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DEBATE ON THE DECISION MAKING PROCESS FOR GREEN INVESTMENTS IN SUSTAINABLE DEVELOPMENT CONTEXT

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Abstract:
Sustainability represents the new paradigm for the development of contemporary society. In order to achieve the desideratum to use rationally the natural resources to meet the needs of the present without compromising the ability of future generations to meet their own needs is necessary that the investments made by countries, regions, companies and people to be green investments. The purpose of this paper is to achieve a critical study regarding two concepts: (1) green investment; (2) models, methods, and methodologies for the prioritization the investment projects so as to select those projects aimed at green investments. After this research we can underline some preliminary conclusions: (1) the green investment represents a relatively new concept, little discussed in the literature; (2) the green investments represents the support to sustainable development of society; (3) the decision making process for green investment is a complex one that takes into account many variables. The main results of this study are: (1) the own definition of the concept of green investment, and (2) proposing a model of decision making process for green investments in companies.

Keywords: decision making process, green investments, management, sustainable development, prioritization of investment projects

1. INTRODUCTION

According to literature, sustainable development, or sustainability is the collection of policies and strategies employed by companies to minimize their environmental impact on future generations. Ecological concerns, such as the environmental impact of pollutants, are balanced with socio-economic concerns such as minimizing the consumption of limited natural resources to maintain their availability for the future. Economical concerns, such as the economic advantages, are, also, important in decision making process for green investments.Sustainable development is the development that takes into consideration the environmental, economic and societal aspects of investments projects.

In business, sustainability means the ability to bring to stakeholders a good return on invested capital; capacity sustained an indefinite period of time (Cândea, 2009). In order to improve the chances to sustainability is important and helpful to serve and protect the environment, in which the company operates, to help and sustain the employees, and to implement green investments projects. A sustainable business acts to achieve short, medium and long term success, today and tomorrow.

The aim of this research is to develop a theoretical and critical research on two concepts that are very important today: green investments and methods and methodologies for decision making process in order to select the green projects. The aim can be achieved following the three parts of this research: (1) considerations about green investments and decision making process, (2) decision making process for green investments in sustainable development context - using multi-criteria analysis (3) results and conclusions.

The methodology used in this research is bibliographical research in field of green investments and decision making process. Based on critical literature research, the authors have developed a definition of green investment and have conceptualized a methodology that help top management of organization on prioritization the investments projects, and to take the decision on green investments projects.

1.1. Considerations about green investments

Broadly, investments are safe expenses (that are done today) for uncertain future benefits (economic advantages). Nowadays we don't talk about investments, we talk about green investments, because with the increasing focus on environmental protection, there have been growing calls, whether from the media, government, or corporations (Boulatoff& Boyer 2009), to make responsibility for the environment an integral part of investment decision making process.

Green investments can be defined in different ways depending on an investor's moral values and financial objectives.

 From the perspective of environmental issue, Cohen, Fenn, and Konar (1997, p. 6) state that green investing means investing in companies that are the environmental leaders in their respective industries. Boulatoff and Boyer (2009, p. 9) write that green investing is the act of investing in companies that have a positive environmental impact. A recent IMF Working paper refers to green investment as the investment necessary to reduce greenhouse gas air pollutant emissions, without significantly reducing the production and consumption of non-energy goods (Eyraud et. al. 2011, p.5). There are three components of green investments: *low-emission energy supply*(including renewable energy, bio-fuels and nuclear), *energy efficiency* (in energy supply and energy-consumption sectors), and *carbon capture and sequestration (*including deforestation and agriculture) (Inderst, Kaminker& Stewart, 2012). In international trade, development aid and other fields, the understanding of green is often restricted to a matter of what you produce, not how you produce it or how use of the good affects the environment relative to substitutes for that good (Golub et. al. 2011, p. 18). Eurostat (2009) go further and propose a definition that includes not only goods and services but also technologies. They are divided into environmental protection activities and resource management activities.

Extra-financial information on environmental factors can be taken into account in the investment process in different ways, as highlighted by Mercer(2009).There is three types of approaches to green investment: the thematic approach, screening, and engagement.

