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This new journal series is the new face of two former journals:

- The *Scientific Bulletin of Politehnica University of Timisoara, Transaction on Economics and Social Sciences (ranked according to CNCSIS classification in Romania: D class);*
- *The Scientific Bulletin of Politehnica University of Timisoara, Transaction on Management. Economics Engineering. Transportation Engineering (ranked according to CNCSIS classification in Romania: C class).*

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CONTENT

Scientific Bulletin
of Politehnica University of Timisoara, Romania

Transactions on ENGINEERING AND MANAGEMENT

Vol. 4, Issue 2, 2018

Editorial

Anca DRAGHICI[1]

In this winter we are pleased to announce the volume, issue 2 of the Scientific Bulletin of Politehnica University of Timisoara, Romania. ***It has been a challenge situation to have two issues this year!***

The Editorial Board has been confronted with the situation of extending the journal network and the scientific events that we usually support. Thus, because of the scientific research policy of the Faculty of Management in Production and Transportation, we have been supported (coach) master students to publish their work (brief description of their research done for defining their master thesis or other interesting projects related to different subjects that they usually follow). In addition, PhD Students were invited to publish at least two articles during their doctoral period of study.

Related to our network extension, this year we have been working with different authors from foreign universities because of Erasmus+ mobilities of the students and professors that have been visiting our faculty.

An event, which the Scientific Bulletin is consistently supported is the *Student Communications Session*. From here we select students works that have potential to be transform into real scientific articles. Thus, we provide assistance to young authors to publish their research in a professional manner. Each member of the Editorial Board was acting as coaches and the satisfaction of the success is very high both for the students (Bachelor or Master level) and for mature and senior researchers.

At the same time, we have been involved in the organization of the *Water Management in the Context of Climate Change - International Experiences* an international conference (Timisoara, October 11-12, 2018) together with Aquademica Foundation. This year's topic is mainly focused on water and wastewater issues and gathers specialists from public services companies, important equipment and services suppliers, universities and research institutions from several European countries. Students (mainly from the Public Administration specialization) were involved in the organization and they have free access to the event.

This event also announced that Timisoara, the city on the River Bega was awarded, by an international panel, of experts, the title of European Capital of Culture in 2021. Timisoara was preferred over other short-listed candidate cities from Romania because of its attributes, not only cultural, but also economic and social, strong enough to cope with the coming challenge.

In the second issue of volume 4 of the Scientific Bulletin have been published five articles that presents extensive studies and that were submitted in the second part of 2018. The aim of this issue is to encourage the academic research staff collaboration with specialists of public bodies and to support knowledge exchange and sharing. The Editorial Board has decided that articles that reflect the ideas and achievements of a large diversity of researchers, could better support the journal mission focus on interdisciplinary. In addition, by accepting for publication articles that have a more practical oriented content, we expect a better knowledge and wisdom transfer of the research results into organizations' practice. This will contribute to a strong knowledge alliance between our academic group of research and other researchers or practitioners from companies and public institutions.

In order to show this issue focus there have been generated a word cloud using World Cloud generator software (https://www.wordclouds.com/). As can be seen in the next "medallion of words" the issue ideas have been summarized and additional explanations about authors have been added to better understand the articles content. The key words associated with the issue are water, risk, product/products, education, evaluation, European.

The first paper "***Accounting and Fiscal Agriculture Incentives Sustainability in Climate Change Conditions***" has been developed by Lecturer Dr. Mihaela VARTOLOMEI, (from the Faculty of Management in Production and Transportation, Politehnica University of Timisoara, Romania). The scope of the paper is to analyze the sustainability in

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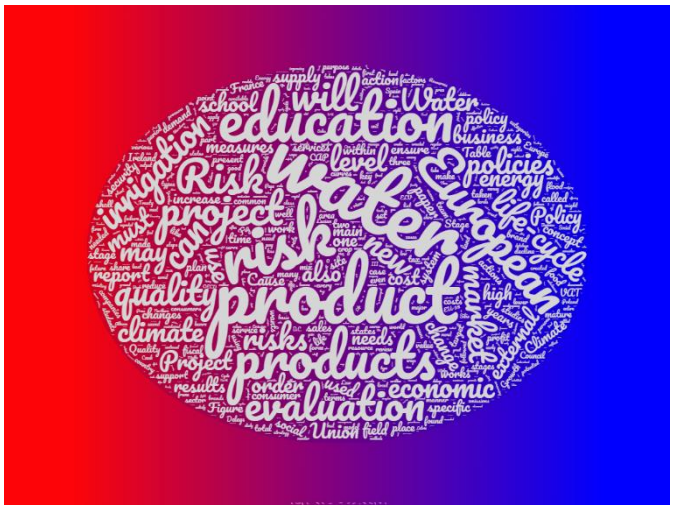
irrigation field of fiscal incentives established by Governments in agricultural sector and the manner fiscal incentives are registered, especially the reduced VAT in Romanian firm accounting system for investments in irrigation field

The second paper "***European Union Policy on Climate Change Framework***" has been developed by also, by Lecturer Dr. Mihaela VARTOLOMEI. The aim of the paper is to study the European policies in the matter of climate change and water resources management, especially Common Agricultural Policy, Environmental Policy, EU Emission Trading System (ETS), climate and energy policies nexus with international agreements in climate action and world global warming, and the way these European policies are settled and applied in national countries. The paper studies the manner these policies are implemented in European Union countries, funding resources for climate action, with impact on decision-making level and good governance.



The third paper entitled "***A Comparative Study of the Procedures of Drawing Up External Evaluation Reports on Secondary Education Institutions in Countries of the European Union and Romania***" has been developed by PhD. Student Petronela MACREA and Prof. Danut Dumitru DUMITRAȘCU (authors from the Faculty of Engineering, University "Lucian Blaga" of Sibiu, Romania). The purpose of this study is to offer a summary on the theoretical basis of the concepts of performance management and quality assurance in education, through a comparative analysis of quality systems in education in European states and Romania. Starting from the hypothesis that, if each educational institution is grounded on a set of guidelines resting on values and principles, known and adhered to by all factors involved in the system, this entails quality education delivered via an efficient management, we have set up an analysis of procedures, instruments and ways of drawing up the external institutional evaluation report, in a comparative approach between European and Romanian secondary education systems.

The fourth paper has been developed by Andreea Mariana MANTA, Cristina DIMA (The Bucharest University of Economic Studies, Romania) and Marius Nicolae PĂCURARI (from Intesa SanPaolo Bank, Bucharest, Romania) and it is entitled: "***Risk Management Planning in a Construction Project***" This paper presents an example of a risk management plan for a construction project to be developed in difficult environmental conditions. This Risk Management Plan defines how risks associated with the construction project in a desert zone will be identified, analyzed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks by the Risk Manager. Based on our studies, risk management is an essential part of construction project management and should be always applied using appropriate tools.

The last paper has been developed by Lecturer Dr. Larisa IVASCU, Prof. Anca DRAGHICI (from the Faculty of Management in Production and Transportation, Politehnica University of Timisoara, Romania) and prof. Jörg NIEMANN (Hochschule Düsseldorf, Geschäftsführender Vorstand FMDauto, FLiX Forschungsstelle Life Cycle Excellence, Düsseldorf, Germany). Their research is dedicated to an actual subject of lifecycle thinking: "***A Debate on the Product Lifecycle Implications and Product Market Behavior***". The paper presents figures that characterize various industry products and their lifecycle curves. The amount of development money invested in a product intended for rapid market penetration, for example, is considerably less than for a one destined to a long-term stable, mature market. In this context authors illustrate the types of feedback used by engineering during the various stages of product lifecycle. Finally, they consider that engineers responsible for product or process improvement must recognize what phase of the product lifecycle is in to practice the most effective research.

Scientific Bulletin
of the Politehnica University of Timisoara, Romania

TRANSACTIONS on ENGINEERING AND MANAGEMENT

Volume 4, Number 2, 2018

Accounting and Fiscal Agriculture Incentives Sustainability in Climate Change Conditions

Mihaela VARTOLOMEI[1]

Abstract – The scope of the paper is to analyze the sustainability in irrigation field of fiscal incentives established by Governments in agricultural sector and the manner fiscal incentives are registered, especially the reduced VAT in Romanian firm accounting system for investments in irrigation field. The paper studies the impact on good-governance and the sustainability on the frame of climate change conditions and water resources management. The main results show fiscal incentives for specific assets don't imply difficulty in accounting system and the impact of good-governance on water management or on the activity of the plant is significant.
Keywords: eco-conflict, water resource management, climate change, sustainability, investment, fiscal incentives, accounting.

Keywords: Eco-conflict, Water Resource Management, Climate Change, Sustainability, Investment, Fiscal Incentives, Accounting.

I. INTRODUCTION

Nowadays increasing climate challenges are putting resources management (Figure 1), especially water sector, under a great pressure and vulnerability (a new eco-conflict): the limitation of water resources availability, uncertainty in climate conditions, precipitation and temperature modification, provision in water security, flood resilience risk, the quickly overgrowing population and health risk, food security due to unsafe water sources, droughts condition, environmental and soil degradation, wastage in using the clean water, increasing poor rainfall, depletion of ground water resources, global warming, increasing greenhouse gas concentration emission [5].

Water resource management (WRM) may respond to such questions with specific tools: flood management (flood studies, flood mapping, real-time flood forecasting, flood protection, flood risk, flood planning), rainfall modelling, drainage design (highway drainage design, rail drainage design, airfield drainage design, pipeline drainage design, river diversion), investments in bridges, channels, embankments, spillways, culvert design and analysis, environmental hydrology assessment, surface water management (surface water impact investment, surface water planning), groundwater management (groundwater flow, investigation and implementation design, hydro-geophysical programs, groundwater resource assessment, dewatering system, contaminated sites investigation, geo-chemical analysis, surface-groundwater interaction, groundwater monitoring design), and finally but not least, investment in irrigation equipment for smart agriculture.

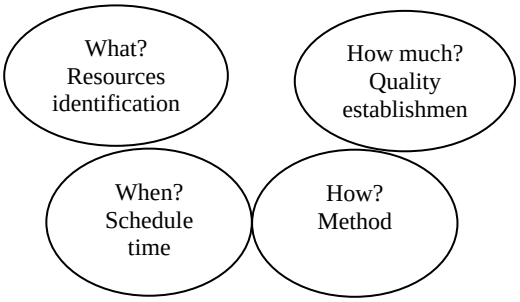


Figure 1. Resources Management

The efficiency in water resources management (Figure 2) plays and important role to determine the quality of mankind life.

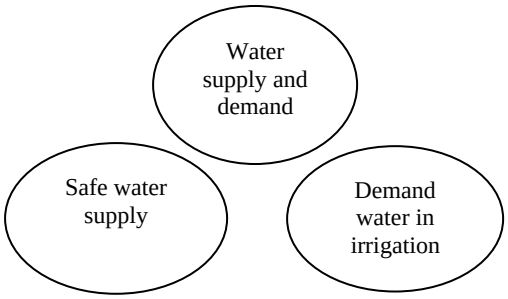


Figure 2. Water Resources Management (WRM)

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The quantity and quality of water used depends on the sustainability, efficiency and equitability of WRM [11].
Sustainability concept can be divided into three important categories:

- Rural income and plant income (they reflect the economic sustainability)
- Rural development and labor (social sustainability)
- Biodiversity, water management, nutrients and pesticides use (environmental sustainability)

In the frame of European Union, some regulation (such as Directive 60/2000) set up criteria for WRM (cost recovery and polluter pay principles).
Water resources management needs to be defined and explained taking into consideration the allocation of scarce water resource and the implication of technical, economic, and environmental efficiency of water use in generally and in irrigation especially within a region or river basin.
Irrigation systems are very useful for increasing the crop and to ensure a certain agriculture result from one year to another, but also with great implication on food security for population and for export. But investments in irrigation equipment are very expensive and the cost of using them are also very high (water and energy consumes). Irrigation water management begin to gain a central role in present and future [1].
The main scope of the paper is to analyze the sustainability of fiscal incentives in agricultural sector, especially in irrigation field. Specific themes analyzed are related to the fiscal incentives that are established by Governments in agricultural sector. Also, it relies the manner these fiscal incentives are registered, especially the reduced VAT in Romanian firm accounting system for specific investments, more the investments in irrigation field. Finally, the paper studies the results of these decisions and actions in good-governance and last but not least the sustainability on the frame of climate change conditions and water resources management.

