizations, bilateral sources, guarantee and insurance instruments, as well as private direct investment and project financing. Such a decomposition is consistent with the practice of actual financing of the state budget of Ukraine, where internal borrowings (including war bonds), loans from IFIs and bilateral loans and grants are used simultaneously [21], and the medium-term framework of EU support is set by the Ukraine Facility Ukraine Program [22] and the regulations for its operation [23].

The resulting gap $\bar{G}$ sets not only the shortage of funds, but also the requirement for the financing structure: as the deficit grows, the share of instruments that create a debt burden should be replaced by instruments for mobilizing private capital and derisking. Table. 2 systematizes instruments as a response to different regimes of gap and limitation of debt sustainability, with reference to control indicators.

The matrix of instruments provides a link between the scenario funding gap and the rules for portfolio selection: under the dominance of budget support (optimistic scenario), grants and concessional loans retain priority, while in realistic and pessimistic scenarios, scaling up guarantee and insurance mechanisms and blended financing, which reduce the cost of capital and expand the attraction of private resources, becomes critical. In terms of decomposition, grants and concessional loans are mainly increase $\bar{E} = \bar{E}_{pub} + \bar{E}_{mob}$, $\bar{E}_{pub}$ while guarantees, war risk insurance, blended financing and PPP are aimed at increasing $\bar{E}_{mob}$ while controlling fiscal risks.

Table 2. Recovery financing instruments and their role in reducing the financial gap

Tool	Role in the model	Conditions of application	Key risk	Control Indicator
Grants	Increase $\bar{E}$, quickly decrease $\bar{G}$	Priority social and critical infrastructure projects	Dependence on donors	Sample share of liabilities; deviation of actual tranches from the calendar; Share of projects with confirmed result (output verification)
Preferential loans to MFIs	$\bar{E}$ with a debt limit	Projects with a projected socio-economic effect	Breach of debt sustainability	Debt Sustainability Analysis (DSA) indicators; grant element/benefit; service cost; Share of loans tied to the implementation of project stages
State guarantees	Mobilize private capital, reduce $\bar{G}$	Credit projects of business and territorial communities	Moral hazard	Share of defaults; expected losses on the guarantee portfolio; the share of guarantees that turn into budget payments; limit of contingent obligations
Blended funding	Pulls private funds to $\bar{E}$	Investment projects with a high multiplier	The complexity of structuring deals	Private/public capital ratio (mobilization coefficient); share of projects with proven additionality; Average term of structuring transactions
Insurance and distribution of war risks	Reduces risk premium → increases investment	FDI and large infrastructure projects	Uncovered war risks	Volume of insured/guaranteed investments; average premium/margin; number of transactions; share of coverage of key war risks; Case Settlement Time
Public-Private Partnership	Partially replaces budget expenditures	Infrastructure projects with projected cash flow	Contract and political risks	Fulfillment of Service Quality Indicators (SLA); Value for Money; Estimation and limit of contingent obligations under contracts

Source: Developed by the author based on a generalization of approaches and recommendations [7; 10; 11; 12; 16; 19].

The architectonics of the proposed financial mechanism provides for functioning at three interrelated levels – macro-, meso- and micro-levels – with digital integration of flows, procedures and control (Figure 1).

As shown in Figure 1, at the macro level, strategic coordination of resources and rules is formed, at the meso level – institutional platforms for the implementation of priorities, and at the micro level – project financing and partnership instruments. A detailed description of the tools and their role in covering the needs of recovery and reducing the financial gap is given in the Table 2, while the prerequisites for the launch, risks and control indicators of the implementation of the financial mechanism are in Table. 3.

Table 3. Minimum prerequisites for the implementation of the financial mechanism for reconstruction

Prerequisite	Owner institution	Minimum term	Risk	Control indicator
Agreed strategy and portfolio of priority projects	Coordinator/ relevant ministries	3–6 months.	Dispersion of resources	Share of funding for projects with an approved passport/stage of readiness; portfolio share synchronized with funding calendars
Debt framework and fiscal rules	Ministry of Finance	0–6 months.	Debt instability	Debt/GDP; service cost; DSA cut-offs; share of contingent liabilities (guarantees/PPP) within the fiscal space
Uniform rules for evaluating and selecting projects	Coordinator/ Customers	3–9 months.	Selection of weak projects	Share of projects with CBA/feasibility study
Monitoring, audit and publicity system	Control and audit bodies	0–6 months.	Corruption risks	Share of projects with open data and reporting

Source: Developed by the author based on institutional frameworks and recommendations [1; 4; 5; 6; 23].

