

EVALUATION OF THE RISK OF FINANCING PROJECTS OF ENVIRONMENTAL PROTECTION*

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Rezumat

Proiectul de cercetare abordează multidimensional finanțarea protecției mediului din perspectiva orientării, corelării și consolidării fluxurilor financiare circumscrise regenerării unei economii afectate de deteriorarea mediului, chiar prin activitățile care constituie conținutul definitoriu al mecanismelor și circuitelor economice.

Scopul proiectului îl constituie identificarea pe baza unei analize științifice, metodologice și empirice, raportată la conceptele, principiile și argumentele impuse de teoria economică, a riscurilor de finanțare asociate proiectelor de investiții de mediu, precum și prospectarea efectelor acestora, deoarece eludarea, abordarea individuală sau dimensionarea eronată a acestora ar putea avea consecințe nefavorabile și neprevăzute în ceea ce privește eficiența strategiilor și politicilor în domeniul protecției mediului.

Obiectivul proiectului constă în relevarea interdependențelor și interacțiunilor dintre fluxurile și circuitele de finanțare a mediului, în

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evidențierea necesității finanțării punctuale, distributive, corelative și multiplicative a protecției mediului, într-o viziune spațială și temporală extinsă și prospectivă, precum și plasarea, printr-o abordare compozițională, a riscurilor finanțării investițiilor de mediu în rețeaua complexă a riscurilor sociale, economice și financiare generate de sistemul global al *praxisului* uman centrat pe binomul interdependențelor dintre om și mediu.

Abstract

The research project approaches multidimensionally the financing of environmental protection from the perspective of directing, correlating and consolidating the financial flows circumscribed to the regeneration of an economy affected by environmental deterioration due to the very activities defining the economic mechanisms and circuits.

The purpose of the project is to identify, by scientific, methodological and empirical analysis of the concepts, principles and arguments imposed by the economic theory, the risks of financing the projects of environmental projects and to evaluate their effects because their neglecting, individual approach or erroneous dimensioning might have unfavourable and unforeseen consequences in terms of the efficiency of the environmental strategies and policies.

The objective of the study is to reveal the interdependency and interaction between the flows and circuits financing the environmental projects, showing the necessity for punctual, distributive, correlative and multiplicative financing of the environmental protection. This must be done from an expanded and prospective spatial and temporal vision by a compositional approach of the risk for environmental investments within the complex network of the social, economic and financial risks generated by the global system of the human praxis focused on the binomial of the human-environment interdependence.

Keywords: risks of financing, financing per project, investments in environmental protection

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The **risks of financing the investment projects** for environmental protection must be evaluated from several perspectives, more precisely, from the position of the one for whom the components of the surrounding world are individualised just because they are parts of a whole. This is so because the understanding of the connections existing between the investments and the reality of an environment which is already polluted, which requires (with emergency) decreasing amounts of pollutants needs a purely financial perspective.

The **risks of financing environmental investment projects** are generated and determined by three categories of interconnected factors, with different contributions to the amplitude and intensity of these risks: 1. Degree and extent of the deterioration, its impact and the characteristics of the environmental protection process initiated and promoted by man; 2. Risks associated to environmental protection under the impact of anthropic pollution; 3. Risks determined by the system and process of financing, by the financing institutions and instruments, by the interactions between them.

The ineluctable global process, from human perspective, the environmental deterioration can also be defined by different zonary configurations which intersect and include mutually, all of them affecting and being affected by the globality of the process, globality intrinsic to the environment, as well as globality "created" by man through the features of transformation and by the psycho-rational features.

The criterional approach of the global process of environmental deterioration allows the delimitation of disjunctive areas (classes) in terms of the criterion-function that is used, and subjective, surjective or injective, in terms of other criteria. In other words, if the areas, considered as classes, are excluded according to a particular criterion, they intersect or are included according to other criteria. The delimitative criteria are: geo-climatic criterion; geographic criterion; geomorphological criterion; eco-systemic criterion; criterion of the interaction of the living organisms with the environment; criterion of the environmental factors submitted to deterioration, to pollution. This last criterion includes "transversally" the globality of the process of

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deterioration (transversally compared to the other considered criteria), delimiting the following areas activated by deterioration: underground soil deterioration; soil deterioration, water deterioration, air deterioration, biodiversity (biosphere) deterioration, which produces the organic matter required for human survival.

Pollution is the anthropocentric perception of environmental deterioration, perception which obviously determines the reaction of protection from the human side. Environmental protection can be approached from five criterional perspectives: sources of pollution, types of pollution, flows of pollution, pollution effects and pollution risks.

