

UDC 332.14:338.47:502.131.1:316.42(477.7)

JEL Classification: I31, O18, R11, R58, Q56, Q01

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SOCIO-ECOLOGICAL-ECONOMIC EFFECT OF THE RESISTANCE OF PORT SYSTEMS IN ENSURING THE QUALITY OF LIFE OF COASTAL TERRITORIES

The paper substantiates the scientific and methodological foundations for assessing the socio-ecological-economic effect of resilience in port systems as an integral factor of quality of life in Ukraine's coastal territories during post-war recovery. The concept of "port system resilience" is defined as a multidimensional property combining socio-ecological-economic and cognitive-institutional stability. Within the Resilience+ framework, a structural-analytical model is proposed to evaluate resilience through four subsystems (social, economic, ecological, and cognitive-institutional) – allowing assessment of their balance and impact on community welfare. A five-level threshold scale of the socio-ecological-economic effect (from critical to reference level) is developed, highlighting that resilience represents both a quantitative indicator of efficiency and a marker of civilizational maturity, reflecting synergy between development, responsibility, and cohesion.

Keywords: port system resilience, socio-ecological-economic effect, quality of life, investapathy, acquired helplessness syndrome, Resilience+, cognitive mobilization, spatial development.

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СОЦІО-ЕКОЛОГО-ЕКОНОМІЧНИЙ ЕФЕКТ РЕЗИСТЕНТНОСТІ ПОРТОВИХ СИСТЕМ У ЗАБЕЗПЕЧЕННІ ЯКОСТІ ЖИТТЯ ПРИМОРСЬКИХ ТЕРИТОРІЙ

Розкрито науково-методичні засади формування соціо-еколого-економічного ефекту резистентності портів систем як інтегрального чинника забезпечення якості життя приморських територій України в умовах післявоєнного відновлення. Обґрунтовано сутність поняття «резистентність портів систем» як багатовимірної властивості, що поєднує соціо-еколого-економічну та когнітивно-інституційну стійкість. На основі концепту Resilience+ запропоновано структурно-аналітичну модель оцінювання ефекту резистентності, яка враховує вагові коефіцієнти чотирьох підсистем (соціальної, економічної, екологічної та когнітивно-інституційної) для визначення рівня збалансованості портів систем у контексті підвищення добробуту населення. Означено ключові синдромальні детермінанти, що нівелюються завдяки локалізації управлінських зусиль (синдром набутої безпорадності, інвестапатія, деморалізація, еко-стрес, тощо). Розроблено п'ятирівневу шкалу порогових значень соціо-еколого-економічного ефекту (від критичного до еталонного рівня) з відповідними управлінськими імплікаціями. Доведено, що соціо-еколого-економічний ефект резистентності є не лише кількісним індикатором ефективності, а й показником цивілізаційної зрілості, який відображає здатність суспільства до синергійного поєднання економічного розвитку, екологічної відповідальності та соціальної згуртованості.

Ключові слова: резистентність портів систем, соціо-еколого-економічний ефект, якість життя, інвестапатія, синдром набутої безпорадності, Resilience+, когнітивна мобілізація, просторовий розвиток.

Problem statement. The current stage of Ukraine's development is determined by the need to rethink the role of coastal areas in the economic system and form a new paradigm of their spatial organization, focused on

sustainability, social security and quality of life. Military-economic challenges, the destruction of transport and logistics chains, environmental degradation of water areas and a decrease in the level of social stability in port

communities necessitate the reformatting of the functions of port systems (PS), their adaptive potential and ability to resist threats and risks – as factors of regional resistance and socio-ecological and economic recovery. In the context of the post-war transformation of the country's transport and logistics structure, PS act as centers for shaping the quality of life of coastal areas. They provide employment, investment attractiveness, technological renewal, entrepreneurship development and integration into global trade and transport networks. At the same time, their effectiveness depends on the dimensions of resistance, the ability to counteract destructive influences, adapt to risks and maintain socio-economic stability in poly-crisis conditions. In the context of multi-crisis processes, the resistance of PS acquires the features of an integral socio-ecological-economic phenomenon, which combines managerial, ecological, cognitive-communicative and institutional components.