II. METODOLOGY

From methodological point of view, the analysis of the incentives sustainability in climate change condition was based on information from: The National Land Improvement Agency (NLIA), The Office for Regulation of the Organizations of Land Meliorations within the Ministry of Agriculture, Forestry and Rural Development, the Ministry of Environment, European Union Committee, as well as a series of governmental reports for the subject approached. As methodological instruments there are used the analysis, comparisons and synthesis of available information.

III. ECONOMIC INCENTIVES IN WRM

Because of many challenges such as: increasing world population, growing water scarcity and water supply, increasing water demand and rising water cost, water is an economic good and to improve water use efficiency in irrigated agriculture area becomes mandatory [2]. The efficiency of different economic incentives (charges and taxes reduction) can be explain using concepts as marginal benefit (demand), marginal cost (supply), and marginal damage cost (damage for incremental unit of one pollutant).
The water in irrigation consume surpass 60% from global water use. Thus, water conservation in agriculture is considered a new 'source' of water [3].
In the following we provides short description for theoretical economic incentives in irrigation field.
1. Users' Pay Principle (UPP) is referring to the fact that who use scarce resource must pay [4].
Irrigation water pricing may include transfer of water rights (technical efficiency), may exclude water rights (allocative/economic efficiency based on opportunity cost of water), or may include environment cost (ecological/environmental efficiency and sustainability). Moreover, productivity of water varies highly, and so economic value does. On one hand, in agriculture, water irrigation may be considered as one input among others, thus charging depends on water quantity use, for change farmers' behavior, and even if it is influenced by the price elasticity of water (based more on marginal cost). On the other hand, irrigation water may be charged on the output (irrigation water in terms of output [6]), certain water fee for each unit of output produced (based more on marginal benefit).
2. Subsidies represents the difference between the sum farmers pay per unit of irrigation water and the marginal cost of supply [11]. Different types of subsidies might be settled such as research grants or payments to farmers, budgetary subsidies (e.g., grants or tax credits), provision of extension services, preference loans, and debt relief.
3. Tax incentives might be settled as preferential tax treatment (tax credits, exemption or deductions, tax benefits for investors, tax on water abstraction, tax on environmental damage through pollution – polluters pay principles and adverse effect [9], taxes on related inputs – energy required to use irrigation equipment and chemical fertilizer use)
Taxes on energy consumption and chemical fertilizer, tradable quotas, and subsidies for land retirement or water conserving agriculture practices, may be direct and indirect means for reducing water-related inputs and water use [7].
The optimal point (also called Pigovian tax) for environmental tax is the point where marginal cost of pollution abatement equals marginal damage cost. It is considered as one of the economic incentive tools for internalizing the externalities.

4. Quotas control water use (how much, where, when, by whom, for what purpose) [11], but might be sometimes rigid (use-it-or-loose-it) or difficult to set: fixed quota for groundwater pumping, allocation of water share in fixed amounts, allocation of fixed quota.
5. Ownership (water rights) is related to the right the user acquires for abstraction, diversion, and use of water: share of stream flow, water purchase rights.
Other examples of incentives are: rebates, grants and loan guarantees, cost share, rate discounts, interest-free loans, credits to bill, subsidized tests,
In fact, in practice incentives measures for improve efficiency in water use is very rare for the fear of losing competitive position in the world agriculture market [8].
Schmitz. and Sourell said that an efficient use of irrigation water is referring to the supply of irrigation water for farms just with as much water it is necessary to produce optimal yield, so neither water, nor production factors (land, labor, capital) is wasted [10].
Irrigation used in agriculture provided in 1999 about 40% of the total world's food supply but occupied only 17% of the arable area of the planet.
For 2020, some specialists predict that the demand for cereals will seriously grow up of around 40%, which may put a great pressure on water all over the world.
Proper incentives for farmers allow improve irrigation systems, crop mixes, proper fallowing.

IV. ROMANIAN LEGAL FRAMEWORK ABOUT IRRIGATION AND ACCOUNTING

Romanian judicial framework regarding agriculture set incentives in these ways: fiscal incentives foresaw in Fiscal Code in regulations, Law no. 175/2018 and Low of Agricultural Cooperation (Law no. 566/2004) and reduced VAT rate by 9% for goods and services in water supply: delivery of irrigation water, draining services, centralized thermic energy production, transport and supply, electricity supply, natural gas supply as well as in agricultural irrigation, investment and supply. The following association form is accepted in Romania: agricultural companies or other agriculture association form (Law No. 36/1991), association or foundations (Government Ordinance 26/2000), agricultural cooperatives (Law No. 566/2004), and organization (federations) of land melioration (Law 138/2004), altered and completed.
The irrigation water users/ associations asked Romanian Government to accept no VAT for investments in infrastructure and land melioration (irrigation, drainage, fight against flood or soil erosion), for purchase and installation of scheduling equipment, but till this moment reduced VAT rate of 9% will apply only to water supply and services in irrigation agriculture.
Romanian Government program (Irrigation National Program, PNI) and policies on medium term run regarding agriculture and irrigation issues for 2018 and projection for 2019-2021 stipulate as major objectives to increase agricultural potential, to ensure food security, and to enhance the export in agriculture field. PNI has 41 new objectives and 9 of them have economic and technical indicators approved (total value, price moment, capacity, number of months).
Romanian accounting of water supply and services is illustrated below:
1. Irrigation equipment acquisition (VAT 19%)

%	*= 404 "Supplier of non-current assets"*
2131 "Plant and machinery"	
4426 "Input VAT"	

2. Depreciation of irrigation equipment (in the end of the financial year)

6811 "Depreciation of non-current assets"	*= 2813 "Depreciation of plant and machinery, motor vehicles, animals and plantations"*

3. Water supply and services for irrigation and reduced VAT (9%) (in the case of operating activity), 19% VAT for utilities

%	*= 401 "Suppliers"*
605 "Electricity, heating and water"	
4426 "Input VAT"	

The technical and economic measures mentioned are directed also to develop irrigation systems (both to recover and repair existent infrastructure and also to extend it in order to reduce energy consumption and to rise water productivity) and to increase competitivity of Romanian crop on European Single Market (increasing labor and land productivity and efficiency, enhancing quantity and quality of the crop, reducing production cost and water consumption).

V. RESULTS AND CONCLUSIONS

Water crises looks to become a fight between cities and farmers. According to literature and database accessed, the irrigation system is used in agriculture field most in Mediterranean European countries comparing North and East Europe Countries. The average of total water demanded for irrigation is 6,500 m^3/ha/year from total quantity of water used in agriculture, around 73,000 million m^3/year. The dimension of irrigated area influences the consumption of water.
In the beginning of new millennium is was notice that the rate of growth of the irrigated field decreased in several countries. In Greece for about 83% of total water is used in irrigation, in Italy for about 57%, in Spain for about 68% and in Portugal for about 52%. These results are in marked contrast with Northern and Eastern European Countries where the share of total water used for irrigation is less than 10%, on average. In USA, the agriculture uses 80% of water supply, in 2018, even if about 40% of farmers use advanced scientific methods that evaluate quantity of water needed for the high-value crops, determining

moment and surface to irrigate. The climate, the cultivated crop structure, the land quality, the area and the irrigation technique are influence factors for the volume of irrigation water use but also for the dimension of area under irrigation systems.

On one hand, economic measures are more efficient when they are used together to complete each other. Thus, economic incentive measures are policy instrument of decision-makers (government, suppliers and users). On the other hand, even if several economic incentive measures do not have a direct and immediate financial impact, they may determine the firms to be more motivated and more efficient. Moreover, in water sector reform is proper to delegate the responsibility towards the user group, of allocating and consumption of water, collecting and handling fees, or in purchasing needed equipment. Furthermore, it is also important regular monitoring and evaluation of irrigation cases at the region level or river basin level.

Studies have shown that subsidies are a popular means of pleasing smallholder farmers in most of the developed and developing countries, and the large or medium size landholders and the agribusiness sector are taking more advantage than the rural. Thus, it is recommended for developing countries to reduce subsidy and introduce economic incentive measures for recycling part of the revenue in order to compensate the smallholders for the adoption of sustainable WMR and common agriculture practices.

Policy interventions depend on the level of hierarchy: at the farm level they are directed towards improving technical and economic efficiency (opportunity-cost, end-use efficiency), at the regional, sectoral and inter-sectoral levels they are directed towards improving economic and environmental efficiency (sustainable development).

Finally, in Romania incentives are very poor comparing with other countries where are up to 90% of the cost investment in completion of irrigation system, up to 50% of the cost for development of irrigation or of purchasing and installing equipment, up to 25% of the cost for upgrading, and so on.

Decision-makers must be careful in setting and integration technological, monetary measures and regulatory (economic incentives) in order to increase in both tangible and intangible investment, to develop the capacity of the users, to facilitate accounting for farmers, to increase water supplies finding water from new sources and strengthening the capacity for implementing economic incentive measures, and to improve the overall WRM for a good-governance. Because setting economic incentive measures is usually an inter-sectoral question, policy actions may be oriented towards sectoral, inter-sectoral, regional and economy level rather than only on water sector or irrigation sub-sector. The degree of implementation of economic incentives determine the success of decision-makers and the policies performances in WRM. The success to accurately account for quantity of water needed contributes directly to the success to manage it sustainability. But competition over water resources limits continues and it is exacerbated by climate change conditions. A smart and innovative agriculture with technologies support, better water resource management, right practices and pricing policies, right incentives can reduce the vulnerability of agriculture to water supply constraints and strengthen long-term sustainability. In practice, these objectives are rather weak in developing countries, thus decision-makers in good-governance system should strengthen the present institutional system (regulation, institution structure), to promote regulated market, to increase trust in incentive measure, to facilitate accounting system for economic incentives in order to improve WRM, and also to increase the agriculture crop, the income of the farms and finally the economic development and living level. The main results obtained in this research show that the fiscal incentives for specific assets (irrigation installation) don't imply difficulty in accounting system. The impact of good-governance in water management field on the activity of the plant is significant.

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TRANSACTIONS on ENGINEERING AND MANAGEMENT

Volume 4, Number 2, 2018

European Union Policy on Climate Change Framework

Mihaela VARTOLOMEI[1]

Abstract – The aim of the paper is to study the European policies in the matter of climate change and water resources management, especially Common Agricultural Policy, Environmental Policy, EU Emission Trading System (ETS), climate and energy policies nexus with international agreements in climate action and world global warming, and the way these European policies are settled and applied in national countries. The paper studies the manner these policies are implemented in European Union countries, funding resources for climate action, with impact on decision-making level and good-governance.

Keywords: EU Climate Governance, European Policies, Water Management, Renewable Energy, Green-Technologies, CAP, European Integration.

I. INTRODUCTION

Climate change effects are becoming evident worldwide, with serious regional and local impacts. The European Union (EU) has launched and developed initiatives and policies that scratch the surface of climate change and so, EU is a key player in designing climate, energy, agricultural, or environmental policies.

The main scope of this paper is to study the EU climate governance in the matter of climate change and water resources management, especially Common Agricultural Policy, Environmental Policy, EU Emission Trading System (ETS), climate and energy policies nexus with diverse entities at European level or with international agreements in climate action and world global warming from three points of view: economic efficiency, social equity and ecological sustainability [2].

Another important aspect is to see the manner these European policies are settled and applied inside EU and national countries. EU approach is toward highly energy efficiency and low carbon economy. Likewise, EU policies are directed to encourage investment in green-technologies, to reduce greenhouse gases (GHG) and ozone-depleting, and to increase the use of renewable energy (water, wind, solar, biomass) with impact on economic competitiveness, social cohesion and friendly with the environment. The paper studies the manner these policies are implemented in EU countries, funding resources for climate action, with impact on decision-making level and good-governance [1].

Economics is the science that deals with limited resources capable of being used in order to satisfy human needs, and classical economics stressed the power of the market both to stimulate growth and to serve the interests of society. Agricultural economics emerged as a field of applied economics that deal with agricultural production, the transformation of yields, and crop in food, for to be consumed by people. If there is food, there is energy, this means life [7].

II. METHODOLOGY

Paper's methodology is based on comparative analysis between European countries (using EUROSTAT database) and consists in presenting EU policies related to climate change and analyzing the results of applying them in the frame of EU-28.

III. EUROPEAN POLICIES, REGULATIONS, AND ENTITIES RELATED TO CLIMATE CHANGE

3.1. Agriculture, energy, environment and climate change policies in EU

EU, using own policies and strategies, is very interested to protect environment quality, to use the highest standards of protection for the natural resources and natural habitats, to keep clean the air and the (ground and surface) water, to ensure proper waste disposal, to promote sustainable production (sustainable development for businesses, low-carbon technologies) and sustainable consumption (to reduce the waste), to present knowledges about toxic gases (pollution) and chemicals, to supply legal framework saving the health and wellbeing of European citizens.

