

## **ECONOMY AND ENVIRONMENT – STRATEGIC, INTEGRATIVE AND CONVERGENT APPROACH OF THE FINANCIAL FLOWS FOR A REGENERATIVE (INDUSTRIAL) ECONOMY\***

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### **Rezumat**

Prin cercetarea întreprinsă în lucrarea de față s-a urmărit o evaluare a conceptului de rețea complexă resurse-economie-mediu, în condițiile proiectelor compozite și interactive de finanțare a protecției mediului, cu elemente care derivă dintr-o asemenea noțiune. Se analizează, în acest context, problematica interacțiunii și a convergenței proceselor de integrare și globalizare a nevoilor, cerințelor, intereselor și tehnologiilor economice și financiare,

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construindu-se suportul metodologic și conceptual necesar conectării activităților și sectoarelor românești la mișcarea mondială a economiei regenerative.

Articolul evidențiază problematica complexă a relației resurse-economie-mediu, precum și perspectiva multidimensională a acestor elemente, cu rezonanțe financiare atât la nivelul subiecților economici cu comportamente poluante, cât și la nivelul comunităților, regiunilor, țării și zonelor transfrontaliere.

### **Abstract**

The research aimed to evaluate the concept of resources-economy-environment complex network, under the conditions of composite and interactive financing projects for environmental protection, with elements which derive from such notion. Within this context, the paper analyses the topic of interaction and convergence of the processes of integration and globalization of the economic and financial needs, requirements, interests and technologies, building the methodological and conceptual support needed to connect the Romanian activities and sectors to the world movement of the regenerative economy.

The paper reveals the complex problem of the resources-economy-environment relation, as well as the multidimensional perspective of these elements, with financial resonances both at the level of the economic subjects with polluting behaviours, and at the level of communities, regions, country and cross-border regions

**Keywords:** network project, regenerative economy, sources and mechanisms to finance environmental protection and sustainability

**JEL classification:** Q2, Q27, Q5, Q57

### **I. Introduction**

The scientific work “Economy and environment – strategic, integrative and convergent approach of the financial flows for a regenerative (industrial) economy” appeared in response to the segmented and non-convergent approach, with no concentric and concerted synergy, of environmental protection financing. Within the context of the acute crisis of economy-environment compatibility, of the environmental effects of the economic and financial globalization,

there is a temporal and spatial opportunity to approach in an integrative, concentric and concerted manner the resources-economy-environment trinomial, oriented towards the aim to perpetuate the conditions for the material and spiritual existence of the mankind.

The methodology we used consists in the analysis of the quantitative value-related (decision-making) and qualitative relational (practical implementation of the decisions) aspects using behavioural and managerial research methods, the latter ones revealing the disfunctionalities, deficiencies and distortions within the mechanisms and flows which finance the environmental investments.

The work promotes original methods, techniques and procedures which analyse the financial impact of the risks involved by alternative strategies, by the interdisciplinary conjunction of some, so far, unilateral approaches to the environmental economy, integrating them into an integrative architectural design focusing on the following elements: ecologic junction points, negative transfers of costs, complementary harmonization, integrative financing and community convergence of the sources of financing.

The research joined explicative and interpretative methods specific to the theory of knowledge, with empirical operational methods which provide the openness towards actual knowledge of the environmental funds.

The applied methodology also tested an original analytical method for the possible incidents between the natural environment and the economic environment.

The purpose of the paper is to develop a strategic approach of the *flows of funds* for environmental protection in a sequential-concentric vision *focusing on the concept of project*, which to allow the use and valorisation of all the feasible sources of financing, within an industrial economy focused on the regeneration of the environmental resources aiming to their multigenerational preservation, to maintaining a sustainable natural environment and to the prudential compliance with the human needs.

The work tries to use the concept of project and the associated ideational and operational set of instruments for a multidimensional approach of environmental protection financing, within the perspective of directing, correlating and consolidating the financial flows allocated to the regeneration of an economy affected by

environmental deterioration using the very basic activities of the economic mechanisms and circuits.

Through the concept of project specifically adapted to environmental protection and to the financing of the actional components, the authors have tried to reconsider, in an integrative-strategic approach, the whole assembly of the involved activities under three dimensions:

- The prospective dimension: the project offers the possibility to conjugate the ideation with the operational, the diachronic with the synchronic, the desirable with the potential, the singularities with the multitude, etc. allowing thus both the particularization of the actions by project and their correlative-dynamic aggregation within programs, plans and strategies of environmental protection beyond the structures of rigid and often un-collaborative systems of organisation existing in the communities, areas, regions etc.

- The managerial dimension: the project allows the coordination and collaboration of the different entities, activities and finalities within a managerial version focused on the environmental projects and programs accomplishment, the financial flows being directed coherently and sequential towards specific, punctual operations and actions. The project management thus reconsiders the entire actional paradigm of accomplishment, starting with the identification, going through organization and decision and ending with finalization.

- The network dimension: the network design is a fertile opening both for the adequate understanding of the economy-environment relations, of the serious consequences of the environmental deterioration, and for the operationalisation and configurational-compositional instrumentation of the protection actions, of their financing, by the consistent and motivational mobilization of the people implied in deterioration and protection. This has obvious effects on the reconstruction of the practical protection systems, for which the project must be the element of synergy, convergence, orientation and finalization.

The integration of Romania within the EU presumes the acceptance of the sustainable development doctrine not as much as a benevolent option, possible among many other, but rather as the only responsible way of designing the medium and long-term development in agreement with the national interest and with the requirements of the international collaboration. Within this context, the strategic, integrative and convergent approach of the financial flows for a regenerative economy is a necessity – as the only alternative which promotes concomitantly the economic and social development and the preservation of the natural capital consisting of (non)renewable resources.