Figure 1: Types of approaches to green investment
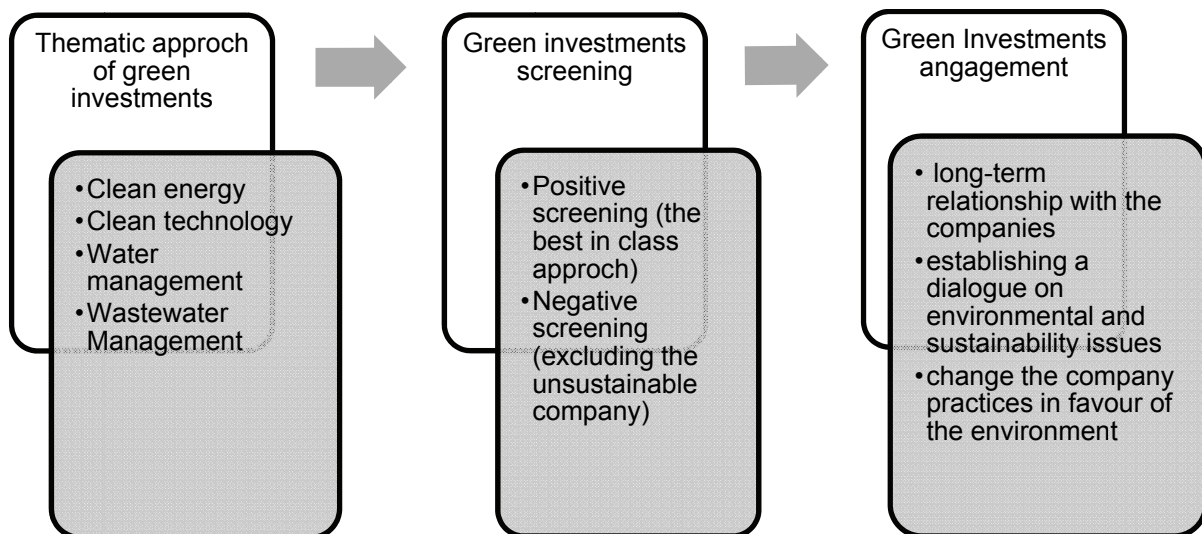
Source: Adapted from (EDHEC, 2010, p.14)

These three approaches are not, of course, mutually exclusive. An investment in a clean energy company (thematic), for example, could also involve enticing the company (engagement) to minimise the environmental impact of its production process and delivery logistics (EDHEC, 2010, p.14).

The reasons for investing green can be categorised in four groups. First, investors may be driven by ethical considerations. Second, they may be interested purely in advantageous return profiles. Third, by making an environmental dimension an integral part of their investment decisions investors may simply be responding to legal or regulatory constraints. Finally, investors may be looking to improve their reputation by making a public showing of their concern for the environment (EDHEC, 2010, p.18).

There are numerous studies highlighting the positive impact of green investment in the company, visible through environmental performance, return on assets, return on equity, return on investment, growth of intangible asset value (Erfle&Fratantuono, 1992), (Diltz, 1995), (Konar& Cohen 2001), (Derwall et. Al, 2005), (Semenova& Hassel, 2008).

When we talk about green investments we talk also about eco-investments, responsible investments, socially responsible investments, sustainable and responsible investments. All these concepts take into account in decision making process the environment issue. There are several sectors that fall under the eco-investing umbrella: renewable energy, Low-emission energy supply, buildings and efficiency sector, Eco Living sector, tourism, agricultural, transport, waste and water waste management.

Renewable energy refers to solar, wind, tidal current, wave and conventional hydro technology. This includes companies that build solar panels or wind turbines, or the raw materials and services that contribute to these technologies. It also refers to Energy Storage - companies that develop and use technologies to store large amounts of energy, particularly renewable energies. Under the renewable energy sector are Biofuels, this group includes companies that use or supply biological resources (like algae, corn or waster wood) to create energy or fuel. Other technologies that are included in the renewable energy group are: Geothermal (companies who use or convert heat to electric energy) and Hydroelectricity (companies who harness water energy to make electricity). The Buildings and Efficiency sector refers to companies that manufacture green building materials or energy-efficient services in the world of engineering and architecture. Green building materials include energy-efficient glass, insulation, and lighting among others. Recycling companies and energy conservation companies also fall under this sector. The Eco Living sector refers to companies that offer sustainable goods and services for healthy living. This includes organic farming, green pesticides, health care and pharmaceuticals (Henshaw, 2010)

From the study of the literature we can highlight the definition of green investment. Green investments are the investments made today by organizations who take into consideration the impact on the

environment (reduce greenhouse gas pollution, reduce the noise and pollution, waste management, wastewater management, improves environmental risk management, maintains the stability of ecosystems, energy efficiency, improves renewable energy, recycling, uses green technologies etc.), impact on society (protects, helps and supports for development the employees, insures wellbeing, insures healthcare, insure support for education, insures the development of green jobs and green skills etc.), and the most important insures economic advantages to company.