In this section there are briefly presented the most relevant directives that are part of EU water policies. With direct influence on water resource management

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and on agricultural water use [4]. The Treaty on EU (Maastricht Treaty) in Article 130-R made specific reference to environment policy and high protection, in order to ensure human health and sustainable development.

Environmental policy objectives were present in various types of regulations, such as (Council) directives that tackled water pollution (dangerous industrial substances, urban waste water, agricultural nitrates and pesticides) and set quality objectives for water for a specific use (drinking water, for instance): 778/EEC/1980 (Quality of water intended for human consumption), 440/EEC/1975 (Water intended for the abstraction of drinking water), 160/ECC/1976 (Quality of bathing water), 659/EEC/1978 (Freshwater Fish), 923/ECC/1979 (Quality required of shellfish waters).

A second type of regulations sets Emission Limit Values (ELV) for certain substances, such as: Council Directive 464/EEC/1976 (pollution caused by certain dangerous substances discharged into the aquatic environment was amended by Council Directive 656/EEC/1990; and Council Directive 692/EEC/1991), Council Directive 271/EEC/1991 (Urban Waste Water Directive helped to ameliorate water quality in rivers and on the shore of EU and to reduce pollution by urban sources, laying down basic ELV for firms, with a specified timetable until 2005), Council Directive 676/EEC/1991 (Nitrate Directive for protection of waters against pollution caused by nitrates from agricultural sources, that can contaminate groundwater resources), and Council Directive 414/EEC/1991 (placing of plant protection products on the market).

Member states (MS) may decide the treatment facilities. For instance, for some countries these Directives created high additional cost for the consumer (Germany), and for other countries (Portugal), the opportunity for important investments from Structural Funds source. Likewise, MS must define *good agricultural practice*, the use of fertilizers, the concentration, and identify vulnerable areas.

Concerns about quickly deterioration of water resources with important consequences for environment were expressed in the Dublin Statement on Water and Sustainable Development (1992), which set a commitment to sustainable water resource management and development. With agenda action towards alleviation of poverty and diseases, protection against natural disasters, water conservation and reuse, sustainable urban development, agricultural production and rural water supply, protecting aquatic ecosystems, resolving water conflict, enabling environment, knowledge base, capacity building, this Accord emphasized that water should be promoted as an economic commodity, not a free good becoming increasingly scarce, valuable, and expensive to provide.

The Integrated Pollution Prevention and Control Directive (61/EC/1996) was another (integrative) policy tool to prevent or reduce emissions to land, air and water. The IPPC regulated activities that can produce damages to the environment (industrial and intensive livestock farming).

In 1997 EU-Commission stated that in most MS most of Directives has not been properly implemented.

In this context, with many challenges and numerous unresolved problems, the European Council of Ministers and European Parliament asked for a reform of the water policies, establishing a framework for Community action in the field of water policy (to reduce emissions of toxic, persistent and bio-accumulated substances discharged by industry to the aquatic environment) and adopted in 2000 the Directive 60/EC/2000, also known as the Water Framework Directive (WFD), it was implemented in 2003 and has the planned completion date as 2027.

WFD is one of the most ambitious European effort for a common integrated management of environmental resources in the European Union, letting MS to choose between ELV or Environmental Quality Standards to reach this aim (all MS have chosen ELV, but EU-Commission did not finish to establish the list of ELV). It states that *water* is not just a good like any other, but it is a heritage which must be protected. Water is a key limiting condition for sustainable development, it increases the quality of life and peace.

Common Agricultural Policy (CAP) is the heavies of European common policies. It was defined by the Treaty of Roma (1957), redefined by Maastricht Treaty (food security), Agenda 2000, and reformed in 2003 (decoupling subsidies, MS may decide to maintain a limited amount of specific subsidy and may apply gradually till 2007), 2009 (the Treaty of Lisbon apply co-decision procedure [6] in agricultural matter), 2013 (with implementation till 2020) where one of the most objective is „sustainable management of natural resources".

Table 1 presents the priorities of CAP in the past and in the future.

Table 1. Common Agricultural Policy

Time	**Issues and concerns**	**Objectives**	**Agricultural water pricing**
In the past	Poverty in rural areas	Equity and rural development	Lower prices
	Increasing food demand	Food self-sufficiency	
In the future	Water and soil pollution	Sustainable development	Higher prices
	Budgetary constraints	Economic efficiency	

Ones of CAP principles and objectives are:

- To increase productivity in agricultural crop using technical progress, in order to ensure rational development of rural yield and optimal use of production factors (especially labor force);
- To increase competitivity;
- To ensure security in supplying, production and delivering activity;
- To ensure a decent living level for agricultural community;
- To ensure reasonable prices for the crop;
- To integrate environment objective in CAP;
- To promote sustainable agricultural policies (to create new jobs, new opportunities for farmers);
- To simplify EU regulations.

From environmental vision, EU has the most intensive and extensive regulations [8] approaching issues like: ozone layer protection, waste water and air pollution, sustainable energy (with the help of European Environment Agency). EU energy policy was established by the Treaty of Lisbon (2009) regarding energy development (production, distribution, and consumption), energy regulations, and energy conservation.

EU Emission Trading System was set up in 2005, it is the first international emission trading system (carbon market) in the world, including all 28 EU MS plus Iceland, Norway, and Liechtenstein. It covers almost 45% of the EU's gas emissions. Its purpose is to limit emissions from more than 11,000 strongly energy-using equipment (industrial companies or airlines operating). Eight EU MS (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland, and Romania) have some allowances in return of investing in environment friendly equipment.

Climate change and energy areas are objectives for Europe 2020 Strategy.

3.2. European Entities in Climate Governance

European climate governance is related not only to European regulation in environment and agricultural matter but also to diverse entities such as European Environment Agency (EEA), Climate Alliance, Renewable Energy and Energy Efficiency Partnership, or Cities for Climate Protection.

EEA was created by European Council for supplying real scientific reports in help of an efficient environment policy.

Climate Alliance is a network of towns, cities, municipalities, districts, regions, NGO, and other organizations from European countries (included Romania) strong committed in reducing CO_2 emissions by 10% every 5 years, to strive for energy conservation, energy, efficiency, and use of renewable energy, and to act for climate justice in partnership with indigenous people. Alliance is concerned about EU policies, it advocates the good-governance in climate and energy policies [3].

3.3. International Climate Policy Framework

OECD developed the Policy Framework for Investment in Agriculture in the fields: investment policy, investment promotion and facilitation, infrastructure development, human resources, research and innovation, financial sector development, trade policy, tax policy, risk management, responsible business conduct and, environment.

The Renewable Energy and Energy Efficiency Partnership (REEEP) is an international organization based on clean energy business model, together with United Nations Industrial Development Organization (UNIDO).

The Cities for Climate Protection (CCP) is a global network of transnational municipalities engaged in reducing GHG emissions, as a local climate policy.

IV. EMPIRICAL RESULTS

This section presents some results about EU environment, according to EUROSTAT database for verify the EU policies implementation.

Table 2. GHG emission (baseline 1990)

Geo\Time	**1991**	**2001**	**2011**	**2016**
EU-28	98.26	93.25	83.13	77.64
Belgium	101.41	101.77	84.47	81.53
Bulgaria	79.08	60.16	63.38	57.02
Czechia	90.55	75.19	69.67	65.62
Denmark	114.65	103.58	84.01	73.91
Germany	96.27	85.36	74.65	74.05
Estonia	92.2	43.83	52.49	48.62
Ireland	101.14	128.63	104.65	113.42
Greece	99.74	122.89	111.85	89.69
Spain	102.74	134.28	126.15	116.43
France	104.85	102.73	90.29	85.64
Croatia	77.69	84.14	86.2	76.19
Italy	100.47	108.91	95.79	83.85
Cyprus	110.08	145.61	158.04	152.92
Latvia	92.88	41.98	44.66	43.77
Lithuania	104.29	41.87	44.22	42
Luxembourg	104.93	84.85	100.51	87.53
Hungary	92.81	80.8	68.42	65.82
Malta	107.17	130.07	145.85	99.42
Netherlands	103.49	101.62	92.96	91.63
Austria	104.92	108.28	106.35	103.06
Poland	97.48	83.21	86.94	85.03
Portugal	102.94	138.16	116.71	115.77
Romania	82.27	59.79	51.84	45.82
Slovenia	92.9	107.42	105.71	95.19
Slovakia	87.05	70.38	61.29	55.63
Finland	96.83	105.94	96.47	84.03
Sweden	99.9	97.28	85.94	76.1
United Kingdom	101.1	91.84	73.6	63.64

GHG emission target EU-28 is accomplished (the target is 80). It is noticed that it has decreased in averaged EU-28 along 25 years (Table 2), but there are MS where it increased even very high (Cyprus, Ireland, Spain). Regarding the share of renewable energy in energy consumption, it can be noticed that the target indicator (20 points) is not accomplished in average EU-28. Resource productivity, measured as the ratio between GDP and domestic material consumption, increased over the trend 2000 and 2017 from 1.47 euro/kg to 2.04 euro/kg. In the case of Romania, the indicator is the lowest (0.32 euro/kg), after Bulgaria (0.30 euro/kg). Price index in agricultural production generally has increased in EU-28. Air pollution from agricultural activity has a high level in EU-28 in 2016 (3,611,068 t from total of 3,912,609 t) increasing comparing with previous years (2009, 2010, 2011, 2012, 2013, 2014, 2015). The greater pollutants are Germany (662,574), France (630,049), Spain (492,210), Italy (382,220), UK (289,445), Poland (267,107). Romanian level is 167,469 in decreasing trend. It can be noticed that share of pollution from agricultural sector in total pollution level is very high (over 92%).

V. CONCLUSIONS

EU integration is followed through its policies. Environment policies are directed to encourage investment in green-technologies, to reduce greenhouse gases and ozone-depleting, and to increase the use of renewable energy with impact on economic competitiveness, social cohesion and friendly with the environment. Overall, European climate governance has many strengths but is difficult to release the connection between EU policies and certain entities (Climate Alliance, CCP, REEEP). In order to reduce pollution and respect ELV, there are necessary appropriate reductions in activities that cause pollution. The paper has identified some direction the dimension of change can be oriented to: (a) Demography – in developed countries, it is well defined and well characterized; (b) Economic growth (structure, composition and rate) – it depends on the outcomes of fiscal policy, monetary policy, trade, rules and legislation rather than on *invisible hand*; (c) Technological changes (the rate and direction) and sustainable development (environment friendly) also shaped by market, political, cultural, judicial factors; (d) Social values and social responsibility matter for policy makers and decision makers but furthermore for economic activity, shaping consumption behavior: consumerism/individualism (selfishness, private goals, individual rights and freedom, short-term interests), conservationism/community (altruism, collective interest, social cohesion, equity, equality, social implication, long-term considerations such as sustainable development) or mixed of them shaping economic activity (market, quantity, quality etc.); (e) Political values and governance can be oriented towards globalization/interdependence, international organizations (EU) or regionalization/autonomy, nationalism. Despite of many reforms, the results of the paper show that EU regulations (CAP, energy, related to other entities) are enough far to be strongly established, because of the new dynamics of EU and new challenges inside and outside in present food and sanitary risks [9]. Farmers represent 3% of EU population, they generate at most 6% of EU GDP, but they receive 30% of EU budget through CAP.

Irrigated agriculture is an important economic agricultural activity, but the largest consumer of water. Common Agricultural Policy (CAP) influences decisively the use of water in irrigation activity. Thus, it requested to search the optimal integration of the sustainability of irrigated agriculture in Europe in the context of CAP Reform, WFD, and of the European Environment Policy.

The paper studied the manner EU regulations respond to present climate challenges and the manner these policies are implemented in EU countries, founding resources for climate action [5], with impact on decision-making level and good-governance. But, in accordance with the principle of subsidiarity, EU actions in the field it has competencies and must support the actions of the competent authorities in every EU country. The results of European policies on national level depend also on the case the country is developed or in developing country, emphasizing the role of education on the environment, good practices and good-governance. This paper makes a major contribution to understand climate policies in the frame of EU and beyond for decision-makers, good-governance factors and academics involved in climate policy.

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A Comparative Study of the Procedures of Drawing Up External Evaluation Reports on Secondary Education Institutions in Countries of the European Union and Romania

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Abstract – **The education management must be seen as a science operating on educational activities via an optimal global or strategic approach, and also as a model of performance management, applicable at the level of education institutions. The purpose of this study is to offer a summary on the theoretical basis of the concepts of performance management and quality assurance in education, through a comparative analysis of quality systems in education in European states and Romania.**
Starting from the hypothesis that, if each educational institution is grounded on a set of guidelines resting on values and principles, known and adhered to by all factors involved in the system, this entails quality education delivered via an efficient management, we have set up an analysis of procedures, instruments and ways of drawing up the external institutional evaluation report, in a comparative approach between European and Romanian secondary education systems.