The integrative and convergent approach of the financial flows changes the perspective of the economic development, and in this direction, this paper proposes a complex of patterns of industrial development which take into consideration economic and social benefits for the present and future generations while not endangering the basic ecological processes. This approach presumes enlarging the analysis of the relationship between resources-economy-natural environment, and of the reciprocal influences, causal chains and areas of relevance.

#### **Concept of network project and its significance for environmental protection financing**

The **network**, approached functionally, from a systemic perspective, is a system which receives inputs (inputs of a problem) and produces outputs (answers to the analysed problem)

Structurally, the network is an assembly of interconnected units, each one being characterized by a simple functioning; the operation of the units is influenced by several adaptable parameters which make the network a flexible system.

In a formal representation, the network is an assembly of functional units located in the knots of an oriented graph; signals circulate along the arches of the graph, which allow the functional elements to communicate between them. The basic elements of a network are: the architecture, the operation (behaviour) and the adaptation (learning).

A **project** in economy and science is a complex activity which presumes collaboration and interactivity, being carefully planned in order to accomplish a particular goal.

The concept of project is circumscribed to a prospective teleology specific to the human praxis employing the imaginative-intuitive capacity of the knowledge involved in the creation of an abstract theoretical-hypothetic construct of the achievement of possible activities generating evolutive objective realities.

The project is the result of designing, a cognitive action of the possible futures. Thus understood, designing presumes intentionality, rationality and evaluation. In the prospective approach the project is defined three-dimensionally as possible futures by: opportunity, potential, trend.

The opportunity presumes knowing the range of possible achievements of the object and objective, identifying the ways of action, the openings and solutions which make it possible their successful and advantageous materialization. Opportunity identification presumes the alternative, cumulative and correlative elaboration of activities such as documentation, strategy, prognosis, differentiation, demand, feasibility, economic and financial favourability.

The potential presumes knowing the demand, the market and its participants, the actors, to anticipate their evolution for a proper evaluation of one's opportunities for development on the market. The study of potentiality involves the following instruments: benchmarking, documentation, prospective studies; product testing; pricing study; sectoral study, feasibility study.

The market trend allows to obtain a perspective of the market evolution in the targeted sector and to acquire a broader perspective on the changes and opportunities that might be capitalised on in the future. The following instruments are used to determine the market trends: documentation, prospective and sectoral studies; competition survey; market opportunity survey, demand coverage survey.

Synthetically, the prospective designing can be represented as a network of interactive activities and instruments providing a prospective basis adequate to the particular project; such representation can be acquired by the extended form of the research work.

The current definitions of a project have a common subject but they generally don't succeed to differentiate the projects from the prospective operations. There are two elements which delimit clearly a project from the operational activities: the projects refer to the creative change, they are temporal organisations.

A project has at least four basic dimensions: inherent size measured in terms of value, technical difficulty, incertitude in defining the objectives, complexity of the relations encompassing the project.

The individuals create value for the organisations through the impact of the **projects network**, not by their position within the configuration of the organisation. The projects network is a dynamic network of connections between people, within and beyond the organisations, which takes form with the purpose to supply projects whose accomplishment has the network configuration of the entities, activities, instruments, flows etc. forming **network projects**.

The projects network doesn't just simply has an impact, because it is not enough to get involved in a network of projects because the projects don't have substance per se; what matters is the effect of these projects beyond the impact of a particular project being the impact of the whole network of projects.

A network project may be represented as a graph, a flow diagram, which shows the sequence in which the terminal elements of a project are accomplished.

The hierarchical structure of the activities shows the part-whole relations, while the project network shows the before-after type of relations. The best known form of the project network is the knot-focused activity, in which each activity is represented as a knot, while the arches show the relation between the knots. The other form is the arch-focused activity but this method is not used at all currently.

The pattern design of the project network is given in the full form to the work "Economy and environment – strategic, integrative and convergent approach of the financial flows for a regenerative (industrial) economy".

The network project is, therefore, a graphical representation of the interconnected activities of a project. The activities of a network project are either successor, or predecessor, the network project being known as the diagram of the precedences, consisting of knots and arches, the time lapsing from the left to the right. All the activities,

except the moment of start and finish, must have at least a successor and a predecessor.

The network project has several characteristics such as, critical, close or quasi paths, total float, free float.

The projects and programs are different but this difference has been ignored for a long time, particularly by the management activity. Any organisation may have one or several project portfolios and each portfolio may contain a number of programs and projects.

The border between projects and programs is more obvious when the projects are started in order to create an object of knowledge and are thereafter closed and in the case of the programs which are started in order to make a change and/or achieve benefits for the organisation. Their adaptation to the circumstances and to the change of the conditions and the use of the projects in order to create individual projects within the general matrix of the program is a requirement of the programs.

The network projects can be classified according to two dimensions: the number of locations and the number of projects, their complexity depending on the multiple interdependencies which have to be coordinated in time and space between the projects.

A second classification, on the basis of the management of knowledge, adds a new dimension to the classification: the dispersion. The most complex situations are to be found within the virtual networks of programs and projects in which the participants are dispersed geographically and as activity.

The global projects aim combined challenges of the international projects, distributed and virtual, this new type being defined as a combination of the virtual and international projects which includes participants from different organisations active worldwide. The full research paper gives the dimensional pentagon of project typology taking into consideration 5 dimensions: the number of locations, the number of different organisations, the culture of the countries, different languages and the time area.

The current competitive changes are accomplished through the establishment of projects or project (program) networks, the competitive change being synonymous with the projects, but to be successful, different projects need different management approaches. An efficient typology has to be determined function of the destination, mission (purposes, objectives, strategies, tactics) and type of project



(targets, programs, projects, tasks). The full paper gives such a hierarchical typology.