1.2. Considerations about decision making process

Decision making process is a daily activity for any human being. In the case of business organizations, decision making is a habit and a process as well. Effective and successful decisions make profit to the company and unsuccessful ones make losses. In decision making process the manager can use many tools, techniques and perceptions, and can take into consideration the effects of the three pillars of sustainable development: economic, social and environmental effects.

The decision classic criteria, classical evaluation methods that use static cost analysis, quantitative decision criteria based on discounted cash flows and financial indicators such as net present value and internal rate of return, are no longer sufficient to reflect properly imposed image the current economic environment.Nowadays, investors' decisions are based on detailed analysis on long-term profitability and integrating elements of sustainability in business management. Discussions on green investments, sustainable investments, socially responsible investment substantiates the idea of integrating ecological and social elements in processes of analysis, evaluation and decision. Last years, within the context of sustainable development, the top management of organizations has integrated in decision making process, beside economical coordinates, those relating to social and environmental aspects.In field of decision making process are many investigations at international and less at national level.

In table 1 are described the most relevant methods and methodologies for decision making process for green investments in organizations.

Table 1: Green investments in organizations

Description	Authors	Method/Methodology
Scoring Model to evaluate sustainable projects	ARUP, 2000	SPeAR (Sustainable Project Appraisal Routine)
The inclusion of sustainable development principles in the life cycle management of industrial projects	Labuschagne, Brent &Claasen, 2004	Life Cycle Management
Two-dimensional and three-dimensional graphical representation of investment projects according to the scoring of eco-efficiency and socio-eco-efficiency	Guillez, 2009	Eco-Efficiency and SEE-Balance for sustainable developments
The intelligent decision making system for the smart grid based electricity market taking into consideration the competitive environments composed of many players and components	Kang et. Al, 2009	Smart grid Model
The model of a representative wind power investor's decision making process of a project financial analysis	Gillenwater, 2013	Monte Carlo Simulation
Sustainable project selection based on a fuzzy multi-criterial group decision-making system	Khalili-Damghani&Sadi_Nezhad, 2013	Fuzzy Multi-criterial Decisional System
A managerial tool for decision making process in the green investment strategies (eco-efficiency)	Negulescu&Lupulescu, 2013	DEGIS Model
A mathematical model to determinate the optimal green investment cost in a supply chain environment to reduce greenhouse gas emissions	Sim & Jung, 2013	GICO Model

Source: Authors development

Beside the methods and methodologies described in Table 1, there are many other methods and methodologies for prioritization the green investments projects: ELECTRE I Method,Cost Benefit Analysis, Cost Effectiveness Analysis, and Multi-Criteria Analysis.

In decision making process for green investments, beside the method and methodology used for selection, it is necessary to follow some important steps without which the decision making process cannot take place: Identification the purpose of the decision, gathering information about green investments projects (factors and stakeholders involved), setting the model criteria for assessment the green projects, setting the variables take into consideration in the assessment process, construction the matrix of decision, selecting the project and implement it.