Keywords: Education Management, Quality in Education, External Evaluation

I. INTRODUCTION

The current educational process, based on a system of actions taken to the purpose of shaping and developing the students' personality, at the same time predominantly oriented and tailored towards certain concrete finalities, determines the development of an efficient educational management, adapted to the characteristics of the organization. We therefore must define quality in education with reference to the organization of a school– as an educational entity of reference within any educational system. The educational products created by the education entity are offered to its customers for use, which customers are the students and other interested parties, by means of a specific process, called educational service [1].

The purpose of this study is to achieve a synthesis on the theoretical basis of the concepts of performance management and quality assurance, in form of a comparative analysis of quality assurance systems in education between European states and our own country. As a methodology to achieve this, we have used secondary bibliographical resources, research reports, studies and scientific works in the field of education management.

Although notions of education quality find a common ground in ensuring the cognitive development of learners, such as building attitudes, skills and values that are likely to foster the individual well-being and the social development and equity, there is still much focus on the quantitative aspects of education [2].

Today, at a European level, the prime objective in the field of education management has become to rise the quality level of education services delivered by education institutions and to assure an efficient management. In each member state of the European Union, quality in education represents a national priority, wherefore transparent and all-accessible education systems have been developed, and their results can be seen and transferred among all European countries.

In this context, all European Union member states are encouraged to develop and promote a culture of quality, by developing a quality management based on systems of quality assurance at all levels of education. The evaluation of the quality level of education services, as provided by schools throughout the entire European Union, and especially the attempt to establish common quality indicators, remains a fundamental issue with European policies in education, influencing the economic and social success of the entire Union.

Therefore, it is to be said that in the times to come, quality is top concern priority of most agendas in

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education, and improving quality is probably the most important task confronting any institution [3].

II. THE ORGANIZATION OF THE SECONDARY EDUCATION SYSTEM IN EUROPE

In Europe, three different organizational models of mandatory education can be distinguished. These can be defined as follows [4]:

- The unique education structure (a combination of primary and lower secondary education);
- Primary education -ISCED 1 (International Standard Classification of Education – adopted at the General UNESCO Conference in its 36th session of November 2011, it represents an instrument of collection and presentation of statistics in education at both national and international levels), followed by a period of integrated secondary education - ISCED 2 according to a "common central" offer
- Primary education, followed by differentiated secondary education through distinct educational threads, to be found in countries like Germany, Austria, the Netherlands, where at the age of 10 -11, for ISCED 2 the parents or the school choose an educational thread or a certain type of education for their children or students.

General mandatory education organized by a unique structure, where education is offered from the beginning to the end of the mandatory education cycle, without transitions from ISCED 1 to ISCED 2 is encountered in 10 European countries, among them some Scandinavian countries, then Bulgaria, Croatia etc.

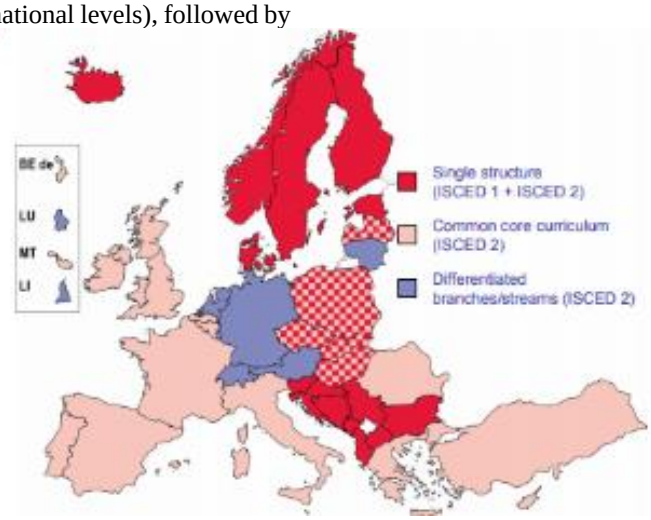

Fig. 1. The main organizational models of secondary education (ISCED 1-2) in Europe [5]

Along the general lower secondary education level, that takes until the ages 15 -16, students of more than half of the European countries go through a common curricular core. There are also countries like Hungary, the Czech Republic, Slovakia in which, although the mandatory education is organized into a unique structure until the ages of 14 or 15, already beginning with ages 10 – 11 students can enroll into distinct institutions that provide lower and upper secondary education.

The map in Fig. 1 shows the *mainstream educational programmes* considered to be the most representative in each country. They encompass:

- Early childhood education and care provided in publicly subsidized and accredited center-based settings for children from the youngest age of enrolment;
- Primary and secondary education programmes including the period of compulsory education;
- Post-secondary non-tertiary programmes;
- Tertiary level main programmes.

The diagrams *do not show*:

- Educational provision intended exclusively to adults with low formal educational attainment and/or a low level of basic skills. The diagrams cover only the courses allowing adult to turn back to school or to gain further qualifications which are incorporated in mainstream educational programmes. Usually, these courses are integrated in the programmes providing competence-based qualifications at secondary educational level or allowing access to tertiary education (post-secondary non-tertiary educational level) [5];
- Separate provision outside mainstream education for children and young people with special educational needs;
- At tertiary level, doctoral studies, as well as the specialized studies for the regulated professions such as medicine and architecture.

In Romania, the mandatory general education comprises:

- Primary education contains preparatory class and classes I – IV, comprising children beginning with 6 years of age.

- Lower secondary education, comprises classes V – VIII, upon graduation students receive a graduation diploma and a grade sheet, both these documents being part of the educational portfolio;
- 2 years of upper secondary education, or high-school, centered upon development and diversification of key competences and on building specific competences according to the domain, profile, specialization or qualification.

III. PROCEDURES OF EXTERNAL EVALUATION OF EDUCATION INSTITUTIONS IN EUROPEAN UNION COUNTRIES IN COMPARISON TO ROMANIA

The information on the external evaluation of schools in Europe has been analyzed through studies made by the European Network of Information Concerning Education [6], the Education, Culture and Audiovisual Executive Agency [7], The Romanian Agency for Quality Assurance in Secondary Education [8].

The external evaluation of schools as an instrument of quality management, is widespread in Europe and is performed in over 31 education systems, distributed across 26 states. Although different from one country to another, the external evaluation is performed to the purpose of increasing education performances and is focused on a managerial evaluation of students' progress and of the level of abidance by regulations.

The frequency of external evaluations in secondary education institutions across the European Union in the states can be classified into three groups, as follows:

- A cyclic model, according to which evaluations are performed at regular intervals, as they are established by the performing authorities; these intervals can vary from 3 years (Macedonia, former Yugoslavian countries, Turkey, up to maximum 10 years (Belgium, France);
- A model based on sampling, where the external evaluation is focused on the evaluation of certain criteria established shortly before by authorities or on evaluation of risks, and the evaluated institutions are selected either based on criteria (size, location in the area, etc., for example Scotland), or the sampling is justified by yearly listed criteria, based on which schools are to be evaluated; such is the case in Hungary, Estonia, Belgium. For the selection of schools in Denmark and Ireland, a risk-based approach is employed. In France there is no clear selection criterion for schools to be evaluated, whereas inspectors have no obligation to evaluate each school in a systematic way.
- A combination of these two models can be found in Holland, Sweden, England and Northern Ireland, where the model is predominantly cyclic, evaluations are performed every 5 years; with all this, some schools can be subjected to new risk evaluations as early as 1 – 3 years, if they have not been rated "exceptional" at their last evaluation.

In Romania we have a periodical external evaluation which is performed every five years on accredited schools. In addition, there is an external evaluation to the purpose of approval for provisory functioning, as well as an evaluation to the purpose of accreditation of an education institution within maximum two years after the graduation of the first generation in that school.

According to the Eurydice Report in Europe, concerning organisms responsible with the accomplishment of external evaluation of schools, there are two main types of organisms, represented from a legal point of view. The first is a department of the educational authority from a central or top level, usually identified as the *inspectorate* or, sometimes the evaluation department. A second type is a distinct agency specialized on school inspection.

In Romania, the external evaluation of the quality of education provided by secondary education institutions and by other education providers is made by ARACIP - a public institution of national interest, subordinated to the Ministry of Education and Research, with judicial personality and its own budget, founded through the Government Emergency Ordinance nr. 75/2005 concerning the assurance of quality in education, as approved in Law nr. 87/2006.

The process of external evaluation is quite similar throughout the European Union countries, and can be divided into three phases:

- Collection and analysis of data;
- Visit to the school site;
- Drawing-up of the report on findings.

IV. DRAWING UP THE EVALUATION REPORT ENSUING THE EXTERNAL EVALUATION

The activities within the process of external evaluation end with the drawing up of a report on the findings. Although this kind of report is met in all evaluated systems, its drawing-up differs among states. In six countries, Belgium, France, Italy, Hungary, Holland and Sweden, it is made without any consultation with the school, while in the other countries, the report is written ensuing discussions between evaluators and the school leadership, in some states even the teachers are involved into this process.

The steps in the writing of the evaluation report in the case such a dialog between evaluators and the school takes place, can be structured into three main phases:

- Evaluators send a draft of the evaluation report to the schools;
- Schools analyze this report and send feedback;
- Evaluators write the final report.

In Poland, the final report is written by the evaluators without any previous feedback from schools, but this report can be contested and sent back to the evaluators to be analyzed again. In Belgium and Ireland, the final report can be completed with supplementary comments from schools, concerning issues that were not mentioned in the report. In Romania, the procedures to the process of external evaluation of schools comprise all three phases:

- Collection and analysis of data from schools, which is performed through the platform https://calitate.aracip.eu, in two directions: one that focuses on analysis of documents that regulate the activity of the school – PDI/ PAS, and of other approvals and authorizations, the educational offer, the results of the children's and parents' interviews, etc., and another one that is based on calculating the school's efficiency index, departing from 15 elements of context/risk factors. The efficiency index can be less than 1 in case of results that are weaker than expected, or 1 when the found results are those expected within the concrete environment in which the school functions, or even more than 1 if the results exceed expectations;
- During the visit to the school site, several activities take place, such as: the evaluation commission analyzes various documents of the institution, the commission members also sit in class observations, they apply questionnaires to certain target groups, analyze the evidence proving results and the effects of various activities in the direction of rising the quality of education offered by the school, in particular on the quality indicators from national standards;
- The final evaluation report is written without consultation with the school, it will be transmitted by the commission to ARACIP and to the school within 10 business days after the end of evaluation activities.

The external evaluation report will contain the scores granted to the school for each performance indicator from the evaluated reference standards. Within 30 days from communication, complaints can be forwarded to the minister of education concerning the conclusions of the external evaluation report.

The results of the external evaluation can be divided into three large categories:

- Correctional measures, requiring schools to take improvement/remedial measures for the deficiencies found by evaluators as a result of the analysis on weak points and faults, made by the evaluators;
- Disciplinary measures applied in cases of breaking regulations, or if no remedial measures for signaled deficiencies have been taken;
- Measures to increase visibility, to the purpose of achieving official recognition, notification and dissemination of good practices resulting from the external evaluation.

The recommendations for improvement are the most common actions that are part of the external evaluation, they are found in most external evaluation procedures.

The monitorization by evaluators is to be found in numerous education systems, where evaluators go on additional visits. If in most countries these monitorizations take place only in cases where the results of external evaluations were wanting, and educational deficiencies were found, in Ireland there is additional monitorization by sampling schools, while in Malta there are unannounced monitorizations within one year from the publication of the evaluation report. Monitorization through additional visits is not mandatory in Germany, Estonia, France, Latvia, Hungary.

The obligation of schools to draw up an action plan for the improvement of detected deficiencies is part of the measures required from schools after the issue of the evaluation report. In 12 education systems from Belgium, Spain, Latvia, Lithuania, Portugal, England, Wales, Northern Ireland, Iceland, Turkey, the drawing up of the action plan focused on weak points correction is mandatory. In Poland, this is only required in the case of very serious deficiencies, in Belgium this action plan is made as an option in order to avoid immediate closing down of the school, and in Hungary this plan is made for a time period of 5 years. In Belgium and Lithuania, clear provisions exist that require the involvement of teachers into the drawing up of the action plan.