Five groups of ecological risks of pollution can be determined: climacteric risks, aquatic risks, soil risks, oil risks, biological risks, which can affect the diversity of the natural bio-ecosystems and ecosystems, the capacity to support them (biotopes), the biodiversity of the phyto- and zoocoenoses.

The pentagram of pollution connects the sources of pollution risks with the environmental factors showing the five essential components of pollution; the relations between them have one-way direction, from the sources to the risks and there are several types of relation that can be determined: relations of determination, relations of flow, relations of conversion, relations of risk (which signify the "transformation" of the pollution effects into associated risks) and relations of connection.

The effects and risks of pollution generate **environmental costs**: costs for different terms (very long, long, medium and short), which presume **financial sources** which to **finance the environmental policies**: the environmental funds, the suprastatal budgets, the voluntary contribution, the contribution of the polluting firms and of the polluted ones, and charity.

Between the sources of pollution and the sources of financing there is a relation revealed by the connection of the pentagonal structure of the pollution to the pentagonal network of environmental protection.

The pollution flows, by the effects associated to pollutants, induce **pollution risks** which differ according to the environmental factors and to the pollutants (a matrix can be built which to include the pollutants,

grouped in a pentagon, and the environmental factors), the risks being observed at the intersection of the two dimensions.

The reaction of the human ecosystems concentrates in activities of protection against anthropic pollution, but this reaction is in terms of pollution receivers.

This reaction induces a chain of reactive flows: information flows, punitive flows, regulatory flows, financing flows.

The economic activities and the generative decisions form a dialogue between man and nature, the *praxis*, which has the following significances: exhaustion of the resources, expansion of human artefacts, of the artificial environment, deterioration of the existential potential of the natural environment, denaturation of the existential matter of the human goods by transformative processes.

Each of the four types of relations mentioned above can be associated to a **specific risk**, to a probability of accomplishment which can affect human existence to different levels, while not having a direct contribution to the manifestation of the risk of survival: risk of resources exhaustion (absolute exhaustion and relative exhaustion); risk of human ecosystems expansion; the stress risk; the alienation risk; the risk of natural environment deterioration.

The risk of deterioration is a potentiality of existential risk, of survival, function of the bio psychical "aversion" of the man to the specific (factorial) or synergic risk of deterioration: aquatic risk, climacteric risk, etc., risk of cumulation, risk of propagation, risk of misbalancing, risk of disturbances (of the natural cycles etc.).

Thus, it was noticed that the **public financing of environmental protection and conservation** was not proper, that it involved inadequate costs, because of the political inferences in funds management. Ultimately, this lead to the adoption of the variant of private financing, an efficient way of private financing being the **financing per project**.

Each project is supported by its own financial sources, guaranteed exclusively by the value of the project or of the "product" of the project, the projects being regarded as distinct units.

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The financing of an environmental project (environmental investment) may presume the use of several financial instruments: indebteding instruments, equivalent actions and instruments, aids and donations; the **risks associated to environmental projects financing** are: the project risk, the credit risk of the credit institution, the credit risk of the sponsors, the country risk.

The financing of large projects, irrespective whether they are financed (sponsored) by public or private organizations, involves many risks plus other associated risks: risks of construction and exploitation, risks associated to income generation, risks associated to the way of project financing.

The **risk associated to the reimbursement methods** is determined by the incertitude of liquidity inflow or outflow, many projects needing flexible mechanisms of reimbursement in order to secure their success even if changes appear in the structure of the liquidities flow.

Among the elements deemed necessary for the successful financing of the projects are the credits without right of regression and with limited right of regression, financing the debts entirely in the currency of the host country, financing the issuing of hard currency bonds, major innovations in project financing, creditors trustful in the success of the project and the regional governments or authorities which are ready to take risks and make available limited resources.

The **financial risk** impacts on the financial performance of an entity submitted to risk, any event of action that may impact on the financial performance of the entity being a potential generator of financial risk.

Generally, according to the sources that generate them, the financial risks of project financing may be grouped in the following categories: currency risk, interest rate risk, capital risk, commercial risk, liquidity risk, counterpart risk and country risk.

The instruments managing the financial risks of the environmental projects are forward contracts, swap contracts for currency debts, change of the variable interest into flat interest, change of the flat interest rate into variable interest rate and then back into flat interest rate; change into flat/variable/flat interest rate with debts in different currencies, orders

of restrictions, option of maximal interest rate, change into debts with option, secondary debt options, contract with reference cost or with target cost, turn-key contract, contracts of procurement and supply, contracts of merging and payment, contracts of merging or payment (with payment conditioned by merging), stand-by credit lines, conversion of the debt into shares, guarantees issued by the project sponsor, guarantees for contracts of merging and payment, or for contracts of merging or payment.