The most common difficulties confronting the project management in the modern world refer to: control over the project goal, impact over the costs and plans, treatment of the difficult beneficiaries, project management frustrations.

Because the business projects are essentially unique and their set of objectives, dimensions, complexity and technologies is almost unlimited, it is advantageous to approach the projects within a usable typological framework. Various parameters of classification, project grouping and typology criteria can be used.

Thus, two classification criteria can be used: the purpose and the uncertainty of the network projects of their management. Three groups of considerations can be determined within this typology, determined by three causes: increased complexity of the goal; increased uncertainty of the applied technology; simultaneous increase of the goal complexity and of the technology uncertainty.

One of the most used ways to describe the projects is a typology which maps the interaction between the uncertainty and the technical difficulty, the knowledge required on what to do and how to do. The resulting matrix-type typology is given in the full text paper: closed projects, quasi-closed projects, quasi-open projects and open projects.

The **management of the network project** includes planning, organisation and coordination of the resources required for the successful accomplishment of the project goals, being closely linked to project programming.

The challenge, the main requirement of project management, is to accomplish all the goals and objectives of the project despite the limitations imposed by the consequences, time, resources and budget. Secondary, yet more ambitious, is the requirement to allocate and integrate the inputs necessary to accomplish the predefined objectives.

The approach of project management activities can be done from several perspectives: activity-focused, interaction-focused, growth-focused and stage-focused (traditional).

Irrespective of the used approach, special attention must be paid to the clarification of the basic goals and objectives of the project and of the roles and responsibilities of the participants in the project.

The traditional stage approach identified a sequence of steps to be taken: initiation, planning (design), execution (elaboration), monitoring (control), ending (accomplishment) of the project.

Any project takes into consideration the uncertainties, of various types, and risks associated to them, the change of uncertainties causing the modification of the initial planning, particularly in the case of the projects with a high level of uncertainty.

The critical approach is a management method which focuses on the resources required to accomplish the project's goals. A network of the critical approach of the project will tend to maintain the resources at a constant level and will require the project to be flexible in the early periods while the chain must change rapidly from one task to another in order to comply with the overall project schedule.

The approach of the big projects is a method to manage very complex and very uncertain projects, which differs from the traditional management mainly by its openness, elasticity and indetermination.

The chain-of-events approach is a technique to shape the uncertainty and to analyse project programming which focuses on the identification and management of events and of the chain of events affecting project programming.

An important component of the network projects management, the project management systems (PMS) are developed from systems with a single user/single project, to complex, multifunctional and distributed systems. The conceptual approach includes all the aspects pertaining to the initiation, planning, execution and finalisation of the projects, describing the process of project management in an extended approach (project life cycle) and explaining the involvement of the different management levels. The project stages (initiation, planning, execution and finalisation) are divided into project stages which are shown in the full text paper.

The project life cycle, which is the sequence of phases and stages of the project, involves the different levels of the management, the informational management of the staff and the team collaboration.

Because project management systems differ much in terms of set of objectives of functional focus, there is no point to compare the systems between them. Clusters of management systems have been formed, with comparable functional focusing and sets of objectives, and this has been done using the statistical methods. Thus, four main types of projects have been delimited: platforms of

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collaboration on different topics; single-project management systems; multi-project management systems; project-cluster management systems.

The project management systems have been adapted to the new opportunities provided by the emerging technologies, supplying a wide range of functionalities; the progress is achieved mainly in networking and project management.

The methodology (technology) of applying network project management consists of the following elements: introduction; configuration of the participants; project organisation, project planning; quality and thoroughness of project management; project commitment; risk management; project examination; time control; cash-flow, liquidities and payments control; network activities indication using arrows; network activities indication using knots (AON); analysis of the network of activities indicated by arrows; analysis of the network of activities indicated by knots; precedence-multiple dependency of the AON; network and the bar diagram; resources analysis.

Project management consists of interconnected activities which produce artefacts (documents) serving to clarify the objectives and results of client harmonization and project team expectations.

Project management instruments are: financial instruments; chart of the effects and causes; project state evaluation instrument; the PERT diagram; the Gantt diagram; the chain-of-events diagram; responsibility assignment matrix; path, stages charts; project cycle optimization; analysis of the impact over the participants; logic framework approach.

The modern project management tells on a common understanding of what a project is, starting from a simple definition showing that the project is a project almost completely distinct from the resulting outcome.

The integration of the project planning and execution allows a systematic project management covering the four stages of the project life cycle shown in the full text paper, which suggest that the project management is logically linear and mechanic in application. If this is rather true, then the real world of the project management is very different because the activities are performed by people and people are responsible for communication.

Given the educated work force of the present time which participates in the planning and execution of the environmental projects, particular attention must be paid to the project manager. Given the difference between planning and execution, the differences between leaders and managers shows that project planning requires leaders, while project execution requires managers, as shown in the full text paper.

In terms of learning, the full scope of project management is described by the following five elements: project environment; project life cycle; project integration; project process; priorities for the project success.

Project conceptualization and planning or development usually is an iterative effort, the simultaneous movement along the two dimensions generating new challenges and problems such as: large multidisciplinary systems, system integration and management of the configuration.

**Environmental economy** is a sub-domain of the economic science which approaches the environmental aspects, being linked to the ecologic economy despite the differences between them; the environmental economy is also distinct from the economy of resources.

The concept of market failure lies at the core of the environmental economy, which means that the markets fail to allocate the resources in an efficient manner, the externalities, the non-exclusion and the non-rivalry being the forms of market failure.

The solutions foreseen to correct the externalities include: environmental regulations; pollution quotas; taxes and tariffs on pollution; a better definition of the property rights.