2. DECISION MAKING PROCESS FOR GREEN INVESTMENTS IN SUSTAINABLE DEVELOPMENT CONTEXT - USING MULTI-CRITERIA ANALYSIS

In the sustainability context, the decision making process must to take into consideration the three elements of the sustainable development: environment, social and economic elements, and to select the projects that promote green investments. Multi-criteria Analysis is often used in decision making.This analyse is a structured system for ranking alternatives and making selections and decisions. Considerations used in Multi-criteria Analysis are: how great an effect is (score) and how important it is (weight). Multi-criteria Analysis describes a system of assigning scores to individual effects that can then be combined into overall aggregates on the basis of the perceived importance (weighting) of each score. With Multi-criteria Analysis, ranking and decision making processes can be made very transparent. This analyse is an analytical tool at a higher level, bringing together different considerations in a structured way. Techniques such as cost benefit analysis and life cycle analysis apply Multi-criteria Analysis principles in their use of weightings, scoring (valuations) and aggregation.The decision making process for green investments is conceptualized in Figure 2.
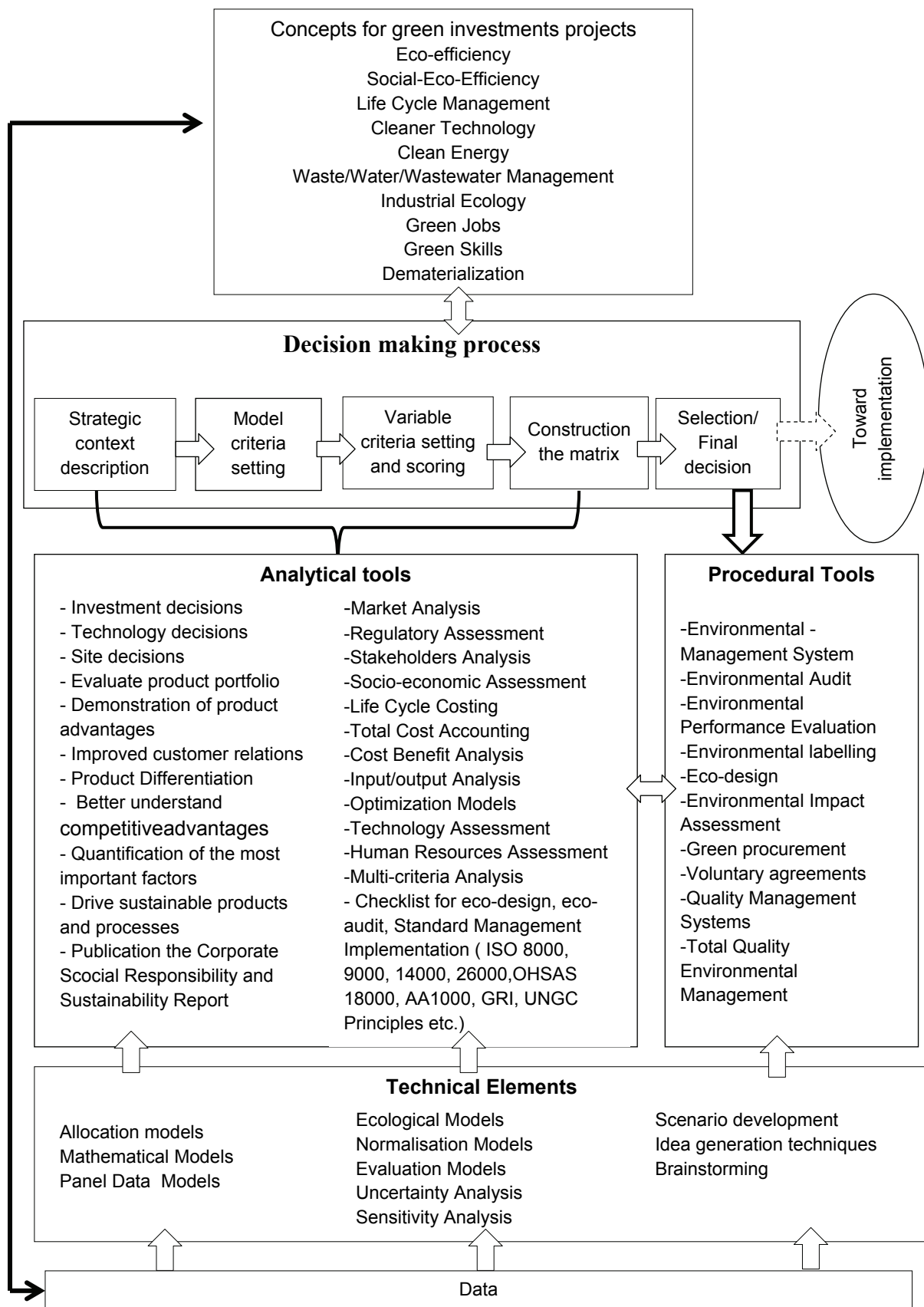
The first level of investment decision making process on the investment stays the subject of the green investments (Concepts for green investments projects) and the data who refers to subject.

When there is the subjects of green investments the top management of organization have to describe the strategic context of the investments project (description of the problem, stakeholders, budget, source of financing, the impact on environment, economic and social level), then according to company's strategy must select the model for prioritization of green investments projects (Ecological Models, Normalisation Models, Evaluation Models, Uncertainty Analysis, Sensitivity Analysis). Another important step is setting the variables that are taken into consideration and scoring them. After calculation of the variables and their share, the top management can construct the matrix of the decision making process, must select the project and implement it.