The support measures point to two categories, like support measures in form of supporting supplementary professional training, that can be achieved either on the evaluators' suggestion, or the school's proposal, being part of their action plan. This support measure through additional training is found in 15 countries, like Belgium, Germany, Ireland, Spain, Italy, Hungary, Lithuania, Malta, Austria, England, Wales, Northern Ireland, and in France it is only applied within ISCED 1, and in Cyprus to ISCED 2.

A second category of support measures based on allocation of supplementary resources in most systems (14 countries) are in form of professional support for assistance. For example, in Lithuania, additional financial resources are allocated to hire supplementary teaching staff helping students, or in France, Cyprus and Malta, the financial support comes for the increase of staff number in schools. In England, financial resources are being offered to support partnerships/experience exchanges between schools with high performances and those with lower academic results.

Disciplinary measures, usually taken by responsible authorities are found in the legislation of 18 education systems, being applied in cases of breaking regulations/laws in Austria, The Czech Republic, Hungary, or they are applied when deficiencies are not corrected or, as is the case in other countries, when

recommendations in the external evaluation report were not followed.

These disciplinary measures are also different from the point of view of object of application: they can be applied against the school staff, and come in form of fines, sanctions, resignations of managers or sometimes of other personnel. In the Czech Republic, Slovakia, Slovenia, Poland, these measures of demanding the managers' resignation are taken when these have not applied the improvement plan in a satisfactory manner.

One other disciplinary method is taken against the entire school, in the form of budgetary cuts (Holland), withdrawal of the right to release recognized certifications (Latvia), the school can be erased from the schools' register (Czech Republic, Slovakia), or even withdrawn its functioning license (Estonia). In addition, a disciplinary measure is the complete closure of schools, which is applied in Belgium, Sweden and Hungary.

In Romania, following periodical external evaluations, in case of positive results – that is, the fulfillment of at least the minimum level of standards – the school receives a quality certification for 5 years, after which a new external evaluation takes place. In cases where a minimal required standard level has not been met, the school is given one year of grace time to improve, after which a new evaluation takes place. If neither the second evaluation can reveal acceptable results, the school enters a procedure of liquidation.

V. CONCLUSIONS

The analysis of European policies in the field of education reveals the conclusion that the development of an education management based on quality improvement in education represents a priority of states' policies, both at national and at international level.

One of the key objectives of the European Strategic Framework for Education and Training (ET 2020) is embodied by the rise of quality levels and efficiency of investments in education across the entire European Union.

Therefore, it is evident that, even if the member states of the EU have education systems with different structures, with specific institutional hierarchies, and implicitly with different quality assurance systems, their common goal is to align themselves to a common European educational policy, aimed at fostering education systems with high levels of quality, based on transparency, and able to deliver recognizable finalities.

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Risk Management Planning in a Construction Project

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Abstract – This paper presents an example of a risk management plan for a construction project to be developed in difficult environmental conditions. This Risk Management Plan defines how risks associated with the construction project in a desert zone will be identified, analyzed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks by the Risk Manager. Based on our studies, risk management is an essential part of construction project management and should be always applied using appropriate tools.

Keywords: Risk Management, Construction, Plan

I. INTRODUCTION

This paper is based on a real construction project which was implemented in very difficult conditions being in a desert zone from Africa. Every construction project must have a specific Risk Management Plan and a Risk Manager.

The Risk Manager working with the project team ensures that risks are actively identified, analyzed, and managed throughout the life of the project. Risks shall be identified as early as possible in the project to minimize their impact. The steps for accomplishing this are outlined in the following sections.

The risk management process is presented as a list of coordinated activities [3]:

- "Recognition or identification of risks;
- Ranking or evaluation of risks;
- Responding to significant risks;
- Tolerate and treat;
- Transfer;
- Terminate;
- Resourcing controls;
- Reaction planning;
- Reporting and monitoring risk performance;
- Reviewing the risk management framework".

ISO 31000 gives a list in order of preference on how to deal with risk:

a) Avoiding the risk by deciding not to start or continue with the activity that gives rise to the risk;
b) Accepting or increasing the risk in order to pursue an opportunity;
c) Removing the risk source;
d) Changing the likelihood;
e) Changing the consequences;
f) Sharing the risk with another party or parties (including contracts and risk financing);
g) Retaining the risk by informed decision.

There are alternative descriptions of this process, but the components listed above are usually present.

II. MANAGING RISK IN THE PROJECT

"Risk management requires a reporting and review structure to ensure that risks are effectively identified and assessed, and that appropriate controls and responses are in place" [4].

In order to improve risk management process there will be carried out frequent verifications of specific standard and rules compliance.

Potential changes on the construction site or in the environment must be observed and appropriate changes must be implemented. The monitoring process should prove that the procedures are understood and obeyed.

Any monitoring and review process should also determine whether:

- Measures adopted achieved the intended result;
- Procedures adopted were efficient;
- Enough information was available for the risk assessments;
- Improved knowledge would have helped to reach better decisions;
- Lessons can be learned for future assessments and controls.

According to the standard *ISO 31000 Risk management – Principles and guidelines on implementation* the

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following steps of the risk management process throughout the project gave to be followed. The Risk Manager uses the following relevant questions to follow the steps presented in Fig. 1.

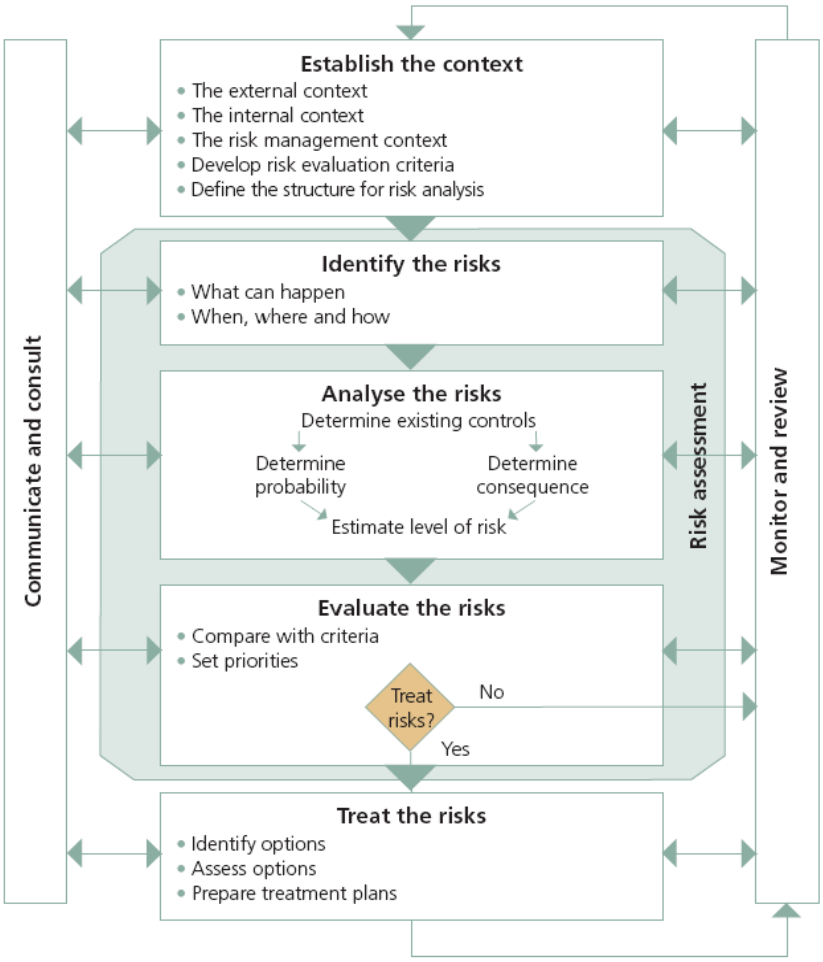

Figure 1. Summary of risk management steps [6]

Table 1 – Specific Risk Management Questions (own contribution)

Risk management process step	**Management question**
Establish the context	What are we trying to achieve?
Identify the risks	What might happen?
Analyze the risks	What might that mean for the project's key criteria?
Evaluate the risks	What are the most important things?
Treat the risks	What are we going to do about them?
Monitor and review	How do we keep them under control?
Communicate and consult	Who should be involved in the process?

In order to obtain relevant results, the Risk Manager must cooperate with all the key members of the team, permanently.

III. REPORTING

The Risk Manager will track, monitor and control and report the status and effectiveness of each risk response action to the Project Team.

A "Top 10 Risk List" must be maintained by the Risk Manager and must be reported as a component of the project status reporting process for this project.

All project change requests must be constantly analyzed for their possible impact to the project risks.

As risk events occur, the list will be permanently re-prioritized and risk management plan will reflect any and all changes to the risk lists including secondary and residual risks.

Major reviews of the project's risk management framework will be performed every two weeks, and might include, if necessary, evaluation of the risk architecture, strategy and protocols.

In addition to internal communication and reporting, the Risk Manager shall report externally to the Beneficiary, through agreed channels, including to Beneficiary's representatives on site. These external reports are produced in response to mandatory

requirements or international best practices related to risk management and internal control. External risk reporting is assurance that risks have been adequately managed.

External reporting provides useful information to stakeholders on the status of risk management and the actions that are being taken to ensure continuous improvement in performance. [7] The Risk Manager reports to the Beneficiary and other agreed stakeholders on a regular basis, setting out its risk management policies and the effectiveness in achieving its objectives within the project framework.

Therefore, the Risk Manager shall:

- Review, reevaluate, and modify the probability and impact for each risk item every two weeks;
- Analyze any new risks that are identified and add these items to the risk list (or risk database);
- Monitor and control risks that have been identified;
- Review and update the top ten risk list as needed, every two weeks;
- Help develop the risk response and risk trigger and carry out the execution of the risk response, if a risk event occurs (all the members of the project team will be involved in identifying adequate solutions);
- Participate in the review, re-evaluation, and modification of the probability and impact for each risk item on a weekly basis;
- Identify and participate in the analysis of any new risks that occur;
- Escalate problems to Beneficiary that:
    - Significantly impact the projects triple constraint or trigger another risk event to occur;
    - Require action prior to the next weekly review;
    - Risk strategy is not effective or productive causing the need to execute the contingency plan. [1], [5].

It is highly important that the Risk Manager must monitor the dynamics of the risks and must report to the superiors or directly to the Beneficiary when urgent decisions are required related to the risk treatment.

IV. RISK MANAGEMENT PLAN

The risk assessments are recorded in the following risk register. The risk register is designed to be a dynamic record of the significant risks faced by the project and will be permanently updated. It should be viewed as a risk action plan that includes details of the current controls and details of any further actions that are planned.

These further actions should be written as auditable actions that must be completed within a defined timescale by identified individuals. This will enable the internal audit function to monitor the existing controls and monitor the implementation of any necessary additional controls. The resources required to implement the risk management policy will be clearly established at each level of management and within each business unit involved in the project. Risk management is embedded within the operational planning and budget processes for the project.

In order to update the risk assessment at regular intervals, major reviews shall take place every two weeks.

After each major review, the Risk Manager shall provide the Beneficiary a Full Risk Report with the following generic structure:

- Executive summary;
- Scope and objectives of report;
- Project status summary;
- Overall risk status;
- Top risks and actions;
- Detailed risk assessment;
- Conclusions and recommendations;
- Appendices:
    - Updated Risk Register;
    - Prioritized Risk List, and other documents as required.

The Beneficiary shall express his opinion on the risk information but must make important decision after discussing with the specialists involved in the construction project.

V. RISK REGISTER

The risk assessments are recorded in the following risk register. The risk register is designed to be a dynamic record of the significant risks faced by the project and shall be permanently updated. It should be viewed as a risk action plan that includes details of the current controls and details of any further actions that are planned:

Table 2 Risk Register own contribution inspired by [2]

Element	Risk	Existing controls	C	L	Agreed priority	Action sheet
Location Risks	**Cause:** Severe weather conditions that could jeopardize the construction works (dust storms, torrential rain with or without flooding) **Impact:** Failure in meeting the undertaken deadlines for completing the execution works.	The key deadlines will be accurately established considering the float for each activity.	5	3	**(15)**	**Mitigation:** The impact of the delays will be mitigated. The critical path will be redefined. The Gantt chart will be rescheduled when needed in order to meet the undertaken deadlines.
Location Risks	**Cause:** Archaeological discoveries **Impact:** Halting execution for an indefinite period depending on the nature of the discoveries.	Although the area has no identified historical or archaeological resources, the Project Manager is carefully following the Beneficiary's policy that there should be continued recognition of potential for discovery of such resources.	5	1	**(5)**	**Retention** In case of discovery of any historic, prehistoric, archaeological, cultural, or paleontological residue or evidence during site investigation or construction, work shall cease immediately, and the Project Manager will immediately inform the Beneficiary; the site shall not be further disturbed until authorized in writing by the Beneficiary.
Location Risks	**Cause:** Terrorist attacks. (kidnapping, destruction of parts of the construction, destruction of the site, block / destruction / seizure of construction materials or vehicles on access roads to and from the objective, personal injury or homicide) **Impact:** Failure/ delay in continuing the construction works.	The cooperation with the military authorities that provide security in the perimeter in which the construction site is located. The cooperation with the regional military authorities for movements in the area, including transport.	5	2	**(10)**	**Prevention:** Establishment of cooperation with the military authorities that provide security in the perimeter in which the construction site is located. Establishment of cooperation with the regional military authorities for movements in the area, including transport.
Contractual Risks	**Cause:** Purchase of materials, equipment and facilities that do not comply with the beneficiary's requirements **Impact:** Delays in execution works.	Validated datasheets for the products. Validation process for suppliers.	3	1	**(3)**	**Prevention:** Before signing the contracts with the suppliers, all datasheets for the products will be presented to the Project Manager and beneficiary for validation.

