

UDC 005.8:658.7:338.49

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<https://doi.org/10.29038/2786-4618-2026-03-159-164>

RISK-ADAPTIVE METHODOLOGY FOR MANAGING LOGISTICS INFRASTRUCTURE RECOVERY PROJECTS

Introduction. The recovery of Ukraine's logistics infrastructure is taking place under conditions of wartime and post-war uncertainty, which necessitates adaptive approaches to managing the relevant projects. Existing project management methodologies fail to provide a holistic integration of risk, financial provision, and adaptive decision-making in this specific recovery environment.

Purpose. The purpose of the article is to develop a risk-adaptive methodology for managing logistics infrastructure recovery projects that integrates risk management, a financial-provision architecture, and a mechanism for adaptive managerial decision-making.

Methods. The methodological basis of the study comprises scholarly works on project management, risk management, and recovery financing, as well as materials from international organisations. The study employs the comparative method, classification and matrix-analysis methods, the structural-logical method, the method of scientific abstraction, and managerial-decision modelling.

Results. An original risk-adaptive methodology has been developed as a system of principles, processes, methods, and tools in which the project's risk profile serves as the integrating element. Seven principles of the methodology have been identified, and its architecture has been formed, encompassing four functional modules – conceptual-analytical, risk, financial-provision, and adaptive decision-making – together with an application loop spanning the project life cycle. An algorithm for applying the methodology has been developed, incorporating a conditional-transition mechanism that ensures managerial decisions are revisited whenever the risk profile changes.

Conclusions. The proposed methodology provides a methodological foundation for managing logistics infrastructure recovery projects under conditions of uncertainty and ensures that managerial decisions are adapted in response to changes in the project's risk profile.

Keywords: risk-adaptive methodology; project management; recovery projects; logistics infrastructure; risk profile; financial-provision architecture; adaptive management; resilience.

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РИЗИК-АДАПТИВНА МЕТОДОЛОГІЯ УПРАВЛІННЯ ПРОЄКТАМИ ВІДНОВЛЕННЯ ЛОГІСТИЧНОЇ ІНФРАСТРУКТУРИ

Вступ. Відновлення логістичної інфраструктури України відбувається в умовах воєнної та повоєнної невизначеності, що зумовлює необхідність адаптивних підходів до управління відповідними проєктами. Наявні методології проєктного менеджменту не забезпечують цілісної інтеграції ризиків, фінансового забезпечення та адаптивного прийняття рішень у специфічному середовищі відновлення.

Мета. Метою статті є розроблення ризик-адаптивної методології управління проєктами відновлення логістичної інфраструктури, яка інтегрує управління ризиками, архітектуру фінансового забезпечення та механізм адаптивного прийняття управлінських рішень.

Методи. Методологічною основою дослідження є наукові праці з управління проєктами, ризик-менеджменту та фінансування відновлення, а також матеріали міжнародних організацій. У роботі

використано порівняльний метод, методи класифікації та матричного аналізу, структурно-логічний метод, метод наукової абстракції та моделювання управлінських рішень.

Результати. Розроблено авторську ризик-адаптивну методологію як систему принципів, процесів, методів та інструментів, у якій інтегруючим елементом виступає ризик-профіль проекту. Визначено сім принципів методології та сформовано її архітектуру, що охоплює чотири функціональні модулі – понятійно-аналітичний, ризиковий, фінансового забезпечення та прийняття адаптивних рішень – і контур застосування в межах життєвого циклу проекту. Розроблено алгоритм застосування методології з механізмом умовного переходу, який забезпечує перегляд управлінських рішень у разі зміни ризик-профілю проекту.

Висновки. Запропонована методологія створює методологічну основу для управління проектами відновлення логістичної інфраструктури в умовах невизначеності та забезпечує адаптацію управлінських рішень відповідно до зміни ризик-профілю проекту.

Ключові слова: ризик-адаптивна методологія; управління проектами; проекти відновлення; логістична інфраструктура; ризик-профіль; архітектура фінансового забезпечення; адаптивне управління; резильєнтність.

JEL Classification: D81; H54; L91; R42.

Introduction.

Russia's full-scale war against Ukraine has caused unprecedented destruction of logistics infrastructure, and the scale of recovery needs continues to grow at a pace that outstrips the volume of confirmed funding sources [1]. The recovery of damaged logistics assets – bridges, railway hubs, port terminals – is taking place amid an unresolved military conflict, which gives rise to heightened security, financial, and institutional uncertainty and requires a fundamentally different methodological toolkit than that applied to typical logistics or infrastructure projects.