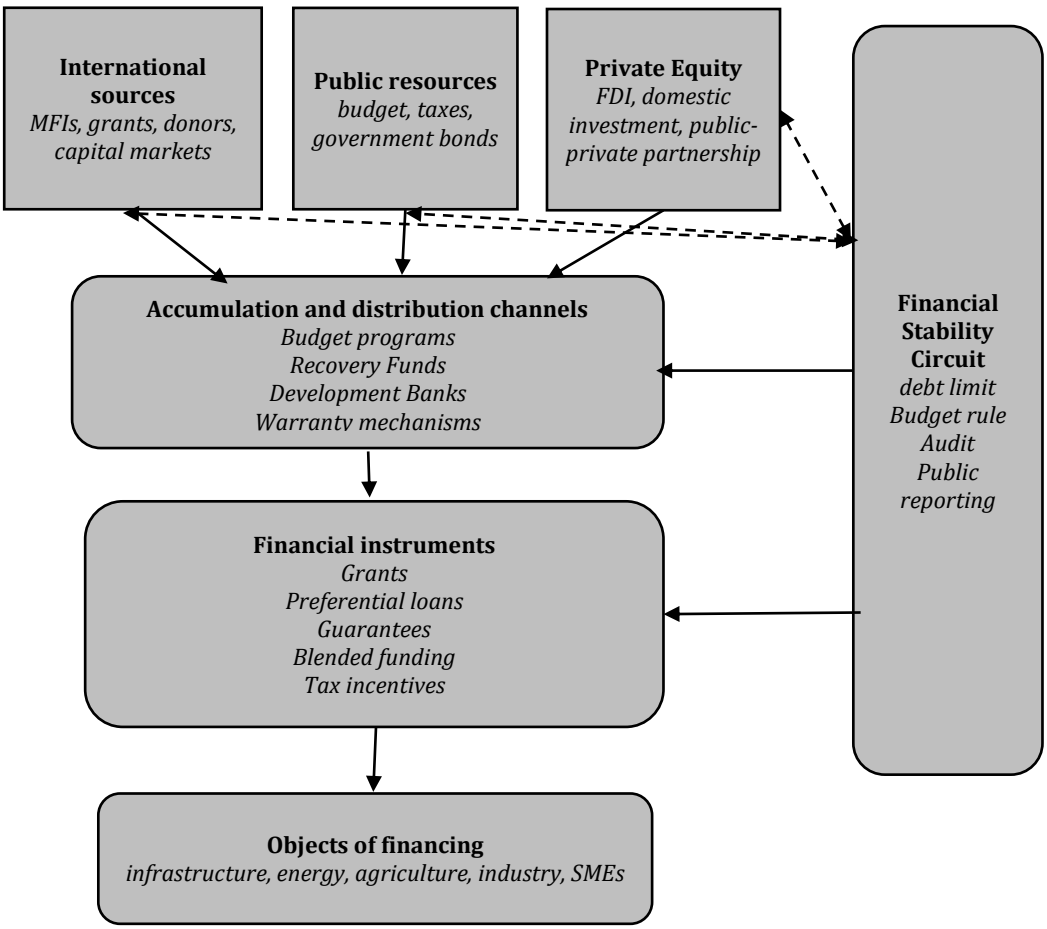

Figure 1. Architecture of International Financing for the Reconstruction of Ukraine: Levels of Management and Control Circuits

Source: Compiled by the author.

Built-in benchmarks take the discussion about funding sources beyond declarations. In the absence of staged project selection, transparent reporting, and fiscal constraints, instruments with a higher share of the private component increase transaction costs, while budget support instruments lose the trust of donors and society.

The obtained scenarios show that with the growth of the $\bar{G}$ gap, the financial mix should change not linearly (by adding new sources), but structurally: the share of instruments that increase the debt burden should be replaced by instruments for derisking and mobilization of private capital ($\bar{E}_{mob}$) under the condition of control of contingent liabilities, which is consistent with the conclusions of the literature on combined financing in terms of justifying the need for criteria of additionality and transparency and minimizing the displacement of private resources.

At the same time, private capital mobilization tools have a hidden price in the form of transaction costs and structuring complexity, so their scaling without PIM reforms (staging of selection, high-quality feasibility studies/CBAs, a single project base) increases the risk of inefficient selection and contract failures. As a result, Table 2 should be interpreted as a matrix for the selection of tools only if the prerequisites of Table 2 are present. 3, which ensures the validity of KPIs and the ability to correct instruments.

From a practical point of view, the proposed architecture sets the contour of controllability: the gap $\bar{G}$ classifies the scarcity mode; the instruments are selected according to the debt constraints and the objective of increasing the $\bar{E}_{mob}$; KPIs bring tools into accountability mode; Monitoring and audit ensure the correction of the mix based on actual results.

6. Conclusions

The scenario model of the financial gap allows you to move from a general assessment of needs to a controlled formulation of the problem: what amount of the deficit should be covered by budget

support and what – by tools for mobilizing private capital. The Instrument Matrix formalizes the rules for portfolio selection through application conditions, risks, and control indicators, which ensures procedural consistency between strategic priorities, debt constraints, and project implementation. The practical implementation of the mechanism depends on minimal institutional prerequisites: a prioritized project portfolio, fiscal rules, uniform evaluation standards, and public monitoring.

The limitation of the article lies in the illustrative nature of the scenario parameters s and $\bar{E}$ and the lack of a complete decomposition of $\bar{E}$ into public support and mobilized private capital according to actual data; further verification requires calibration on historical series of budget financing and portfolio data of MFIs/guarantees/insurance.

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