The relevance of the problem is due to the fact that the quality of life of the coastal territories population is determined not only by the level of income and employment, but also by security, ecological and cognitive-behavioral conditions. Also important are access to infrastructure, community participation in decision-making and overcoming the “acquired helplessness syndrome” (AHS) [1], which is formed under the influence of a protracted war, demoralization and loss of trust in social institutions. Therefore, the assessment of the socio-ecological-economic effect of resistance (SEEER) of port systems (PS) is a strategically important task both for improving the state policy of sustainable development and spatial planning, and for developing regional programs to improve the quality of life and cohesion of the Southern macroregion. From a scientific point of view, the study is aimed at integrating the Resilience+ concept [2] into the quality of life assessment system, which allows combining economic productivity, environmental safety, cognitive stability and social sustainability into a single analytical circuit. The practical significance of the developments is to create a methodological basis for developing national and regional programs for the restoration of the maritime economic complex, building a system for monitoring socio-ecological-economic indicators and increasing the investment attractiveness of regions. Therefore, the problem of ensuring the SEEER of PS goes beyond the transport or production logic – after all, it appears as a multidimensional task aimed at: restoring the quality of life of the population; strengthening the spatial integrity and ecological balance of the South of the country; developing the cognitive capacity of the population by overcoming syndromic risks (AHS, demoralization, the syndrome of “lost production”, loss of public trust). And, the cognitive component, in this context, ensures the internal mobilization of human capital, activation of social resources and restoration of trust as the foundation of socio-political stability. Therefore, the issues identified by the authors have not only scientific, but also significant state-building, humanitarian and strategic-management significance for the regeneration of spatial formations and the rehabilitation of the national economy.

Analysis of recent research and publications. In the theory of quality of life, a solid scientific school has been formed, combining economic, social and environmental indicators of the well-being of territories, which highlighted the dependence of the life chances of the

population on access to infrastructure [3], environmental safety, employment and community participation in decision-making [4]. For the coastal territories of the country, the role of transport and logistics hubs has been determined, capable of multiplying the effects of well-being through labor markets, entrepreneurship and urban attractiveness [5; 6]. The direction of “port-city studies” (research of ports and cities) and transport economics [7;8] outlines the interaction of ports and urban agglomerations (spatial conflicts and synergies, the impact of port activities on labor markets, real estate, the ecology of water areas and coastal zones). A number of works have proposed a typology of port-city regimes [9;10] and models of coordination of interests “port-city-region” [11], however, their focus remains on production-economic and technological-logistical indicators as priorities, while the integral socio-ecological-economic effect in the context of the quality of life of the population of the territories has been assessed fragmentarily.

Within the modern discourse on the sustainability of infrastructures and complex systems, approaches to adaptive management and decision-making under uncertainty have become widespread [12–14], demonstrating how the combination of prevention, scenario modeling, multi-criteria assessment and flexible institutions increases the ability and increases the potential of systems to withstand shocks while maintaining functional integrity. At the same time, these works focus on engineering, technical and environmental aspects of production activities, while the social component of resistance (demographic risks, institutional trust, cognitive effects, community participation) is insufficiently studied, especially in conditions of war and polycrisis. Scientific literature on social security risk management [15–18] emphasizes that the quality of life of port communities is determined not only by the level of income, but also by the stability of employment, access to services, information security, the state of trust and the cognitive ability of communities to act in crisis conditions. International and national studies add traumatic and migration effects, the problem of the NSS and the need for rehabilitation programs and the return of human capital [19–23].

A group of works is devoted to the digital transformation of ports [24–26] (integrated data platforms, digital twins, intelligence monitoring, cyber resilience, transparency of supply chains), which ensure manageability and reduce transaction costs, however, do not combine comprehensive assessments of the impact on the quality of life and social cohesion of port communities. In studies on the issues of “green” modernization and the economy of resilience [27–29], attention is focused on decarbonization, energy efficiency, eco-rehabilitation of coastal systems, but the integration of these results into socially oriented models of well-being is only being formed. Ukrainian regional studies on the problems of spatial development and recovery have highlighted: the need for a macro-regional vision of southern territories [30]; the significance of the role of ports as drivers of recombinant growth and entry points to global networks [31]; regulatory and institutional barriers, risks of managerial fragmentation and lack of measurement tools with access to social results [32–34].