Contractual Risks	**Cause:** Failure in meeting the planned deadlines for the execution phases. **Impact:** Delays in the general execution graphic and therefore, postponing the completion term for the project.	Contractual terms of enterprise monitoring and penalty for failure in following the execution graphic. (excepting the force majeure)	4	2	**(8)**	**Prevention:** Ensuring contractual terms of enterprise monitoring and penalty for failure in following the execution graphic. (excepting the force majeure)
Contractual Risks	**Cause:** Defects in equipment used. **Impact:** Delays in execution works.	Cooperation with other suppliers to conclude contracts with them when needed.	3	3	**(9)**	**Prevention:** Cooperation with other suppliers to conclude contracts with them when needed.
Contractual Risks	**Cause:** Failure to comply with contractual obligations by local suppliers. **Impact:** Jeopardize the construction works. Occurrence of delays and additional expenses.	Cooperation with other suppliers to conclude contracts with them when needed.	3	3	**(9)**	**Prevention:** Cooperation with other suppliers to conclude contracts with them when needed.
Contractual Risks	**Cause:** The Beneficiary withdraw from the project or introduction of important changes / new elements in the project. **Impact:** Delay in project. Project Management Team forced to commit more resources. Financial loss for the management company	Contractual terms – including Notification of changes apply	5	2	**(10)**	**Prevention:** Ensuring compliance with contractual terms to avoid this kind of situations. **Mitigation:** Permanent contact with the Beneficiary will be maintained. Following such a notice from either party, a cost breakdown of the additional costs to be incurred by the Constructor if he would implement the change/deviation and the related impacts on the terms and conditions.
Economic Risks	**Cause:** Boost of prices for gas and other materials. **Impact:** Financial loss.	Reserves in the budget for expenses classified as contingencies.	3	3	**(9)**	**Prevention:** Establishment of reserves in the budget for expenses classified as contingencies.
Communication Risks	**Cause:** Poor communication between Project Manager's team members. **Impact:** Dissemination of distorted information or lack of necessary information in the execution works.	Multiple communication means available on site	1	1	**(1)**	**Prevention:** Permanent information of the personnel regarding the technical and administrative issues and decisions

Construction Risks	**Cause:** Not following the general principles of design. **Impact:** Design and execution errors; delays in ensuring the working area	Financial and technical evaluation of the project. Contractual penalties for the persons responsible with following and verifying the execution works, who do not inform the project team about occurrence of design and execution errors.	4	2	**(8)**	**Prevention:** Necessary resources. will be assigned The Technical Project (Basic Design) will be closely followed. The project will be evaluated. There will be included contractual penalties for the persons responsible with following and verifying the execution works, who do not inform the project team about occurrence of design and execution errors.
Construction Risks	**Cause:** Cadastral boundaries overlap, resulting in wrong location, probability of enclosure and penetration of neighboring properties. **Impact:** Additional administrative costs. Additional costs caused by paying the neighboring land occupied.	Accurate establishment of the ownership limits.	5	1	**(5)**	**Prevention:** Checking ownership limits before starting work.
Construction Risks	**Cause:** Suspension of the execution work by the public authorities. **Impact:** Delays in the execution graphic. Financial loss.	Necessary permits following the local conditions and regulations	1	2	**(2)**	**Prevention:** Obtaining all the necessary permits following the local conditions and regulations.
Politic / Security Risks	**Cause:** Occurrence of substantial changes in the constitutional order, political regime, economic, security, social movement in the host country **Impact:** Project delays. Financial loss.	-	4	3	**(12)**	**Retention**
Personnel Risks	**Cause:** Impossibility of locally contracted employees to work within project framework and imposed standards. **Impact:** Delays in execution.	Cooperation on contractual bases with specialized local recruitment agencies and other contacts.	3	3	**(9)**	**Mitigation:** Extend cooperation with other recruitment agencies to find appropriate human / working resources Extend recruitment regionally.

Personnel Risks	**Cause:** The impossibility of the Project Management Team personnel to work. **Impact:** Delays in execution.	Contingency planning already in place to change any person in the Project Management team structure for the project	2	2	**(4)**	**Mitigation:** Apply contingency planning. Bring the assigned persons with the equivalent qualifications and competence. Repatriate the persons who cannot work. Complete the project team with new members.
Personnel Risks	**Cause:** Work accidents. Possibility assessed due to differences in working culture and procedures, also differences in working experience. **Impact:** Delays in execution works.	Contractual terms of enterprise monitoring and penalty for failure in following the health and security conditions at work. The contracts will include the obligation to ensure conditions of safety and security at work in according to the current legislation.	4	3	**(12)**	**Prevention:** Ensuring contractual terms of enterprise monitoring and penalty for failure in following the health and security conditions at work. The contracts will include the obligation to ensure conditions of safety and security at work in according to the current legislation. Permanent instructions and trainings will be performed on site to avoid such problems. Cooperation and communication with the closest medical facility to evacuate wounded persons. On-site trained personnel in medical first aid.

Risk Register columns and their content description are presented below:

- Element - A risk category;
- Risk - A brief description of the risk, its causes and its impacts;
- Existing controls - A brief description of the controls that are currently in place for the risk. At an early stage in the life of a project, the controls may be those that are expected to be in place if normal project management processes are followed;
- C - The consequence rating for the risk, with the controls in place, using scales;
- L - The likelihood rating of the risk, using scales like;
- Agreed priority - The agreed priority for the risk, based on an initial priority determined from a matrix, adjusted to reflect the views of the project team in the risk assessment workshop;
- Action sheet - A cross–reference to the action summary for the risk.

The following risk matrix has been used as the basis for the scoring of risks. After identifying the risks and scoring their likelihood and consequences, the Risk Manager must propose multiple ways of treating them to the Project Team and the Team must approve some solutions to risk treatment.

VI. RISK TREATMENT

1. One high risk concerns severe weather conditions that could jeopardize the construction works. This risk cannot be avoided, and the mitigation process must minimize the consequence; the critical path will be redefined, the Gantt chart will be rescheduled.
2. A major risk is represented by work accidents. In order to prevent work accidents, contractual terms and permanent *on-site* instructions will be provided, as well as performs to ensure conditions of safety and security at work according to the current legislation and best practices. Permanent instructions and trainings will be performed on site to avoid such events. Cooperation, communication and a contingency planning with the closest medical facility to evacuate wounded persons. On-site trained personnel in medical first aid.
3. A risk that cannot be avoided or transferred (the costs of doing so being high) is the occurrence of substantial changes in the constitutional order, political regime, demographical movement in the host country. In these circumstances, the organization must retain the risks, permanently assess the risk factors adapting contingency planning to the current situational changes.

CONSEQUENCE	LIKELIHOOD					
		RARE (1)	UNLIKELY (2)	POSSIBLE (3)	LIKELY (4)	ALMOST CERTAIN (5)
	INSIGNIFICANT (1)	LOW RISK (1)	LOW RISK (2)	LOW RISK (3)	LOW RISK (4)	MODERATE RISK (5)
	MINOR (2)	LOW RISK (2)	LOW RISK (3)	MODERATE RISK (6)	MODERATE RISK (8)	MODERATE RISK (10)
	MODERATE (3)	LOW RISK (3)	MODERATE RISK (6)	MODERATE RISK (9)	HIGH RISK (12)	HIGH RISK (15)
	MAJOR (4)	LOW RISK (4)	MODERATE RISK (8)	HIGH RISK (12)	EXTREME RISK (16)	EXTREME RISK (20)
	CRITICAL (5)	MODERATE RISK (5)	MODERATE RISK (10)	HIGH RISK (15)	EXTREME RISK (20)	EXTREME RISK (25)

Figure 2. Risk Scoring Matrix
(Source: https://healthandsafety.curtin.edu.au/emergency _management/risk-analysis-matrix.cfm)

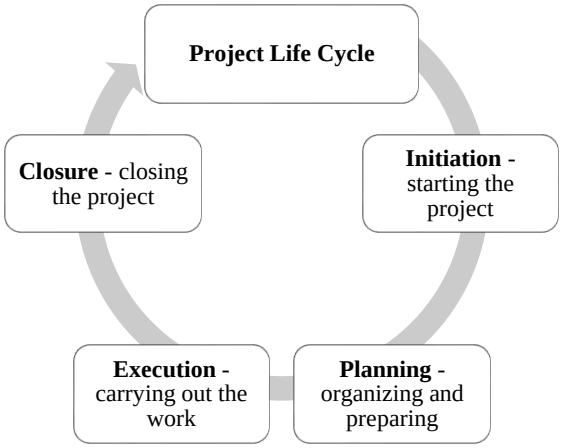

Figure 3. Project Life Cycle Definition
(Source: http://www.free-management-ebooks.com/faqpm/principles-08.htm)

VI. LINKS TO PROJECT PROCESSES

Risk Management is connected to all project processes. The risks of the projects will be monitored and controlled throughout the entire lifecycle of the project. Consequently, risks will be managed in the following processes:

- Project initiation;
- Project planning;
- Project execution;
- Project control and validation;
- Project closeout.

Risks can damage projects. They can also increase project costs. By having risk management plans established, the project management team will be prepared to deal with risks if they occur and attempt to mitigate the risks before they can damage the project.
The main techniques used in estimating the risks in this project were:
The main roles of the project that were taken into consideration in the initial process for analyzing the risks were:

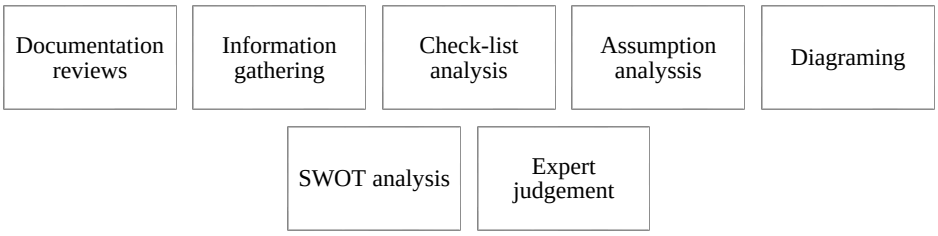

Figure 4 Methods used to identify project risks
(Adapt from: http://www.free-management-ebooks.com/faqpm/risk-03.htm)

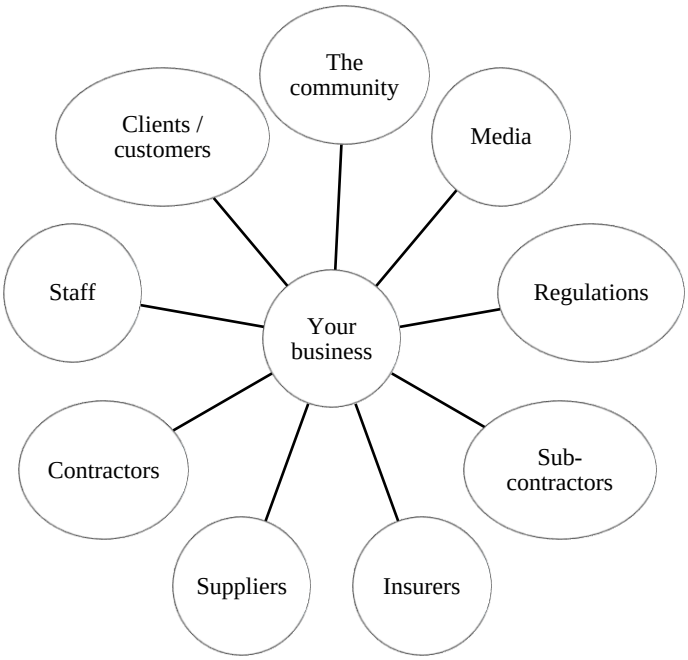

Figure 5. Entities involved in Risk Management [6]

Consequently, risk management involves working with all the stakeholders of the project in order to identify risks from all perspectives. Therefore, a Risk Manager must have a diplomatic attitude and perseverance to obtain all the information needed.