**Environmental deterioration** is an anthropomorphic process, the environment consisting of the surrounding space, with a temporal perspective, in which man lives and exists. Its deterioration signifies the deterioration of the parameters for human living and existence within this space, parameters which depend on several characteristics: characteristics of the environment, characteristics of the outer environment, characteristics of the human species, characteristics of the man as individual.

The criterial approach of the global process of deterioration allows the delimitation of disjunctive areas (classes) in relation with the used criterion function, but subjective, surjective or injective in relation with

other criteria; in other words, if the areas, considered classes, are excluded according to a specific criterion, they intersect or they get included according to other criteria. Five criteria were used to delimit the areas: geoclimatic criterion, the geomorphic criterion, the geographic criterion, the geomorphologic criterion, the ecosystemic criterion and the criterion of the environmental factors.

According to the economic criterion, there may be two areas of deterioration in strong interaction: the area of the natural ecosystems deterioration (the biocoenosis and biotope of the animal and plant species) and the area of the human ecosystems deterioration (characteristics of the societal habitat, characteristics of adaptation and transformation, characteristics of the man as active psycho-rational being).

This pentagonal zonal configuration can be represented by an ordered network which shows the areas of the global process of environmental deterioration, through the flows of the quantum of deterioration, as well as the interconditioning (influences, determinations, osmoses) between the areas; the network reveals some flow categories: the flows of determination, the flows of zonal transfer, the flows of osmosis, the flows of adaptation, the flows of transformation, the flows of deterioration.

These flows are perceived as polluting flows, detrimental to the environment, which trigger protective reactions from the human ecosystems.

The environmental pollution can be approached from 5 criterial perspectives: sources of pollution, types or forms of pollution, flows of pollution, effects of pollution and risks of pollution.

The pollution pentagon which connects the sources and the risks of pollution will allow, in a broader approach, to connect the zonal and biosystemic delimitations with the structures of pollution through the environmental factors of their associated risks. Emerging thus is a network of relations of the pollution pentagon which shows the five basic elements of pollution, the relations between them having a one-way direction, from the sources towards the risks, as follows: relations of determination, relations of flow, relations of conversion, relations of risk, relations of connection. The full text paper gives the design of this network.

Environmental pollution, materialized in pollution effects and risks, affects the natural ecosystems, particularly the phylogenoses and

zoogenoses, destroying the natural, biological support of the human ecosystems, of human life. Environmental protection thus signifies human protection.

This process of environmental protection represents, through mechanisms and institutions, a process developed by man for the man, with five basic components: the polluters, the decision-makers, the environmental protection policies, environmental protection financing.

The delimitation of the financing sources is an essential problem of the financing policies and the formation of a matrix of funds taking into consideration all the taxonomical elements may contribute to the elucidation of many mysteries of man's funds.

The five basic components of environmental protection can be represented as a pentagonal network of environmental protection. Between the composing elements of the network, each of them consisting of five types of elements too, one can detect five groups of flow relations: polluting flows; polluter signalling flows; pollutant signalling flows; decision-making flows; financing flows. The full text paper gives the design of this network.

The reaction of the human ecosystems materializes in activities protecting against pollution (also due to human ecosystems), but their reaction is in their quality of pollution receptors. This reaction induces a chain of reactive flows grouped as follows: information flows, punitive flows, regulatory flows, financing flows. The array of flows is "managed" by the decision-makers from the human ecosystems, who are a component of the environmental protection pentagon.

The environmental protection promotes several principles, policies and regulations which must aid to the orientation of the activities and to an adequate management of the environmental projects.

The environmental protection policies propose a group of projects and programs which must form a network of projects, a coherent, convergent and consistent network that must prioritize the objectives, order and classify the activities, connect and interact the instruments and procedures, the methods and techniques.

Specific indicators are used for the substantiation of the environmental policies, of the environmental projects and programs; the indicators are interconnected and form the network of the environmental indicators.

The environmental indicators are used for four major purposes related to the environmental policy decisions: to provide information on the environmental problems, to support the substantiation of the environmental policy and the selection of priorities, to monitor the effects and efficacy of the environmental policy, to raise the public awareness regarding the environmental issues.

The network of indicators characterizes the main environmental consequences. The environmental policy must contain clear and specific information on the following aspects: the driving forces of deterioration; the pressures on the environment, the state of the environment, the impact of the changing environmental qualities. The social responses to these environmental changes and the general framework for the environmental indicators network are given in the full text paper.

With the purpose to answer this necessity, the environmental indicators must reflect all the elements of the chain between the human activities, their environmental impact and the societal responses to these impacts, the network of interactivity between the human actions and the environment, highlighting the environmental protection policies. It is given in the full text paper.

According to the aspects taken into consideration in building the network of indicators, one may delimit the following categories of indicators: indicators regarding the driving (deleterious) forces; indicators regarding the pressures on the environment; state, condition indicators; impact indicators; response, reaction indicators.

Although the general framework of the indicators can be considered as a descriptive analysis focusing on the individual elements from the social, economic and environmental systems, the relation between these elements introduces the dynamics of the framework of the indicators and generates changes. Focusing on the links between the elements reveals a number of processes and indicators which describe these changes, as shown in the full text paper.

The proposed network of the indicators substantiating the environmental protection policy, the network projects for environmental protection, includes the following groups of indicators: descriptive indicators, performance indicators, eco-efficiency indicators, indicators of the environmental policy efficiency, welfare indicators.

The communities are the basic cell of the environmental strategies and policies, its deterioration being felt directly by their inhabitants. Environmental protection promotion at community level requires knowledge regarding the multidimensional network of the community because the environmental projects, irrespective of the objectives, are circumscribed to the institutional, regulatory, productive, locative network of the community; ultimately, financing the environmental protection and the environmental programs is done within a network of the sources, instruments, flows and destinations of financing. The latter network adapts continuously to the circumstances of any kind without, however, giving up the network characteristics of the environmental protection financing at community level.