The evaluation of the financial risks by their nature, complexity, volume and activity which generate a particular risk, not taking into consideration the management and control process, while focusing on the nature, degree and complexity of environmental deterioration yields **three classes of risks**: high intrinsic risk, medium intrinsic risk and low intrinsic risk.

When the adequacy of the system of financial risk management is evaluated, the process must evaluate the **potential of the risk management and control process** for each function and activity, which is delimited into three levels: high potential of the risk management, acceptable potential of the risk management and poor potential of the risk management.

The combination and balancing of the global level of financial risk inherent to the activity of protection with the general potential of the systems of financial risk management for the same activity may determine the **composite risk** for each relevant activity and function.

The composite risk has three levels: high composite risk, medium composite risk and low composite risk.

The network configuration of the interdependency between profitability and risks can be represented in matrix form as **matrix of covariance** between the funds supplied by the different financiers of the environmental investment and the financial assets, function of the risk affecting them.

The existence of a strong, positive relation between the results of the industrial companies and their sustainability, competitiveness and financial performance, imposed the integration of the sustainability

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factors into measuring the yield of investments or the yield of own capitals. The Environmental Value at Risk (EVaR) may supply concise information in this regard.

Thus, the integration of EVaR method into the strategic planning and financial analysis of company performance presumes its inclusion into the strategic planning at the company level, in stock evaluation, in calculating the credit rating for the companies, countries and stock, as well as the development of a sustainable system of reference.

The diversity and heterogeneity of the risks, their individualisation and localization, represent the background for their interdependency and interactivity, for their codetermination and branching, for their polarization and dissemination; the assembly of the risks forms a network of the risks, of their incertitude and etiological determinations, which gives them a potential of propagation, conversion and multiplication, often dangerous for the survival of the economic entities.

We may thus say that in the contemporary economies, the economic entities of any kind and size act within a **global risk economy**, with accepted and many times high incertitude, in which the losses generated by the specific risks seemingly are the main result of the functioning of such economy, its main discernible performance.

The risk expressed synthetically as uncertain, yet possible element, appears permanently within the process of the technical, human, social and political events. It reflects a structured process of subjective, comparative, parametric and analytical evaluation of the distribution of the probability of loss and gain, which may picture both negative, possible damaging and irreversible events, and beneficial opportunities and it can be an adequate moment for adaptation, innovation and learning.

Thus, the main idea is to define the concept of complex project and entropic risk management of the projects by:

- Considering the probability and impact of the entropic strategic thinking inspired by the characteristics of the adaptive complex systems imprinted by the **adaptation – innovation – earning** triad within the context of the limits and opportunities confronting the economic agents

with production activity and the socio-economic community as well (case of the European Union);

- Considering the limits and opportunities of the entropic risk management as epistemic risk management in terms of the limits framed by the experimental-scientific knowledge objectivism, and of the opportunities framed by the subjectivism of the intuitive meta-scientific knowledge;

As this study demonstrated, the purely financial perspective is not unimportant but, on the other hand, its exclusive use obstructs the non-financial valences of the dynamics of the activity of a polluting economic agent which tries to protect its investment projects while protecting the environment.

The dynamics of the dividend policy is, particularly, the perfect illustration (if we may say so) of what we showed above: although it has obvious financial bases and effects, the dividend policy is not less shaped (and directed) by psychological reasons, both on the side of the company management and on the side of the company owners (shareholders).

The psychological reasons, being those of businessmen, are somehow from a financial (psychological) area, but they are not influenced exclusively or determining, by its influences. On the other hand, the economic and financial component of the very assembly in which the investment projects are oriented towards environmental protection, has several facets, all relevant for the evaluation of the risk of financing these investment projects.

The importance of the marginal income and of the marginal cost for the management of the polluting company, next to the potential advantage of the monopoly show that the type of production (and its measurable traits) are essential for the analysis. The analysis of competition (the polluter included) is a necessity if we want to know if, and for how long, the product(s) will compete with substitute-products.

Risk analysis of the investment projects is an adequate subject for fundamental scientific research, and the studies subsequent to the

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fundamental research must build a cybernetic or at least mathematical superstructure.

Last, but not least, the effects of the investment projects oriented towards environmental protection on the company liabilities are not to be neglected; they are more complex than can be inferred from a brief analysis. A subsequent analysis will delimit the areas within which the effects on the company liabilities cause tangible (and possibly negative) effects and will attempt to design the optimal accounting policy to use.