Thus, in the scientific discourse there are developments on the problems of infrastructure resilience, port-city interaction, digital and “green” transformation and quality

of life as a target criterion of modern policy. However, there is a lack of integrated models that: a) link the resilience of port systems with quality of life through cause-and-effect chains; b) combine socio-ecological-economic and cognitive-psychological indicators in a single evaluation circuit; c) take into account military-economic and cognitive-informational factors (trust, participation, overcoming SNB); d) ensure operationalization through institutional and investment mechanisms, digital analytics and indicative planning at the level of ports and port communities. All this remains a significant scientific gap, which the author's structural-analytical model is designed to fill, which incorporates Resilience+ approaches into its format [2], introduces a factor-indicative system for assessing SEEER, combines managerial, social, and information-communication mechanisms, and focuses the result on improving the quality of life in poly-crisis conditions.

Formulating the purposes of the article. The purpose of the study is to provide a theoretical and methodological justification and practical definition of the socio-ecological and economic effect of resistance (SEEER) of port systems (PS) of Ukraine as an integral factor in ensuring the quality of life of the population of coastal territories, to develop analytical approaches to its assessment in the conditions of post-war restoration and transformation of the national transport and logistics infrastructure. To achieve this goal, the following tasks were envisaged: a) to clarify the theoretical and conceptual content of the category “resistance of port systems” as a multidimensional socio-ecological and economic property that determines the ability of ports to adapt to crisis challenges, maintain functional integrity and provide a positive social effect for communities; b) to systematize scientific approaches to assessing the resilience, quality of life and socio-economic well-being of territories according to the Resilience+ concept; c) identify key determinants of the SEEER of the PS (economic, environmental, institutional-management and cognitive-communication factors); d) develop a structural-analytical model for assessing SEEER, taking into account the relationships between economic productivity, environmental safety, social stability, cognitive-institutional and communication characteristics of port communities; e) assess the impact of the level of socio-ecological-economic effect of resistance on the quality of life of the population of coastal areas, identify reserves for increasing social stability and reducing syndromic risks (AHS, investopathy, demoralization [1]); f) determine the threshold quantitative-qualitative levels of SEEER and develop an interpretation scale for management decisions; g) formulate recommendations for integrating indicators of the socio-ecological-economic effect of resistance into the monitoring system of spatial planning and regional policy.

Presentation of the main research material. Within the framework of the modern paradigm of sustainable development, the problem of measuring the resistance of port systems acquires interdisciplinary significance,

since it goes beyond the limits of technical or, strictly, economic resistance. In the article, resistance is considered as an integral property of sea-economic structures, which combines economic efficiency, ecological balance, social stability and cognitive-institutional capabilities of regional communities. This approach forms the basis for determining the socio-ecological-economic effect of resistance (SEEER), which is manifested in the restoration, stabilization and improvement of the quality of life of the population of coastal territorial communities of Ukraine.

The methodological basis of this study is the author's approach, developed within the framework of the Resilience+ concept [2], which involves a combination of system-complex, cognitive, spatial-economic and adaptive-management approaches to assessing the socio-ecological-economic effect. His idea is to interpret the concept of resistance¹ not only as a property of a complex system, but as a dominant feature of the dynamic process of managing counteraction processes, but also as a balance between the vulnerability zone and the spatial development zone. The initial stage in this area is the modeling of the SEEER structure, which includes three interconnected subsystems: I) social, which characterizes the standard of living, social security, trust, community participation, demographic stability and cognitive readiness for recovery; II) environmental (covers indicators of the state of water areas, energy efficiency, pollution levels, environmental innovations and environmental investments); III) economic (reflects the intensity of port activity, employment, productivity, investment dynamics, institutional stability and financial capacity of regions).