Managing such projects requires the simultaneous resolution of three interrelated tasks: clearly defining the specifics of a logistics infrastructure recovery project, systematising the risks inherent to it, and building an adequate financial-provision architecture aligned with the project's risk profile. However, these tasks are for the most part addressed in isolation from one another, and no holistic methodology integrating them into a single decision-making system has yet been proposed. The purpose of this article is to develop such a methodology – risk-adaptive by its very nature, since it is precisely the project's profile that determines the choice of intervention mode, the configuration of the financial architecture, and the subsequent adaptation of managerial decisions throughout the project life cycle.

Literature review.

An analysis of scholarly sources reveals sustained interest in comparing classical project management methodologies. Simonaitis, Daukšys, and Mockienė, examining repetitive construction projects, found that PRINCE2 provides better control over project phases, whereas PMBOK offers a broader toolkit without detailing the distribution of responsibilities among team members [2]. Faraji et al. showed that the seventh edition of PMBOK, built on principles rather than process groups, broadens the standard's scope of application, yet its principles remain too general for industries with specific operational constraints, including construction [3]. Takagi and Varajão point to a gap in ISO 21502:2020 – the standard defines project success criteria but does not contain a formalised mechanism for managing it [4]. What these studies have in common is that none of them accounts for the heightened uncertainty of an environment shaped by armed conflict.

The question of adaptive management under conflict conditions is addressed by Niroula, who, drawing on cases from Afghanistan and Nigeria, demonstrates the need for flexible rather than pre-fixed planning of infrastructure projects in conflict zones [5]; the author, however, does not link adaptiveness to specific financial mechanisms or a quantitative risk classification. The conceptual foundations of system resilience are laid out by Shishodia et al., who distinguish the proactive, reactive, and restorative components of supply-chain resilience [6], yet the question of how resilience is embodied in the financial architecture of a specific project remains outside the authors' scope.

The risks of public-private partnership as a mechanism for attracting private capital have been widely studied using data from developing countries: Samoilov et al., based on a survey of 261 respondents in Colombia, Kazakhstan, and Ghana, found that less mature PPP programmes are characterised by a higher level of investor risk aversion [7]. Ukrainian researchers examine this issue in the national context: Petrukha

argues that the effectiveness of public–private partnership for Ukraine's infrastructure recovery depends above all on overcoming the imperfections of the regulatory framework and corruption risks [8], while Lozynska et al. provide quantitative confirmation that an improved PPP mechanism can substantially reduce the risks of external investment [9]. Holovnia et al., analysing successful cases, show that the effectiveness of project management in Ukraine's post-war recovery depends on integrating project scale, stakeholder involvement, and international support [10], while Reshitko characterises the financing channels of the construction industry – from the Ukraine Facility to mortgage programmes – and points to the need for a transition toward build-back-better models [11].

The review shows that existing research treats classical project management methodologies, adaptive management under conflict conditions, system resilience, and financing risks as relatively separate strands, without proposing a methodology that simultaneously integrates risk classification, a financial-provision architecture, adaptive decision-making, and the specifics of a wartime environment within a single risk-adaptive methodology for managing logistics infrastructure recovery projects. This constitutes the research niche of the present article.

Research purpose.

The purpose of the study is to develop a risk-adaptive methodology for managing logistics infrastructure recovery projects that integrates risk classification, a financial-provision architecture, and a mechanism for adaptive decision-making.

To achieve this purpose, the study addresses the following tasks: a) substantiate the limitations of classical project management methodologies (PMBOK, PRINCE2, ISO 21502) with respect to the specifics of recovery projects under martial law; b) formulate the author's definition of a risk-adaptive methodology through a set of essential features; c) develop the methodology's architecture – its life cycle and functional modules; d) develop an algorithm for applying the methodology that accounts for changes in the risk profile during implementation.

Materials and methods.

The information and methodological basis of the study comprises scholarly publications on project management, risk management, and post-war recovery financing, as well as analytical reports of international organisations (the World Bank, the European Commission, the OECD, and the UN). The comparative method is used to substantiate the limitations of classical project management methodologies; the classification method combined with the matrix method is used to assess risks and form the risk profile; the structural-logical method and the method of scientific abstraction are used to develop the conceptual architecture of the risk-adaptive methodology; and the method of managerial-decision modelling is used to construct the algorithm for its application.

Results.

The analysis conducted provides grounds for proposing a risk-adaptive methodology for managing logistics infrastructure recovery projects, whose conceptual foundation is the project's risk profile, which performs the function of an integrator of managerial decisions. A risk-adaptive methodology for managing logistics infrastructure recovery projects is a system of principles, processes, methods, and tools that ensures the selection of the intervention mode and the financial-provision architecture on the basis of a continuously updated project risk profile, and that provides for the cyclical adaptation of managerial decisions in response to changes in security, financial, and institutional conditions.