The sustainable financing of the environment integrate the environmental, economic, social and governance factors within the process of analysis and decision-making. This financing supports sectors such as: environmental infrastructure, ecosystems, renewable energy, clean technologies, biodiversity, water shortage, sustainable towns, transportations etc.

Environmental protection presumes the existence of the financial sources which to ensure the **sustainability of the environmental policies** imposed by these costs. We may thus determine typologically five sources of financing: environmental funds; suprastatal, statal or local budgets; voluntary contributions, financial contribution of the polluting and polluted companies; charities (sponsorships, donations etc.).

Until now, the financial approach of the investment projects for environmental protection was fragmentary and circumstantially, the regulations for environmental protection failing to reflect its financial necessities. Thus, the conjunction between the ecological circuits and the pollution mechanisms, on the one side, and the financial flows and structures, on the other side, was done in a distorted, accidental manner. Romania will need a punctual, distributive and correlative financing of environmental protection, in an extended spatial vision.

References

1. Bradley M., P. Ryan (2011) – *Synthesis Accommodating the Challenges of a Climate Change adaptation and Governance in Conventional Risk Management: Adaptive Collaborative Risk Management (ACRM)*, Ecology

- and Society, volume 16 no. 1/2011
<http://www.ecologyandsociety.org/vol16/iss1/art47>.
2. Ciocoiu N.D. (2008) – *Risk management. Volume 1: Theories, practices and methodologies*. (in Romanian) ASE, Bucharest.
 3. Cișmașu, I.D. (2003) – *Risk – element for decision-making. Concept, methods, applications* (in Romanian) Economic Press, Bucharest.
 4. Dulcan D. C. (2009) – *Matter intelligence*. (in Romanian) 3rd ed., Eikon, Cluj Napoca.
 5. Filipoiu I.-D., C. Rânea (2009) – *Management of the Research-Development and Innovation Projects for Products* (in Romanian) Polytechnic Press Bucharest (<http://www.omtr.pub.ro/didactic/mdpp>).
 6. Iordache F., Bălășescu R. (2010) – *European Union – Space of Regeneration, Learning and Innovation in the Context of Sustainable Multidisciplinary Research*, Acta Universitatis Danubius, OEconomica, Issue 2(2), pages 87-97. <http://journals.univ-danubius.ro/index.php/oeconomica/article/view/619/570>.
 7. Piciu G., Ghe. Manolescu, F. Bălășescu, C. Drăgoi, G. Chițiga, I. Predescu (2011), *Economics and Environment - A Strategic, Integrative and Convergent Approach of Financial Flows for an Industrial Regenerative Economics*, Financial Studies nr. 1(54)/2011, pp. 210-241, CCFM „Victor Slăvescu”, Bucharest.
 8. Piciu G. C., C. Trică (2011) – *Globalization and Environment*. Proceedings of „Science and Art in the Informatics Era 2011”, American Romanian Academy of Arts and Sciences (ARA), „Polytechnics” University Timișoara, Presses Internationales Polytechnique, École Polytechnique de Montréal, Québec, pp. 59-62.
 9. Piciu G. C., C. Trică (2011) – *The Role of Management in the Banking System in Environmental Risk Assessment*. „Capital Markets” nr. 7/2011, Faculty of Economy and Business Administration, West University, Timișoara.
 10. Piciu G. C., I. Dobre, C. Trică (2011) – *Fundamental Criteria in a Management Plan of a Protected Area*. Proceedings of „Investments and Economic Recovery - Proceedings of the 10th International Conference”, pp. 71-77. Bucharest, Romania, Volume 10 (2011), Issue 1, indexed in EconPapers and RePEc.
 11. Piciu G. C., Ghe. Manolescu, F. Bălășescu, C. Drăgoi, G. Chițiga, I. Predescu, M. Borza, C. Trică, I. Dobre (2011) – *Integrative approach of environmental protection financing*, (in Romanian) Sedcom Libris, Iași.

Synthesis

12. Piciu G. C. (2008) – *Risk in economy. Financial-banking applications.* (in Romanian) Economic Press, Bucharest.
13. Predescu I., G. C. Piciu, A. Predescu (2010) – *Risk Diagnosis and Evaluation Vs. The Alternative Strategies of Financing the Complex Resources-Economy-Environment Network. Working In An Integrative-Regenerative Industrial Economy.* Romanian Economic Business Review, vol. 5, nr. 4-1, pag. 89-96. Romanian-American University, Bucharest.
14. Prunea P. (2003) – *Risk in the economic activity. Hypostases, factors and ways of reduction* (in Romanian) Economic Press, Bucharest.