To combine these components, we use a factor-indicative assessment system (“I_RES_PORT+L model”), adapted to the characteristics of the Southern macroregion (typification of territories into seven macroregional zones, which is formalized and represented by the authors in [36]). Its essence lies in constructing an integral SEEER index, which takes into account not only quantitative, but also qualitative parameters (cognitive-communicational and managerial). Formally, the SEEER level is given through a system of weight coefficients in four directions according to the model (1):

$$I_{SEE}^{RES} = w_1 \cdot S_{soc} + w_2 \cdot S_{eco} + w_3 \cdot S_{env} + w_4 \cdot S_{cog}, \quad (1)$$

where, I_{SEE}^{RES} – quantitative values of SEEER measurements (integral indicator);

indicators: S_{soc} – social (employment level, availability of services, level of security, trust in institutions); S_{eco} – economic (investment, productivity, logistical efficiency); S_{env} – environmental (environmental quality, energy efficiency, eco-costs); S_{cog} – cognitive-institutional (information activity, community participation, cognitive mobilization);

w_1, w_2, w_3, w_4 – weight coefficients (which in sum are “1.0”).

Each indicator is normalized on a scale of “0–1”, after which it is integrated into a general index taking into account weight coefficients (determined using

¹ In modern realities, the category of “resistance” is gaining particular relevance, which allows us to go beyond the classical notion of stability and resilience, integrating the ability of systems to resist, preserve basic functionality and, at the same time, strategic transformation. Resilience, according to the author [35], appears as an integral characteristic that illustrates the systemic ability not only to overcome the consequences of crises, but also to form the potential for recovery on qualitatively new principles, adapting spatial systems to extremely complex global and regional conditions. It is from this constitutive and key position that the need for further scientific development and deepening of the concept of resistance and its operationalization in the practice of strategic management arises.

expert assessment or logical design methods), which allows not only to determine the current level of SEEER, but also to identify reserves for increasing the socio-ecological return of the PS. A feature of the approach is the introduction of the concept of “cognitive resistance”, which reflects the ability of communities to meaningfully respond, cooperate, support each other and form horizontal trust. This component becomes key in restoring human capital, overcoming NSS and returning social activity in communities. The original methodological framework for the SEEER assessment is based on: systemic integration of social, economic, environmental and cognitive indicators; a dynamic approach to managing PS resilience; a combination of quantitative and qualitative assessments on a single analytical platform. This ensures the formation of scientifically sound recommendations for managing PS resilience as a resource for improving the quality of life of the population. The parameterization of the SEEER model (1) (with the definition of coefficient weights, basic indicators and impact on syndromic determinants) is shown in Table 1.

Given the data provided by the researchers in Table 1, we offer recommendations for conducting SEEER calculations:

a) normalization and weighting: indicators are normalized in the range [0;1] (min–max) and the robustness of the results is checked when changing the normalization method;

b) calibration of weights: first, we take into account the theoretical possible weights, in particular, for: $w_{soc}=0,35$; $w_{eco}=0,30$; $w_{env}=0,20$; $w_{cog}=0,15$; and, subsequently, we perform scenario calibration (social-priority, investment, “green”, manageability);

c) sensitivity testing: we conduct single and global analyses, determining which indicators are most affected by the SEEER systems;

d) we build a syndrome map: for each community, we identify the leading syndromic determinants, linking them to target tools (educational programs, digitalization, “green” projects, social partnerships);

e) time dynamics: we calculate indices quarterly / every six months to identify trends and assess the effect of policies.

Therefore, based on the results of the calculations, the threshold scale of quantitative changes for the integral indicator of resistance should be determined and taken into account. (I_{SEE}^{RES}). It is necessary in order to interpret the integral value in a quantitative format not only “on average”, but as a signal for certain management actions to localize efforts and resources according to priorities. We believe that the most justified is a five-level gradation of indicators with clear quantitative boundaries (“0–1”), calibration rules and management implications (Table 2).