The materialization of an environmental project at community level runs through 7 interconnected stages: identification of the problem, decision regarding what has to be done, project designing, project implementation, evaluation of accomplishment and of the results (efficacy and efficiency).

The attention must be focused on the evaluation of the needs, on goal setting, on results evaluation, taking into consideration the partners, voluntaries and communication.

The evaluation of needs is a way to know the community in order to help it; the gap between the existing environmental situation and the desired situation must be identified.

Before sketching the project one needs to set realistic goals which help a realistic planning of the activities focusing the project towards environmental improvement, bettering an aspect without deteriorating others.

Setting adequate goals presumes knowledge on the characteristics of a good goal. A good goal is a SMRTA objective: specific, measurable, realistic, temporally delimited and accomplishable.

One of the best ways to improve the quality of the environmental projects and programs is to conduct the activities jointly, by the people, within the community. The partnerships represent the innovative approach of getting positive results; the collaboration with other people yields the following aspects: new approaches to the "citizenship" of the environment; participation of more people in community environmental projects; more money allocated to



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environmental actions; more efficient organisation of the human and financial resources.

The volunteers are often the driving force of the environmental groups, acting with conviction and will to accomplish the environmental projects, playing multiple roles: financing, leading, administration, activity organisation, education, environmental cleaning and restoration.

The significant involvement of the voluntaries and their preservation can be done in several ways: planning, recruiting and using voluntaries, orientation, training and acknowledging.

The proper communication is another critical issue of the environmental improvement activities. If the community members know the project and its goals they can react favourably by contributions in cash, time and other resources. Communication must treat in a similar way all media channels and the information must be intelligible, real, essential, avoiding the technical terms.

When the project goals are outlined, the organization has landmarks, it knows which the current situation is and what improvements are necessary. The capacity to confirm whether the objectives have been reached or not is called evaluation.

A set of creative methods can be used to measure and prove the "landmarks" of the project, the evaluation of all the aspects of the project supporting the finality of the project. The evaluation process is necessary in the environmental improvement projects because they examine the state of the environment before the start of the project, what has to be done to improve the environmental conditions and how the project is to be accomplished. The evaluation of the overall progress of the project will allow corrections when and if they are necessary.

➤ The evaluation strategy must offer a direction to the project, and it must take into consideration some aspects such as: what indicators are to determine whether a project is successful or not, what problems must be answered and where to find the information, what methods will be used to collect information, how is the progress of goals accomplishment going to be evaluated etc.

The major challenge of the environmental projects resides in the fact that the long-term financing mechanisms must be used for the preservation and protection of the environment at community level.

A necessity results, to supply practical instruments in support of a fast expansion of the mechanisms of sustainable financing which to generate the long-term financing of environmental protection and conservation.

The diversification of the mix of conventional financing resources (allocations from the national budget, international assistance for development etc.) and innovative financing sources (payments for ecosystem services, mutual funds, green taxes – for the environment) the individual countries may provide a stable, long-term financing to support environmental protection.

The sustainable financing of the environmental protection can be defined as the capacity to ensure stable and sufficient long-term financial resources and to allocate them in a proper form and rhythmically, to cover the full costs required for the protection of the (directly or indirectly) protected areas of environment and to endure an efficient and efficacious management of the protected areas.

A plan of sustainable financing is an iterative plan expanded in order to draw enough funds for the efficient protection of the environment. It identifies the priorities and shows the strategies to finance the financial gaps.

The elaboration of the plan for the sustainable financing of the environment includes six critical stages: the system of the financial gap analysis (between the current state and the goals of financing); evaluation of the administrative and financial process required for the system of environmental protection; examination of the existing financial mechanisms and of the new ones existing at the local site level and at system level; formulation and implementation of the plan of sustainable financing at the system level. The full text paper gives the diagram with the elements of the financing plan.

A relevant network of the financing resources for environmental protection, shown in the full text paper, includes: sources (mainly public), non-profit sources (mainly private), sources with profit (mainly private), special payments for environmental products, special payments for environmental services, special reduction of the need for additional financing.

The mechanisms for environmental protection financing are standardized for a range of public and private sources and within them according to the inflows external to the protected environmental

areas and incomes self-generated by the protected environmental areas (such typology is shown in the full text paper).

The mechanisms for environmental protection financing can be described by focusing on their current status, on obstacles and opportunities, on their future potential and on the challenges confronting them (the network of mechanisms is shown in the full text paper).

The mechanisms for the sustainable environmental protection financing are applied through a system of financing instruments; there are three important aspects regarding the financing instruments: requirements to use the revenues and taxes as instruments; promoting sustainability through these instruments; advantages in the kind of revenues or non-revenues; transfer of the positive experiences in the use of these instruments.

The financing of the environmental projects is done through several institutions, instruments, areas, geographical and territorial structures, policies and regulations, stakeholders, entities and forms of financing, financing mechanisms etc.; they are all organised in networks whose configuration, composition and interaction characteristics provide them with flexibility, adaptability, self-organisation, differentiation etc.

The environmental projects are differentiated; they have different goals, which make their efficiency to vary with the type goals of the project (the configuration of the financing sources is given in the full text paper). There are special sources such as local or central public financing, foreign financial assistance, private funds (foundations, charities, NGOs, funds from corporations, personal donations), loans taken from the environmental market, environmental funds, mutual environmental funds, market-based taxes (fees).

The funds financing the environmental projects must cover the operation expenses, must compensate the costs of opportunity, must compensate the supportive behaviour and must be reinvested in order to generate new revenues.

The network financing of the environmental projects require a diversified range of financing sources, they presume local involvement and work better using networking.