VII CONCLUSIONS

The approach of risk management in construction investment projects has a very specific character. There are many entities involved in risk management for this type of projects. Risk management implies continuous monitoring and verifying risks on site. Risk Management as part of Project Management in construction projects is indispensable.
In order to implement successfully the project and to accomplish the projects' objectives, without loss of money and time, Risk Management is undoubtedly one of the key factors.

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A Debate on the Product Lifecycle Implications and Product Market Behavior

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Abstract – The product life-cycle marketing approach is a concept that describes the sales and profit margin of a given product category over a prolonged period - from lust to dust. The concept holds that a product's sales and profits change over time in a predictable manner-at least in the four distinct major stages of introduction, growth, maturity, and decline. It is important to understand product life-cycles curves to make the best use of engineering resources. The paper presents figures that characterize various industry products and their life-cycle curves. The amount of development money invested in a product intended for rapid market penetration, for example, is considerably less than for a one destined to a long-term stable, mature market. In this context we illustrate the types of feedback used by engineering during the various stages of product life-cycle. Finally, we consider that engineers responsible for product or process improvement must recognize what phase of the product life-cycle is in to practice the most effective research.

Keywords: Product Life-Cycle, Marketing, Models of Product Life-Cycle Editing.

I. INTRODUCTION

Today's consumers are increasingly selective in product choice and consequentially target markets are fragmenting. Simultaneously, product life cycles are shortening, competition is intensifying, and the new product failure rate is growing. Understanding the consumer buying process can make the difference between success and failure in consumer marketing strategies [2]. In this context, the diverse topics associated with product lifecycle requires a multidisciplinary approach [13] and this will be reflected in the present article scientific discourse.

The historical context, design, engineering, marketing, law, politics, consumer behavior, technology and systems of provision are all covered, although critics will note that other fields, notably human geography, anthropology and economics, are perhaps inadequately represented but they can be deducted as back-side knowledge and approaches.

It is a fundamental idea of marketing that organizations survive and prosper through meeting the needs and wants of customers. This important perspective is commonly known as the marketing concept. The marketing concept is about matching a company's capabilities with customer wants. This matching process takes place in what is called the marketing environment [8, 10].

Businesses do not undertake marketing activities alone [9]. They face threats from competitors, and changes in the political, economic, social and technological environment. All these factors have to be taken into account as a business tries to match its capabilities with the needs and wants of its target customers. An organization that adopts the marketing concept accepts the needs of potential customers as the basis for its operations. Success is dependent on satisfying customer needs [8, 9].

How can customers' needs be characterized? A need is a basic requirement that an individual wishes to satisfy. People have basic needs for food, shelter, affection, esteem and self-development. Many of these needs are created from human biology and the nature of social relationships. Customer needs are, therefore, very broad. Whilst customer needs are broad, customer wants are usually quite narrow. A want is a desire for a specific product or service to satisfy the underlying need [3, 10, 13].

Social and cultural forces, the media and marketing activities of businesses, shape consumer wants and desires. This leads on to another important concept - which of customer demands. Consumer demand is a want for a specific product supported by an ability and willingness to pay for it. For example, many consumers around the globe want a Mercedes. But relatively few are able and willing to buy one [9, 14, 15].

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Businesses therefore have not only to make products that consumers want, but they also have to make them affordable to a sufficient number to create profitable demand. Businesses do not create customer needs or the social status in which customer needs are influenced (e.g., it is not McDonalds that makes people hungry). However, businesses do try to influence demand by designing products and services that are: attractive, works well, are affordable and available. Businesses also try to communicate the relevant features of their products through advertising and other marketing promotion, which leads us finally to an important summary point [1, 10].

1.1. A Marketing Orientated Business

Whilst marketing references [8, 15] usually suggest that successful business will be "marketing orientated", it is the case in the real world not all businesses subscribe to the marketing concept. The implications of believing in the marketing concept become clearer when the alternatives are examined. There are three main alternatives to adopting a marketing orientation. These are [1, 8, 9, 10]:

- **Sales orientation** - Some businesses see their main problem as selling more of the product or services, which they already have, available. They may therefore be expected to make full use of selling, pricing, promotion and distribution skills (just like a marketing-orientated business). The difference is that a sale-orientated business pays little attention to customer needs and wants, and does not try particularly hard to create suitable products or services;
- **Production orientation** - A production-orientated business is said to be mainly concerned with making as many units as possible. By concentrating on producing maximum volumes, such a business aims to maximize profitability by exploiting economies of scale. In a production orientated business, the needs of customers are secondary compared with the need to increase output. Such an approach is probably most effective when a business operates in very high growth markets or where the potential for economies of scale is significant;
- **Product orientation** - This is subtly different from a production orientation. Consider a business that is "obsessed" with its own products – perhaps even arrogant about how good they are. Their products may start out as fully up-to-date and technical leaders. However, by failing to consider changing technological developments or subtle changes in consumer tastes, a product-orientated business may find that its products start to lose ground to competitors.

The process of marketing management is about attracting and retaining customers by offering them desirable products that satisfy needs and meet wants. Marketing management in a customer-orientated business consists of five key tasks, as summarized in Table 1 (a synthesis from [6, 7, 9, 10]). Furthermore, marketing management literature mainly offer a listing of everything there is and was, with a lack of syntheses and theory generation (dynamics analysis of the marketing management paradigms are missing). Despite this, new thinking perspectives are presented in the marketing subject literature. In addition, there have been observed that academic paradigms differ from practitioner paradigms and several paradigms are living side by side, as can be seen in Table 2 that presents a synthesis on identifying changes over the past decades related to marketing management. As all such efforts it offers fuzzy rather than crisp categories with time frames that are fuzzy [4].

Table 1. The tasks of marketing management in a customer-oriented business (a synthesis from [5, 6, 8, 10, 11])

Marketing Task	Explanations
Identify target markets	Management have to identify those customers with whom they want to trade. The choice of target markets will be influenced by the wealth consumers hold and the business' ability to serve them.
Market research	Management have to collect information on the current and potential needs of customers in the markets they have chosen to supply. Areas to research include how customers buy (which marketing channels are used) and what competitors are offering.
Product development	Businesses must develop products and services that meet needs and wants sufficiently to attract target customers to wish and buy.
Marketing mix	Having identified the target markets and developed relevant products, management must then determine the price, promotion and distribution for the product. The marketing mix is tailored to offer value to customers, to communicate the offer and to make it accessible.
Market monitoring	The objective in marketing is to first attract customers - and then (most importantly) retain them by building a relationship. In order to do this effectively, they need feedback on customer satisfaction. They also need to feed this back into product design and marketing mix as customer needs and the competitive environment changes

Table 2. Paradigms of marketing management (a synthesis from [4, 11])

Paradigm	Description
The '70s	Was dominated by American marketing management and the marketing mix ("the 4Ps"); all was standardized, mass-manufactured and mass-distributed consumer goods, business-to-consumer (B2C) marketing was a footnote. Services and relationships were absent. Customer centricity was stressed but on the conditions of suppliers who do something to customers.
The 1970 – 2000 period	Service marketing and management dominate and they were focusing on differences to goods marketing. The service encounter introduced interaction between service providers and customers, also noting that customers were partially present during the production and delivery of service. B2B marketing was also discovered and treated as different from B2C marketing. Customer Relationship Management (CRM), and one-to-one marketing were introduced, network and interaction concepts started to appear more frequently. In the 1980s quality management was rediscovered in business and excellence, value, and customer satisfaction were in focus. Marketing was claimed to be customer and relationship centric, but as before essentially based on the supplier's conditions: do something to the customers.
From the 2000s	It starts the era of commonalities, interdependencies and a systemic, stakeholder centric approach, addressing marketing complexity and theory generation. It is a period of Service-dominant (S-D) logic opens up for higher level theory, grand theory, and connects former fragments but also, discards outdated and a non-viable theory claims. It is supported by the practitioner-initiated service science, with an increased emphasis on many-to many networks and systems theory. A new marketing and service theory and a science of service based on co-creation of value in complex service systems is in the making: "do with others".

1.2. Product Concept From the Marketing Perspective

A product is defined as *"Anything that is capable of satisfying customer needs"*. This definition includes both **physical products** as well as services. The process by which companies distinguish their product offerings from the competition is called branding. For most companies, brands are not developed in isolation - they are part of a **product group** (or product line) which is a group of brands that are closely related in terms of their functions and the benefits they provide (e.g. Dell's range of personal computers or Sony's range of televisions). There are two main types of product brand [2, 4, 9]:

(1) Manufacturer brands - are created by producers and use their chosen brand name. The producer has the responsibility for marketing the brand, by building distribution and gaining customer brand loyalty. Good examples include Microsoft, Panasonic and Mercedes;

(2) Own-label brands - are created and owned by distributors. Good examples include Tesco and Sainsbury's.

The main importance of branding is that, done well, it permits a business to differentiate its products, adding extra value for consumers who value the brand, and improving profitability for the company. Businesses should manage their products carefully over time to ensure that they deliver products that continue to meet customer wants [6].

The process of managing groups of brands and product lines is called **portfolio planning.** Two models of product portfolio planning are widely known and used in business: the Boston Group Growth-Share Matrix, and GE Market Attractiveness model [1, 7, 9, 10].

Businesses need to regularly look for new products and markets for future growth. A useful way of looking at growth opportunities is the Ansoff Growth matrix, which suggests that there are four main ways in which growth can be achieved through a product strategy [7, 9, 10]:

(1) Market penetration - Increase sales of an existing product in an existing market;

(2) Product development - Improve present products and/or develop new products for the current market;

(3) Market development - Sell existing products into new markets (e.g. developing export sales);

(4) Diversification - Develop new products for new markets.

II. PRODUCT LIFE-CYCLE FROM THE MARKETING POINT OF VIEW

Businesses should manage their products carefully over time to ensure that they deliver products that continue to meet customer wants. The process of managing groups of brands and product lines is called portfolio planning [8, 12]. The stages through which individual products develop over time is called commonly known as the ***Product Life-Cycle***. The classic product life-cycle has four stages (illustrated in the Fig. 1): introduction; growth; maturity and decline [1, 8, 12, 14].

The life-cycle concept may apply to a brand or to a category of product. Its duration may be as short as a few months for a fad item or a century or more for product categories such as gasoline-powered automobile (e.g. natural resources). Product development is the incubation stage of the product life-cycle. There are no sales and the firm prepares to introduce the product. As the product progresses through its life-cycle, changes in the marketing mix

usually are required in order to adjust to the evolving challenges and opportunities [1, 8, 9, 14, 15].

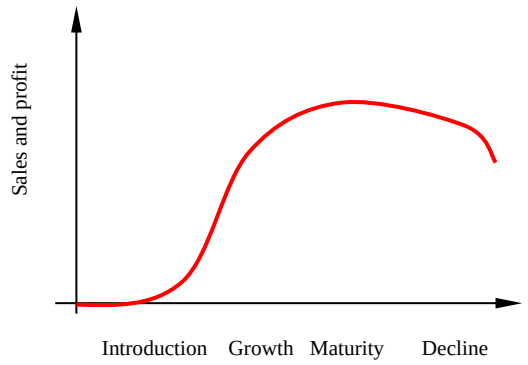


Figure 1. The classic product life-cycle curve

Introduction Stage - At the Introduction (or development) Stage market size and growth is slight. It is possible that substantial research and development costs have been incurred in getting the product to this stage. In addition, marketing costs may be high in order to test the market, undergo launch promotion and set up distribution channels. It is highly unlikely that companies will make profits on products at the Introduction Stage. Products at this stage have to be carefully monitored to ensure that they start to grow. Otherwise, the best option may be to withdraw or end the product [12, 14, 15].

During the introduction stage the primary goals is to establish a market and build primary demand for the product class. The following are some of the marketing mix implications of the introduction stage [1]:

1. *Product* – one or few products, relatively undifferentiated;
2. *Price* – generally high, assuming a skim pricing strategy for a high profit margin as the early adopters buy the product and the firm seeks to recoup development costs quickly. In some cases a penetration pricing strategy is used and introductory prices are set low to gain market share rapidly;
3. *Distribution* – is selective and scattered as the firm commences implementation of the distribution plan;
4. *Promotion* – is aimed at building brand awareness. Samples or trial incentives may be directed toward early adopters. The introductory promotion also is intended to convince potential resellers to carry the product.