Therefore, from a methodological point of view:

a) normalization within “0-1” – allows combining multi-dimensional indicators and, accordingly, “reading” the quantitative value of the index as a probabilistic measure of achieving managed stability for a complex system;

b) taking into account five threshold levels – reflects a specific political and managerial logic of actions: “first save – then, stabilize – further, develop – after, scale – and, finally, lead”;

c) the width of the threshold intervals – is greater in the “average” efficiency zone (“0.45–0.65”), where

Table 1

Parameterization of the integral indicator model (I_{SEE}^{RES}): scales, indicators and syndromal determinants

Component	Weight range w_i^* (sum=1)	Basic indicators for accounting (normalization “0–1”)	Syndromic determinants that are eliminated by localizing efforts
Social Ssoc	0.25–0.40 (high sensitivity of quality of life to social stability)	Employment rate in port communities. Proportion of population with access to basic/social services (health, education, transport, water). Subjective security index (survey). Trust in institutions/participation in decision-making index. Turnover rate. Proportion of households with incomes above the vulnerability threshold.	AHS (“acquired helplessness syndrome”); demoralization; social isolation; increased conflict; distrust of management; depopulation trends.
Economical Seco	0.25–0.35 (key to increasing investment and logistics capacity)	Capital investments in port /infrastructure (per 1 inhabitant of the territory or per 1 ton of cargo turnover). Labor productivity in port logistics. Logistics efficiency index (turnover time, downtime, chain reliability). Share of private investment. Diversification of cargo/directions. Export sustainability (to pre-war base).	“Lost production syndrome”; investment apathy; dependence on one corridor; shadowing; low solvency of enterprises.
Ecological Senv	0.15–0.25 (balance with “green” requirements and restoration of ecosystems)	Marine environment/ water area quality index. CO ₂ emissions per unit of cargo turnover. Share of renewable energy in the energy balance of ports. Volume/ share of “green” investments. Waste management index (or ballast water). Area/state of coastal ecosystems that have been restored over a certain period of time.	Eco-stress, degradation of coastal ecosystems, “dirty water syndrome”, “port-community” eco-conflicts, penalty risks.
Cognitive-institutional Scog	0,15–0,25 (adaptivity and controllability measurement amplifier)	Port Digital Maturity Index (data, processes, cyber resilience). Share of decisions made based on managed data. Level of community/ partnership participation. Availability/ quality of risk management and continuity protocols. Intensity of communications in the “port-community-state” format. Educational and training activity.	Institutional distrust; information vulnerability/ disinformation; managerial fragmentation; “silent organization”; low cognitive mobilization.

Notes: weight ranges are justified for coastal areas in the recovery phase; quantitative values of “ w_i ” are fixed through an expert procedure taking into account the priority of objectives (social, environmental or investment) and sensitivity analysis.

Source: substantiated, defined and systematized by the authors

Table 2

Basic calculations for the threshold scale of SEEER measurements by integral index (I_{SEE}^{RES}) (range «0–1»)

Level profile	Index range	Interpretation (qualitative)	Management signal
Critical	0,00–0,25	Systemic vulnerability and disorganization; multiple failures in two or three subsystems (society/ economy/ ecology/ cognitive).	An extraordinary package of interventions, implemented synchronously: anti-crisis protocols, employment guarantees, financial resuscitation, environmental barriers, rapid social interventions.
Low	>0,25–0,45	Local stabilization without a stable trend; usually dominated by one or two “bottlenecks”.	Preventive package: targeted investments, accelerated retraining, local “green” projects, increased community participation.
Medium	>0,45–0,65	Managed resilience, but with risk of rollback to low levels; coordination and intensification of reforms needed.	Growth package: digital platform scaling, logistics optimization, partnerships, eco-renovation of nodes.
High	>0,65–0,80	Balanced development, sufficient level; feedback loop is working.	Scaling package: complex investment projects, integration into macro-regional/European corridors, quality of life programs.
Target (reference)	>0,80–1,00	Resistant, reproducible model; diffusion effects on adjacent territories.	Leadership package: export of management practices, competence centers, net zero pilots, smart innovations.