### **Network designing the environmental financing and sustainability**

The network designing of the environmental protection financing considers the continuous interaction between the scientific and practical information from the real-natural sphere with those from the humanist-social sphere, under the form of a network of entropic relations, connections, interdependences and flows, between the (biotic and abiotic) entities of the natural environment and the actors of the social environment (the socio-economic human society).

The ecological network of the surrounding natural environment can be seen as a coherent assembly of the mutual interaction between the natural or semi-natural elements of the ecological landscape which are configured and administered with the view to maintain or restore its ecological functions as means to preserve the biodiversity, which also ensures adequate opportunities for the sustainable use of the natural resources.

The socio-economic and financial network of the artificial human environment, formed as official and unofficial institutions, regulations, demand and offer – act in the sphere of the institutional human interaction through the interaction of the material-economic and financial-monetary flows reciprocally manifested between the social actors (bidders and beneficiaries), in terms of the economic-financial principles, regulations and instruments which allow the initiation and administration of the process of financing the endosomatic and exosomatic socioeconomic metabolism within the context of the available economic-financial resources.

Several other connections and interdependences can be set between the ecological network and the socioeconomic networks because the network is a concept which includes knots and connections composing a matrix of structured elements – the knots – as well as material economic-financial relations among them – the connections. It is therefore necessary to show the possible attributes of the network components: trust, responsibility and economic, social and financial information, water flows, virus manifestation.

The knots of the socio-ecologic network reveal a social component (public and economic-financial entities-authorities, individual people, organisations, instruments, conventions and specific rules of the market play), as well as an ecological component (entities: flora, fauna, the food web). The connections can be multidirectional or single-directional and can illustrate the established links: flows and ebbs of resources.

The nature of the relations can be ecological, social or mixed, as set between the man and the natural surrounding environment.

So far, most studies designing socio-ecologic networks displayed both a predictable static character, and an unpredictable dynamism.

There are some useful multidisciplinary theoretical and applied considerations for the network approach of environmental protection financing:

- Transition from the paradigm of the sustainable development to the regenerative development;
- Modernization of the ecological models of economic analysis passing from input-output, material-financial patterns to multi-criteria patterns of analysis;
- Impact of considering the “complex” attributes of the socio-ecologic systems – unpredictable, decentralised non-linearity, self-organization and adaptability to the risk of crises;
- Network designing the environmental financing and sustainability from the perspective of the innovation-learning binomial, of the rules and interactions between the elements of project management, of the learning management; the individual and social learning builds the way from idea to its successful application within different contexts (technical-productive, socio-ecological) relevant for environmental protection and sustainability.

#### **Instrumental-operational configuration of the network projects for environmental protection financing**

The instrumental-operational configuration of the network projects for environmental protection financing endeavours to assemble the environmental factors, the polluters, the pollutants, the ecological risks, the financial flows, the financial instruments for environmental protection and the relevant decision-making factors, within the network of environmental protection. It also aims to determine the induction areas of environmental deterioration and the transmission poles of the adverse financial effects; this allows focusing the instruments and flows involved in environmental protection.

The network is an integrated element of communication between elements interconnected in multiple dimensions; networking is a response adapted to the necessity of a fast development. Each knot of the network is important, but there is no hierarchy of them. The focus is on relations, not on situations, on the goals, roles played,

nature and intensity of the contacts between the elements composing the network knots. The specificity of the network is to ensure the continuity at the micro, macro world-economic level.

The network financing of the environmental projects can be defined as the way in which an environmental investment is financed, a coherent assembly of activities oriented towards the accomplishment of an objective of environmental protection. The suppliers of financial funds take the cash flows and the environmental profits following the accomplishment of the project, within the defined temporal and spatial context, as collaterals for the loans; these environmental profits are sources for the reimbursement of the loans.

The network also monitors the organisation and progress of an environmental project starting from the studies of economic and financial feasibility (commercial, technical-economic, fiscal, financial study) during the stage of project evaluation, continuing with the financial designing of the project and with the establishment of the project management unit. The financial designing attempts to make an approximation of the required cash flow in order to seek the most suitable sources for project financing. Project financing presumes the use of a large number of financial instruments: long-term and short-term financial instruments. The actors involved in environmental projects financing can be public, private, financial and non-financial institutions, domestic or foreign investors, and there are several variants of collaboration between them.

The financing mechanism involves flows and circuits which are common for other fields too, while some of them are specific to environmental protection. Thus, the financial flows for environmental protection from the state budget are identical with the flows used to finance other fields. At the microeconomic level, however, financing can use circuits and flows specific to environmental protection: support of the associations and foundations relevant for environmental protection, credits taken from the Environmental Fund, bank loans, subsidies from the local budget etc.

A model is proposed to gather environmental protection within a network including the environmental factors, the polluters, the pollutants, the ecological risks, the financial flows, the financial instruments for environmental protection and the relevant decision-making factors. The matrix model relies on the balance between the costs of pollution (the causal costs and the costs induced by a sector

to another sector) on the one hand, and the investments required for environmental protection, on the other hand.

The matrix model is a manner to approach the balance of the costs generated by the process of environmental protection and the monetary revenue from different sources.

The matrix model is a possibility to approach the financial management as part of the ecologic management. It allows to build an instrumental matrix of the financial network architecture, with the institutions on the lines and the financing sources on the columns; their intersection shows the existence or non-existence of financing and the intensity of using these sources.

The matrix analysis allows an easy and pragmatic understanding; it is a useful tool to evaluate the financial interactions which characterise the economy in general. The use of the matrix analysis allows the public and private sectors to evaluate better the consequences of the governmental or private decisions or actions on the different sectors.