This methodology rests on seven interrelated principles that determine the logic of forming, implementing, and adapting managerial decisions; the practical significance of each is summarised in Table 1.

The methodology's conceptual architecture (Fig. 1) is built on a modular principle and encompasses four interrelated functional modules. The model's structure reflects the logic of moving from risk analysis to adaptive project management through a mechanism of continuous risk-profile updating. The conceptual-analytical module rests on the author's definitions of a logistics infrastructure recovery project and the specific features that distinguish such projects from classical ones (networked character, multimodality, dual civilian-military criticality). The risk module ensures the assessment of security, financial, institutional, and reputational risks and the formation of the project's risk profile, taking into account their causal interrelations, in which security risks are primary. The financial-provision module corresponds to the three-level architecture developed (international, state, and private levels), the choice of whose combination is

determined by the risk profile. The adaptive decision-making module synthesises the results of the three preceding modules and determines the intervention mode (rehabilitation, reconstruction, or build back better) and the specific configuration of the financial architecture for the given project. Thus, the first three modules form the informational and analytical basis for managerial decision-making, while the fourth ensures the integration of their results into the process of selecting the intervention mode and the financial-provision architecture.

Table 1

Principles of the risk-adaptive methodology for managing logistics infrastructure recovery projects

Principle	Practical significance
Risk orientation	The profile determines the choice of intervention mode and financing
Adaptiveness	Decisions are adjusted in response to changes in the risk profile
Integration	Risks, financing, and planning are aligned within a single model
Continuity	The risk profile is continuously updated throughout its life cycle
Stakeholder orientation	The interests of state, donor, and private participants are taken into account
Transparency	Accountability for the use of funds at all levels of the financing architecture
Resilience	Decisions are oriented toward the long-term stability of recovered facilities

Source: developed by the author

The four modules are not applied once; rather, they operate within the methodology's application loop, which spans the project life cycle – initiation, planning, financing, implementation, monitoring, and completion. At each phase of this loop, the project's risk profile is updated, and monitoring results are fed back, through a feedback loop, into planning, financing, or the chosen intervention mode, ensuring that decisions are adapted in response to changes in the external environment.

The cross-cutting element that integrates the four modules and the methodology's application loop into a single system is precisely the profile: it determines the choice of financial architecture, influences planning, is continuously updated during implementation, and triggers the adaptation mechanism – that is, it performs the function not of one of the modules but of a centralised integrator of managerial decisions at all stages of the project life cycle. It is precisely the use of the risk profile as an integrator of all managerial decisions that distinguishes the proposed methodology from traditional approaches to project management and constitutes its principal conceptual contribution.

The practical implementation of this methodology follows an algorithm which, unlike the functional modules and application loop discussed above, provides for conditional transitions depending on changes in the project's status, and includes the following stages: 1) identification of the recovery project's object; 2) risk assessment across four groups (security, financial, institutional, reputational) using a “probability × impact” matrix; 3) formation of the risk profile on the basis of the assessment results for the defined risk groups; 4) selection of the financial-provision architecture (international, state, and/or private levels) in accordance with the risk profile formed; 5) project implementation; 6) continuous monitoring of implementation progress and of the state of the security environment. At step 6, the algorithm requires a mandatory check of the condition: has the project's risk profile changed – for example, as a result of a repeat strike on the facility or a change in the volume of donor funding? If so, management returns to step 2, with a

possible subsequent revision of the chosen intervention mode and financial architecture; if not, project implementation continues under the unchanged configuration through to completion. Upon project completion, an evaluation of the results achieved is carried out; a detailed examination of this evaluation lies beyond the scope of this article.