Notes: possible buffer zones (uncertainty zones) are likely at the limits of 0.25; 0.45; 0.65; 0.80. In this case, a “corridor” at the level of ± 0.02 should be used to avoid sharp “jumps” between levels due to information or statistical “noise”.

Source: calculated, formulated and systematized by the authors

there is a transition from reactivity to pro-activity of managerial actions (in this plane, management flexibility is required);

d) a buffer within ± 0.02 of the “uncertainty zone” takes into account probable measurement errors, data lags and seasonality, which prevents false signals for the implementation of organizational and economic procedures for the formation, strategizing and implementation of resistance policy.

And, we further emphasize the rules for classifying deviations (to avoid rating errors) – it is necessary to take into account several conditions that the authors introduce to limit compensation: 1) “weakest link” (mini-threshold) – the category cannot be “high” if any of the subsystems (S_{soc} ; S_{eco} ; S_{env} ; S_{cog}) has a level < than 0.40; 2) an increased threshold for the status of “target/reference” – is possible only when each subsystem ≥ 0.70 ; 3) hysteresis (ambiguous dependence) – so, to move to: a higher SEEER level, an excess of + 0.02 is necessary for two consecutive periods; a lower one – a drop of more than 0.03 in one period.

In the future, we should detail the quantitative and qualitative profiles of structural and functional subsystems for the selection of management interventions (using the rules of delimitation and classification according to quantitative and qualitative SEEER levels) in Table 3, in which we record the minimum requirements for quantitative and qualitative values for each element of the PS. Along with the subsystem profiling conditions, we will explain and describe the relationship between quantitative SEEER measurements and syndromal determinants (binding of functionals). Thus, if:

1) $S_{soc} < 0,35$ – then there is a risk of increasing the scale of the NSS, mistrust, social fragmentation. In this case, the priorities are: cohesion programs, employment, service infrastructure;

2) $S_{eco} < 0,40$ – There is a “lost production syndrome”, investment apathy (investapathy) – that is, a systemic state of low investment dynamics, which arises as a result of a combination of economic, institutional and

cognitive factors (lack of confidence in the predictability of the environment; increased risks (military, political or environmental); bureaucratic barriers and managerial fragmentation; demoralization of the business community, loss of “trust in the future”. In this case, the priorities are public-private partnership, concessions, logistics optimization, cargo diversification. At the same time, it should be taken into account that effective mechanisms for overcoming investapathy are established levers and regulators: strengthening trust (stable regulations, transparent concessions, public-private platforms); communication resonance (information campaigns that show success stories and safe investment niches); fiscal and environmental incentives (“green bonds”, tax breaks for eco-modernization); digital openness of ports (indicative dashboards that reflect results and create an engagement effect); support for cognitive mobilization (training, network communities, mentoring programs). Therefore, investapathy is not only an economic “cooling off”, but also a cognitive-institutional syndrome – that

Table 3

Elementary profiles of the port system for implementing resistance policies in the context of improving the quality of life

Level profile	Minimum for subsystems
Critical	S_i is <0.30 for two or more subsystems.
Low	At least three subsystems have a SEEER level of 0.30–0.50. And, none reaches a value of 0.65 or more.
Medium	Two or more subsystems have reached the level of 0.50–0.65. And, none has a value less than 0.35.
High	Three or more subsystems have values of 0.65 or greater. And, none have values less than 0.40.
Target (reference)	All subsystems are calculated to have quantitative values of 0.70 or more.

Source: defined, introduced, conditioned and systematized by the authors

is, a loss of faith in development, which directly affects the level of SEEER of the port system in general. The main manifestations of investapathy are:² a decrease in the volume of private and external investments, despite the presence of infrastructure needs; reorientation of capital into short-term or speculative operations (instead of real projects); "expectation syndrome" (investors expect "greater stability", but without participating in its formation); a decrease in innovative activity, the cessation of "green" and technological initiatives; the formation of pessimistic narratives in the professional community ("there is no point in investing" or "nothing will change"). Therefore, overcoming investapathy is a key condition for the transition from the stabilization phase to the phase of investment revival and sustainable functioning (growth);

3) $S_{env} < 0,35$ – There is eco-stress, penalty risks are increasing. The priorities in this case are – increasing energy efficiency, eco-modernization, rehabilitation and regeneration of water areas;

4) $S_{cog} < 0,40$ – The real ones are institutional distrust and information vulnerability. The priorities are the development of digital platforms, the activation of risk management technologies, and community participation.