**Diagnosis and evaluation of the risks entailed by the alternative strategies for the financing of the complex network resources-economy-environment under the conditions of the integrative-regenerative industrial economy**

An integrative-regenerative industrial economy relies on win-win strategies and targets the protection of the environment, of the consumers and of the employees while increasing the industrial efficiency, the profitability and competitiveness, acting according to principles of precaution, prevention and integration.

The main difference between pollution control and the integrative-regenerative industrial production is of timing: pollution control is a "post-event" approach (react and treat), while the clean production is a concept facing the future (anticipate and prevent). The promotion of this new concept aims to develop a systematic program for the identification of losses, seek the possible options and implement the best solution.

The integrative-regenerative economy is an evolving concept which allows the companies to adapt to the dynamic changes of the

globalization, to anticipate the needs of the beneficiaries while protecting the environment, to “produce more using less”.

The integrative-regenerative approach leads to the concept of the maximal income flow that can be generated by maintaining the quality of the product which has brought the benefit. In ecological terms, the integrative-regenerative production focuses on the biological and physical stability of the systems.

The socio-cultural integrative-regenerative approach means to promote the equity both within the same generation (mainly to eliminate poverty) and between generations (ensure the right of the future generations to a healthy environment).

We can thus say that the integrative-regenerative economy targets the goals of the economic development in close connection with a healthy environment by creating connections enabling strategies of sustainable development: it integrates the economic growth with the improvement of the environmental performance.

The integrative-regenerative economy is a method of reorganisation in cyclic systems similar to those existing in the natural world. The main purpose of this trend is to establish and develop clean industries on the pattern of the natural environment. The use of the natural model in the industrial activity will increase the efficiency, reduce the consumption of natural resources and decrease the losses.

Unlike the strictly specialised linear enterprise, the integrative-regenerative industrial enterprise demands the development of new, complementary technological flows which to take and use the substances that are lost as emission in the air, soil, water, as well as the secondary materials and the wastes. Establishing an integrative-regenerative enterprise means to innovate, to transform anew, something already existing which had to be developed on new principles, aiming several finalities.

The risk of the network financing the environmental protection and sustainability under the conditions of the integrative-regenerative industry can be defined as the probability of occurrence, starting and happening of an incident within the network, which may affect the favourable accomplishment of the network characteristics and of its interactive flows.

The risk of the network is a risk of flow which disturbs and deteriorates the interconnectivity and interactivity between the



network elements causing effects which are adverse to the fulfilment of the financial network characteristics.

The classification of risks gives the overall understanding of the possibilities for them to appear and a global evaluation of their adverse consequences. The paper defines nine types of financial network risks, five types of ecological risks and three types of conditioned risks

The ecological risks reflect the distortion of the man-environment relation, its alteration by the elements of the artificial environment by breaking off the economic activities from the natural environment, from its requirements of balance and cyclicity.

The description and analysis of the interdependencies between the project and the environment is a crucial stage for the identification of the risks associated to the network projects.

The description and analysis of the interdependencies between the project and the environment can be done using the structural analysis, by comparing the branchy structures of the environment and of the project within a matrix of the risks.

The coordinates of every element within the matrix are represented by the action (included in the project) which causes risks and the factor affected when the risk occurs; the importance (value) assigned to the risk will be an aggregate dimension determined on the basis of its associated parameters: intensity, persistency, frequency of risk occurrence (reversibility), flexibility.

The identification of the impact risks depends largely on the possibility to forecast the effects of the projected economic-social activities on the natural factors, which are in a close interdependence.

Given the role of prognosis in evaluating the probability and area of risk impact manifestation, the period of manifestation, the speed and dynamics of diffusion, the matrix of the future parameters of the identified effects is the result of three vectors: size of the risk, probability of the risk and importance of the risks.

Depending on the characteristics of the risk impacts, their forecast can be quantitative or qualitative.

The global and formal approach of the risk impact on the achievement of a network project to finance environmental protection can be done using the matrix instrument.

The matrix allows showing, determining and interpreting the causal, determinative interdependencies between the network risks, the ecological risks and the conditioned risks.

The nine types of financial network risks are generated by the tree conditional factors which produce direct and indirect effects via the specific risks of the financial system. The network risk is locked within a structure of interdependencies, of direct and immediate influences whose synthesis can be given in the matrix form.

The matrix is an analytical instrument which reveals the possible interdependencies between the nine types of network risks and the interdependent elements which contribute to the generation of these risks, such as the exogenous factors. It has the shape of a board with two inlets: on the vertical axis there are the risks of the financial network, while on the horizontal axis there are the conditional and ecologic risks.

The essence of the matrix model is the global and punctual relation between the categories of financial network risks, the categories of conditioned risks and the categories of ecologic risks.

The following stages lead us to the matrix:

1. identification of the financial network risks;
2. identification of the ecologic risks;
3. mark the impacts at the intersection of the financial network risks and the ecologic risks using a line drawn on the diagonal, downwards upwards and from the left to the right;
4. subjective expression of the size of the risk impact on a scale from 1 to 10, recording it in the upper part of each diagonal (upper-left corner);
5. subjective expression of the importance of the impact on a scale from 1 to 10, recording it in the lower part of each diagonal

In order to get more information the matrix can be elaborated in two variants – on the short-term and on the long-term, and the primary impacts can be used as input variables for another matrix producing information about the indirect impacts.

The algorithmic development of the interdependency matrix can provide the possibility to reconsider it, to reconstruct sub-matrices, to identify the calculation errors. Hence, it is important that the matrix has a high capacity of theoretical-methodological explanation and interpretation and a wide operational opening.