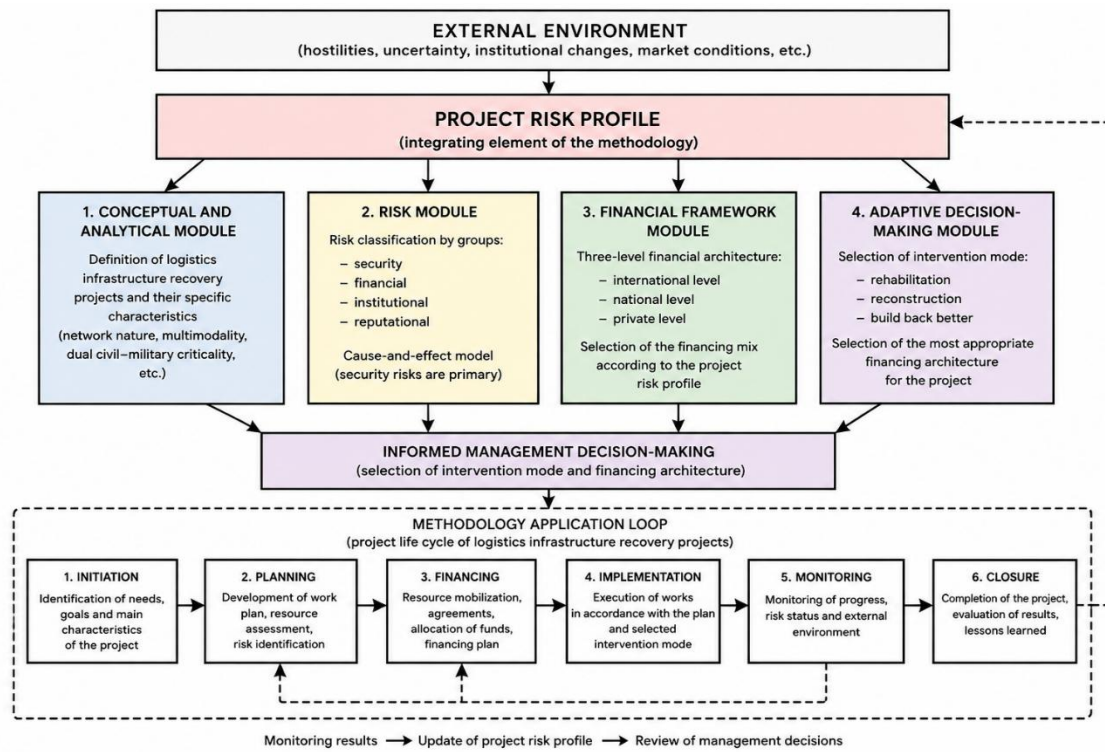


Fig. 1. Conceptual model of the risk-adaptive methodology for managing logistics infrastructure recovery projects

Source: developed by the author

This algorithm ensures the continuous adaptation of managerial decisions to changes in the project's risk profile, which is the key distinction of the risk-adaptive methodology from traditional project management models built on a linear life cycle.

Discussion.

The scientific novelty of the study lies in the development of a risk-adaptive methodology for managing logistics infrastructure recovery projects, in which the project's risk profile performs the function of integrating the processes of planning, financing, and the adaptation of managerial decisions. Unlike PMBOK, PRINCE2, and ISO 21502, in which risk management is treated as one of the functional processes of project management, in the proposed methodology the risk profile determines the logic of selecting the intervention mode, the financial provision, and the subsequent adaptation of managerial decisions. This approach also advances current research on adaptive management under conflict conditions and on ensuring resilience, integrating them with the financial-provision mechanisms of recovery projects within a single methodological model. Thus, the proposed methodology extends the theoretical foundations of managing logistics infrastructure recovery projects, transforming the risk profile from one element of management among others into a system-forming principle of managerial decision-making.

The practical significance of the proposed methodology lies in its applicability by public authorities, local self-government bodies, international donors, and other participants in recovery projects for substantiating the choice of intervention mode, the financial-provision architecture, and the adaptive revision of managerial decisions in response to changes in the profile.

This methodology is conceptual in nature and requires further empirical testing on the example of specific logistics infrastructure recovery projects. At the same time, the study does not develop a quantitative mechanism for aggregating the project's risk profile or for assessing the economic efficiency of applying the methodology, which defines directions for further research.

Conclusions and prospects for further research.

The study develops a risk-adaptive methodology for managing logistics infrastructure recovery projects that integrates the conceptual apparatus, risks, and financial-provision architecture into a single management system. This methodology includes the author's definition, a system of principles, a conceptual architecture consisting of four functional modules and an application loop, as well as an algorithm for adaptive decision-making based on the continuous updating of the project's risk profile. A key feature of the methodology is the use of the profile as an integrating element that determines the choice of intervention mode, the financial-provision architecture, and the adaptation of managerial decisions throughout the entire project life cycle.

Prospects for further research relate to the empirical testing of the proposed methodology on specific logistics infrastructure recovery projects, the development of a quantitative mechanism for aggregating the project's risk profile, and the creation of a model for assessing the economic efficiency and resilience of projects implemented on its basis.

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Стаття надійшла до редакції 04.08.2026 р.

Стаття прийнята до друку 22.08.2026 р.

Стаття опублікована 16.09.2026 р.