Therefore, the formation of the SEEER PS is of fundamental importance for the restoration and development of coastal territories, because it is this integral effect that acts as a synthesizing indicator of the harmonization of three basic planes: social, economic and environmental. Its growth reflects not only the stability of the maritime economic complex or the restoration of infrastructure, but also the ability of port communities to self-organize, increase the level of trust, involvement in decision-making processes and the development of new models of socio-economic interaction. In the social dimension, the effect is manifested through an increase in the level of employment, improvement of the quality of social services, an increase in the sense of security and confidence in the future, which proportionally affects the cognitive state and psychological stability of the population. The economic component of the SEEER PS is implemented through increased investment activity, diversification of production, strengthening the competitiveness of the PS and expanding the logistics capabilities of the Southern macroregion, which creates new jobs and, accordingly, increases the income of the population.

In the environmental aspect, the SEEER effect contributes to the formation of a "green" trajectory of territorial development, reducing man-made loads, restoring coastal ecosystems, and increasing the energy efficiency of port facilities. From this, ecological stability, in turn, becomes the basis for social well-being and tourism and recreational potential, which strengthens the synergistic relationship "port – community – region". Particular attention should be paid to the cognitive and institutional component of SEEER, which ensures the development

of a new management culture, increasing transparency, communication openness, and creating an environment of trust. It is it that forms the prerequisites for overcoming investapathy, attracting partner resources, and developing civic participation, without which it is impossible to achieve sustainable management. Thus, SEEER is not only a quantitative and qualitative aggregated index, but also an indicator of civilizational maturity and managerial capacity of our state, which demonstrates the level of combination of economic development, environmental responsibility and social cohesion in the format of "scale – compensation rules – syndromic diagnostics".

So, transforming, according to the results of the study, the index I_{SEE}^{RES} to a managed policy tool – they have been given the opportunity not just to "measure", but to manage transitions between resistant states (from rescue to leadership). Therefore, increasing the SEEER should be considered as a strategic goal of state policy for coastal territories, integrated into national programs for spatial development, infrastructure restoration and regional security. The resilience of coastal areas can be defined not only as a technical, logistical and economic property³, but as a form of a social contract between the state, business and communities, which creates conditions for a decent life, sustainable growth and long-term development.

Therefore, we see the SEEER of coastal areas as an integral, causal result of increasing their resilience, which is simultaneously manifested in the following dimensions: a) social (growth in employment, quality and accessibility of basic services, sense of security, trust and participation of communities); b) economic (growth in investment and logistical capacity, productivity, diversification of flows and incomes of the population); c) environmental (improving the quality of the coastal environment, energy efficiency, "green" modernization and restoration of ecosystems); d) cognitive-institutional (increasing digital and managerial maturity, transparency, participation, ability to collective action, overcoming syndromic risks – in particular, SNB and "investapathy").

Therefore, in content, this is a measurable objective effect (index/set of indicators), which improves the quality of life of the population of coastal areas through managed channels of the port's influence on the community and the region and, accordingly, reflects a sustainable synergy between social, economic, environmental and institutional results. Determining the structure and channels of implementation of this effect, we note that its:

1) carriers are port administrations and operators, port communities, business partners, state and local authorities;

2) transmission channels: labor market – household income – demand for services; logistics efficiency – investments – innovations; "green" modernization – ecological safety – recreational potential; digital management – transparency – trust – participation;

3) anti-syndromal dimension: targeted resistance interventions that reduce the likelihood/scale of

² The reasons for the emergence of "investapathy" in the southern region of the country are the following: a) military-economic risks; b) uncertainty of logistics routes; c) insufficient coordination between state, regional, local and private institutions; d) lack of guarantees of property rights and long-term "rules of the game"; e) general psychological exhaustion of business. Therefore, the main one in this area is the cognitive component of investapathy, which turns it into a "syndrome of stimulating financial and economic degradation."