The diagnosis and evaluation of the risks raised by the alternative strategies of financing the complex network resources-economy-environment under the conditions if the integrative-regenerative industrial economy is an extremely important stage in monitoring the risks afferent to the alternative strategies of financing the promotion and consolidation of the environmental protection. This presumes the identification of each risk category using scenarios to determine their frequency and amplitude, process which differs from one company to another. Risk diagnosis and evaluation aims to limit the unidentified risks, because some risks are obvious, while others are hard to identify irrespective of the precautions taken, until they burst and cause losses. Among these risks there are: the economic risk, the financial risks (interest rate, exchange rate, insolvability risk) and the business risks.

One of the efficient instruments used to evaluate the financial risks, used to select the investment projects and implicitly the financing sources, is the internal rate of profitability (IRP) used in all the activities whose mechanism presumes environmental protection and monitoring the environmental deterioration (in practice), preferable with a pollution increment as low as possible. The decision to invest will be feasible when the economic mechanism of the company (potentially pollutant) will be “aligned” simultaneously with two criteria (IRP and VAN) and when the interest risk is minimal, this risk being present particularly within the polluting productive context.

Recently, the business risk was increasingly present, so that as of late 2008, the effects of the global financial crisis affected the business environment and the financial system, the financial market and thus the companies, which were affected by the strong depreciation of the exchange rate and by the lack of liquidities. An immediate effect was the increase of the loan interest on the banking market, which increased the risk aversion and closed investments.

The diagnosis of the economic risk – materialized in the fail to accomplish in due date the cash flow of the discounted positions, which appears when the environmental investments do not yield the

expected income and the debtors do not return in time their loans – is done by quantifying the cash flow dynamics as sum of its variations during a specified period of time.

The financial risk is closely related to the liquidity of the investment and to the life span of the investment: for the creditors who don't mobilize their capital for a long period of time, with a non-indexed interest rate, the financial risk increases as the due date is farther away, because of the opportunities which they miss during this period. Thus, the financial risk can be represented by the costs of opportunity; the investors may face a decrease of the investment value when better possibilities for placement appear.

The probability of occurrence of the financial risk increases for the companies whose activity depends on the market fluctuations of the interest rate; this difficulty is also transmitted via the "banking highway" of information and orders of the real economy, highway which, in the hypothesis of a high market value of the interest rate, already pits the company in difficulty running the risk of insolvency.

The integration of diagnosing and evaluating the risks of the alternative strategies used to finance the complex relation resources-economy-environment, under the conditions of the integrative-regenerative industrial economy, presumes that the managers of the companies involved in environmental protection identify the financial strategies to be adopted and the main lines of activity.

### **Conclusions**

The investigations of the authors, circumscribed one way or another to a strategic, integrative and convergent approach of the financial flows used for a regenerative (industrial) economy, allowed the formulation of conclusions and the identification of possible ways to promote environmental protection financing, as follows:

1. Network designing environmental protection financing must take into consideration the aspects circumscribed to the continuous interaction between the real-naturalist scientific and practical information with the humanist-social ones, in the form of a network of the entropic relations, connections, interdependencies and flows between the entities from the entities of the natural environment (biotic and abiotic) and the actors of the social environment (the socioeconomic human community). In this respect, the ecological network of the surrounding natural environment may be seen as a

coherent cluster of reciprocal interactions between the natural or seminatural elements of the ecological landscape which are configured and administered in order to maintain or restore the ecological functions by means of preserving the biodiversity, which provides simultaneously adequate opportunities for the sustainable use of the natural resources and for the transition from the paradigm of the sustainable development to the regenerative development.

2. The financing sources for environmental protection must form a relevant network, the network design targeting particularly the public sources, and private too, both non-profit and with profit, special payments for environmental products or services, the special reduction of the need for additional financing etc. The financing mechanisms are standardized on a broad spectrum from public sources to private sources and between them, by flows external to the environmental areas and by incomes self-generated by these environmental areas.

3. The mechanisms for the sustainable financing of the environmental protection are applied through a set of financing instruments, with three important aspects: the requirements regarding the use of the revenue from taxes and dues as instruments, promote sustainability through these instruments and the transfer of positive experiences with the use of these instruments.

4. Environmental projects financing is done via institutions, instruments, areas, geographical and territorial structures, policies and regulations, groups of interests and stakeholders, financing entities and forms, financing mechanisms etc. They all form networks with configuration, composition and interaction characteristics which give them under favourable systemic conditions, flexibility, adaptability, self-organisation, differentiation etc. The diversity of the financing sources, the local involvement and the networking of the financial flows are important aspects to be considered.

5. The instrumental-operational configuration of the projects within the network for environmental protection financing assembles within a single environmental protection network the polluters and the pollutants, the ecologic risks, the financial flows, the financial instruments for environmental protection and the decision factors in this area. This allows determining the induction areas for environmental deterioration and the poles transmitting the adverse financial effects, thus enabling to focus the instruments and flows

allocated to environmental protection.

6. The risks of the network financing the environmental protection and sustainability under the conditions of the integrative-regenerative industrial economy are flow risks which disturb and deteriorate the interconnectivity and interactivity between the network elements, with adverse effects for the financial network.

The work proposes solutions to ensure environmental protection against the technological and consuming aggressiveness of the man, oriented towards meeting a broad spectrum of needs. Many of them, in the nature of the substantial matter, involve actions accompanying the productive human activities, activities which must contribute to the preservation of resources, to the internalization of the negative residual effects within the process of their industrial transformation, to the preservation of the conditions and parameters of the environment in a state proper for human living, to environmental regeneration, to the reconditioning, remediation and restoration of these conditions, etc. These accompanying activities claim financing both the environmentally friendly technologic-industrial behaviours and the environmental investments. The design of strategic alternatives to finance the complex network resources-economy-environment is a necessity. The strategy must set the priorities, orientations and finalities, the goals, targets and financing so that the industrial component of the economy becomes a generator of clean natural and social environment, adequate to human existence.

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