The limits of this research are represented by the methodological approach that is a theoretical one. This topic of prioritization of investment projects is a new topic, hot, being developed in the context of sustainable development. This study was aimed to develop a theoretical analysis on methods decision making on green investments. Traditional methods of making investment decisions were focused only on the economic side of projects. The new methods of prioritization, selection, and implementation of green investment projects focus on economic benefits of the project and its impact on society and to the environment. The model of prioritization of green investment projects developed as a result of theoretical research of the literature is consistent with the new trends of development, sustainable development.

The model of decision making process for green investment in sustainable context, using multi criteria analysis that was conceptualized in this paper, presented in Figure 2 will be tested in future researches.

Figure 2: The conceptualization of the green investments decision making process

Concepts for green investments projects
Eco-efficiency
Social-Eco-Efficiency
Life Cycle Management
Cleaner Technology
Clean Energy
Waste/Water/Wastewater Management
Industrial Ecology
Green Jobs
Green Skills
Dematerialization

Decision making process

| Strategic context description | Model criteria setting | Variable criteria setting and scoring | Construction the matrix | Selection/ Final decision |

Toward implementation

Analytical tools

- Investment decisions
- Technology decisions
- Site decisions
- Evaluate product portfolio
- Demonstration of product advantages
- Improved customer relations
- Product Differentiation
- Better understand competitiveadvantages
- Quantification of the most important factors
- Drive sustainable products and processes
- Publication the Corporate Scocial Responsibility and Sustainability Report

-Market Analysis
-Regulatory Assessment
-Stakeholders Analysis
-Socio-economic Assessment
-Life Cycle Costing
-Total Cost Accounting
-Cost Benefit Analysis
-Input/output Analysis
-Optimization Models
-Technology Assessment
-Human Resources Assessment
-Multi-criteria Analysis
- Checklist for eco-design, eco-audit, Standard Management Implementation (ISO 8000, 9000, 14000, 26000,OHSAS 18000, AA1000, GRI, UNGC Principles etc.)

Procedural Tools

-Environmental - Management System
-Environmental Audit
-Environmental Performance Evaluation
-Environmental labelling
-Eco-design
-Environmental Impact Assessment
-Green procurement
-Voluntary agreements
-Quality Management Systems
-Total Quality Environmental Management

Technical Elements

Allocation models
Mathematical Models
Panel Data Models

Ecological Models
Normalisation Models
Evaluation Models
Uncertainty Analysis
Sensitivity Analysis

Scenario development
Idea generation techniques
Brainstorming

Data

Source: Authors development

3. RESULTS AND CONCLUSIONS

Traditional models of decision making process for green investments are based only on the financial side of the project. According to the traditional model of investment decision making process are selected only those projects that generate the greatest economic benefits disregarding the impact of project on society and on the environment.

The novelty of proposed model on investment decisions making process is that green investment decision is taken after a multi - criteria analysis. Factors underlying the investment project selection pursue the economic benefits generated by the project, but also the project's impact on society and the environment.

Following the theoretical analysis performed in this paper we emphasize the fulfilment of the paper aims: (1) own definition of the green investments (green investments are the investments made today by organizations who take into consideration the impact on the environment (reduce greenhouse gas pollution, reduce the noise and pollution, waste management, wastewater management, improves environmental risk management, maintains the stability of ecosystems, energy efficiency, improves renewable energy, recycling, uses green technologies etc.), impact on society (protects, helps and supports for development the employees, insures wellbeing, insures healthcare, insure support for education, insures the development of green jobs and green skills etc.), and the most important insures economic advantages to company (2**)** was conceptualized a model of decision making process for green investments using multi criteria analysis.

The mains conclusions that we can draw are:
- The green investment represents a relatively new concept. It emerged with sustainable development and is often approached in international literature. In Romania, green investments represent a new concept, so there are fewer approaches in the literature.
- Sustainable development of a country, region, organization can be achieved only by using green investments, so they represent the support for the sustainable development
- The decision making process for green investment is a complex one that takes into account many variables.
- In context of sustainable development, decision making process takes into consideration the economic, social and economic effects of the investments.
- In connection with sustainable development and prioritization of investment projects have appeared new concepts such as eco-efficiency and socio-eco-efficiency.

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