³ Since the socio-ecological-economic effect of resistance is not equal to, does not correspond in essence and content to: 1) the purely "economic effect of the port" – because, in this plane, social and environmental results and cognitive and institutional capacity are mandatory; 2) engineering "resilience" – besides, resistance includes the ability to adapt, learn and transform risks into development; 3) general "well-being" – after all, it focuses on the quality of life (safety, accessibility, trust, participation), and not only on the incomes of the population of territorial communities.

manifestations of NSS, “lost production syndrome”, institutional distrust, eco-stress;

4) measurability is formalized by an integral index (I_{SEE}^{RES}) as a weighted combination of four sub-indices: S_{soc} – social (employment, access to services, security, trust/participation); S_{eco} – economic (investment, productivity, logistical efficiency); S_{env} – environmental (environmental quality, energy efficiency, eco-costs); S_{cog} – cognitive-institutional (digital maturity, risk management, community participation). And, at the same time, each indicator is normalized within [0;1], and the weights (w_i) – summed to “1.0”; 5) recommended interpretation thresholds I_{SEE}^{RES} : critical (≤ 0.25); low (0.26–0.45); medium (0.46–0.65); high (0.66–0.80); target/reference (≥ 0.81)⁴.

Increasing quantitative values I_{SEE}^{RES} – is a strategic goal of modern maritime policy, where the index acts as a “dashboard” that connects port resilience with real improvements in the quality of life. Calculations I_{SEE}^{RES} allows: to prioritize interventions by the objects of localization of efforts (where to act – society, economy, ecology or manageability); to avoid compensation for failures (a high result – does not “cover” a failure in any subsystem); to track transitions from “rescue” to “leadership” by transparent thresholds. Therefore, SEEER is interpreted by the authors as a measure of maturity and operational capacity of the spatial-management model, which ensures an increase in the quality of life of coastal communities due to the synergy of social, economic, ecological and cognitive-institutional results, formed through the managed resistance of the port system.

Conclusions. According to the results of the study, the concept of the socio-ecological-economic effect of the resistance of port systems as an integral indicator of the balance of socio-ecological-economic and cognitive-

institutional processes in the coastal territories of Ukraine was substantiated and structured, taking into account the dominants of the author's concept Resilience+. The proposed model for assessing the dimensions of the socio-ecological-economic effect of resistance (taking into account weighting coefficients and syndromal determinants) creates an analytical basis for making management decisions in the policy of restoration and development of coastal communities. The scientific novelty of this study is the transition from a fragmentary analysis of the resilience of port systems to an integrated approach, linking institutional, ecological and social resilience with the quality of life. The practical significance of this work is determined by the application of the built, using the integral indicator I_{SEE}^{RES} , models for monitoring the state of port systems, forecasting socio-ecological and economic risks, forming spatial policy instruments aimed at improving the living comfort of port communities. Prospects for further exploration of this issue are associated with: testing the proposed structural and analytical model on specific cases of ports of the Southern macroregion of our state formation; expanding the analytical base for quantitative determination of cognitive resistance measurements and measuring the level of investapathy; developing mechanisms for integrating the resistance index (I_{SEE}^{RES}) into the system of state monitoring of sustainable development and spatial planning; preparation of recommendations on institutional and regulatory support for the policy of resistance in the maritime economic complex of Ukraine. The implementation of these tasks will ensure the formation of a holistic methodology for managing the resilience of port systems as a key factor in improving the quality of life of the population of coastal territories in the post-war period.

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⁴ This allows the application of the “weakest link” rule and hysteresis to ensure controllability of transitions between resistance levels.

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Стаття надійшла: 14.11.2025

Стаття прийнята: 29.11.2025

Стаття опублікована: 17.12.2025