Growth Stage - The Growth Stage is characterized by rapid growth in sales and profits. Profits arise due to an increase in output (economies of scale) and possibly better prices. At this stage, it is cheaper for businesses to invest in increasing their market share as well as enjoying the overall growth of the market. Accordingly, significant promotional resources are traditionally invested in products that are firmly in the Growth Stage [13, 14, 15]. During the growth stage the goal is to gain consumer preference and increase sales. The marketing mix may be modified as follows [1, 8, 9]:

1. *Product* – new product features and packaging options; improvement of product quality;
2. *Price* – maintained at a high level if demand is high, or reduced to capture additional customers;
3. *Distribution* – becomes more intensive. Trade discounts are minimal if resellers show a strong interest in the product;
4. *Promotion* – increased advertising to build brand preference.

Maturity Stage - The Maturity Stage is, perhaps, the most common stage for all markets. it is in this stage that competition is most intense as companies fight to maintain their market share. Here, both marketing and finance become key activities. Marketing spend has to be monitored carefully, since any significant moves are likely to be copied by competitors. The Maturity Stage is the time when the market as a whole earns most profit. Any expenditure on research and development is likely to be restricted to product modification and improvement and perhaps to improve production efficiency and quality [8, 12, 13, 14]. During the maturity stage, the primary goal is to maintain market share and extend the product life-cycle. Marketing mix decisions may include [1, 8]:

1. *Product* – modifications are made and features are added in order to differentiate the product from competing products that may have been introduced;
2. *Price* – possible price reductions in response to competition while avoiding a price war;
3. *Distribution* – new distribution channels and incentives to resellers in order to avoid losing shelf space;
4. *Promotion* – emphasis on differentiation and building of brand loyalty. Incentives to get competitors' customers to switch.

Decline Stage - In the Decline Stage, the market is shrinking, reducing the overall amount of profit that can be shared amongst the remaining competitors. At this stage, great care has to be taken to manage the product carefully. It may be possible to take out some production cost, to transfer production to a cheaper facility, sell the product into other, cheaper markets. Care should be taken to control the amount of stocks of the product. Ultimately, depending on whether the product remains profitable, a company may decide to end the product [5, 6, 7, 14]. During the decline phase, the firm generally has three options [5, 14, 15, 16]:

– Maintaining the product in hopes that competitors will exit. Reduce costs and find new uses for the product;
– Harvest it, reducing marketing support and coasting along until no more profit can be made;
– Discontinue the product when no more profit can be made or there is a successor product. The marketing mix may be modified as follows:

1. *Product* – the number of products in the product line may be reduced. Rejuvenate surviving products to make them look new again;

2. *Price* – may be lowered to liquidate inventory of discontinued products. Prices may be maintained for continued products serving a niche market;
3. *Distribution* – becomes more selective. Channels that no longer are profitable are phased out;

Promotion – expenditures are lower and aimed at reinforcing the brand image for continued products.

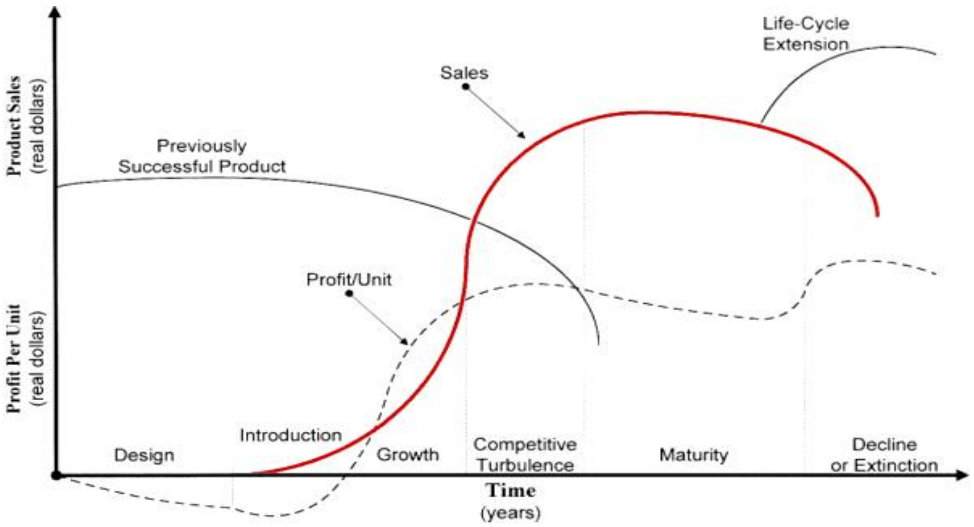


Figure 2. Generalized product life-cycle [7, 10]

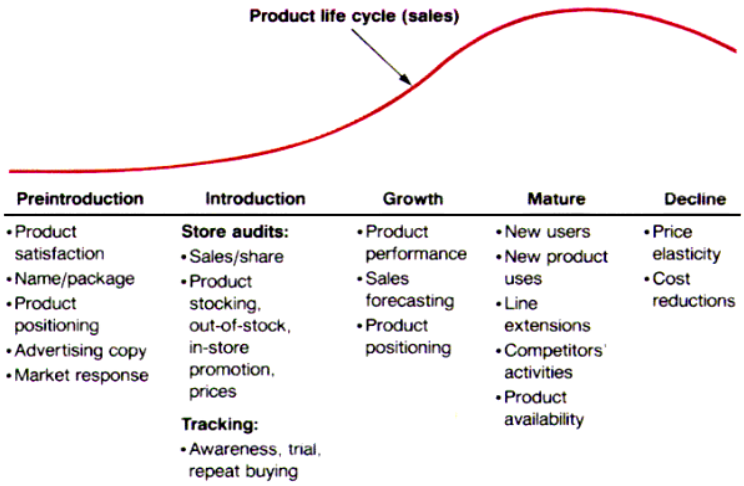


Figure 3. Types of research studied by stage of product life-cycle [7, 10]

Table 3. Examples of products and their different life-cycle's stages (related to the analysis done in 2005 [3])

Product life-cycle phase			
Introduction	**Growth**	**Maturity**	**Decline**
Third generation mobile phones	Portable DVD Players	Personal Computers	Typewriters
E-conferencing	Email	Faxes	Hand-written letters
All-in-one racing skin-suits	Breathable synthetic fabrics	Cotton t-shirts	Shell Suits
Iris-based personal identity cards	Smart cards	Credit cards	Cheque books

In Table 3 are presented some suggested examples of products that are currently at different stages of the product life-cycle.

The product life-cycle is a concept that describes the sales and profit margin of a given product category over a prolonged period, *from lust to dust*. The concept holds that a product's sales and profits change over time in a predictable manner-at least in the four distinct major stages of introduction, growth, maturity, and decline [15, 16].

Each of the curves in Fig. 2 represents the successive efforts of applied design methods. The figure shows, in a general way, the sequence of six possible steps fundamental to the product life-cycle analogy. A new product is *designed* and then *introduced* into the market. If wanted by the market, production and sales experience rapid *growth*. If successful, similar

competitive products exit the market. Typically after three to five years, the market stabilizes and sales flatten to predictable patterns of slow growth or decline, seasonal demand, or other more complex cycles. The incandescent lightbulb is an example of a *mature* product. Eventually, even the incandescent lightbulb will be obsolete. This is process is called market *decline* or *extinction*.

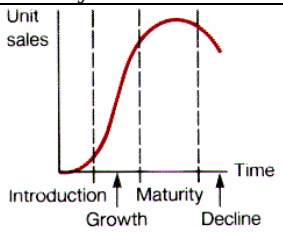
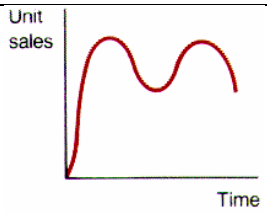
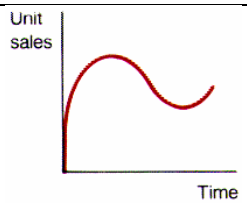
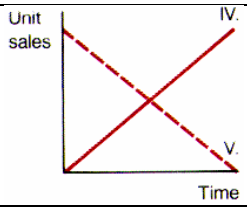
Typically when a product is mature, the profit per unit is predictably consistent and companies are reluctant to *invest* in design engineering. Such products are called *"cash cows,"* and may exist unchanged in the market for many years. Manufacturing engineering, however, is continuously engaged in reducing costs through production and assembly improvements, often called methods engineering.

When sales of a mature product consistently decline, it is often re-promoted, re-packaged, re-positioned, or re-priced and the product life-cycle is *extended*. How often have you observed the words "new and improved" on mature products like laundry detergent, vacuum cleaners, and oil filters? When traditional marketing efforts fail, management will often *invest* in engineering to design a similar product with newer methods and technologies. Alternatively, when there are many competitors in the market, companies with existing *growth* products actively develop future generations of replacement products. Growth products are exemplified by electronics and computer software markets such as the Pentium, and PentiumPro microprocessors [7, 10].

Activities Performed – Fig. 3 illustrates the types of feedback used by engineering during the various stages of product life-cycle. Engineers responsible for product or process improvement - usually a two year effort - must recognize what phase of the life-cycle the product is in to practice the most effective research.

Product Life-Cycle Curves - There are many ways to invest money. Design is simply one form investment. We invest money and resources in design activities because we expect a future return greater than we can receive elsewhere. It is important to understand product life-cycles curves to make the best use of engineering resources. The following figures characterize various industry products and their life-cycle curves. The amount of development money invested in a product intended for rapid market penetration, for example, is considerably less than for a one destined to a long-term stable, mature market [8, 9, 10]. A few examples of the product life-cycle curves are shown and described in Table 4.

Table 4 Examples of the product life-cycle curves [10]

#	Description	Product life-cycle curves
1	**Classical** product and project life-cycle sometimes called the "S" curve and is typical for consumer durable such as televisions, automobiles, and refrigerators and consumer non-durable such as cigarettes and food products. This is typical for industrial projects such as general engineering products, automobile components, petrochemicals, and industrial chemicals.	
2	**Cycle-Recycle** - exhibits increasing and decreasing sales with high and low plateaus. Typical for consumer non-durable such as drugs, household supplies, and personal-care products. Typical for high value added companies and gardening industries.	
3	**Cycle-Half Cycle** - reveals innovative maturity before replacement by next generation products.	
4 5	**Increasing Sales** - typical for growth and fad products having long market introductions such as machine vision systems. **Decreasing Sales** - typical for long-term mature products facing slow decline or extinction due to other competitive products in market.	

(ii) Environmental, economic and social criteria. In the second class of criteria, only environmental and economic criteria are treated in the literature.

The present paper content is related to the product life-cycle perception on the market and the link with the technical approach (special the possibility to extend the (1) relation). We have presented different life-cycle curves that describe product's behavior on the market. Product concept from the marketing perspective has to be correlated with the design and manufacture perspective in a customer-oriented business. Marketing has a concrete representation of the product life-cycle by considering the time evolution of the sales and profit. Regarding Relation (1) we consider that LC_{phase} has to be consider from the marketing perspective, too.

$$P = f(LC_{phases}) = f(PreI, I, G, M, Dec) \quad (2)$$

where P is the symbol for product / different products categorization;

LC_{phases} – Life-cycle phases;
PreI – Pre-introduction;
I – Introduction;
G – Growth;
M – Mature;
Dec – Decline.

The evaluation of the importance of product life-cycle phases is done by the marketing-mix evaluation (component analyses). This new perspective can develop new criteria that can be linked with the initial one (Fig. 6) because of the marketing orientation. The problems regarding categorizing products according to the importance of their life-cycle phases becomes interdisciplinary and they need to be solving in teams of specialists.

According to these new point of view we propose a model that can be represented as following:

$$P = f(LC_{phases}) = f(MP, PM, D, U, D/R) + \\ + f(PreI, I, G, M, Dec) \quad (3)$$

These cumulated criterions will assure a competitive advantage of the product. A competitive advantage is an advantage over competitors gained by offering consumers greater value, either by means of lower prices or by providing greater benefits and service that justifies higher prices.

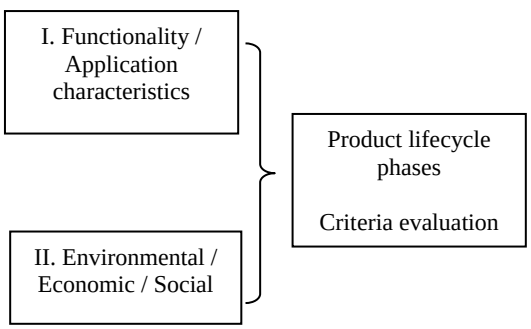


Figure 5. Criteria evaluation of the importance of product life-cycle

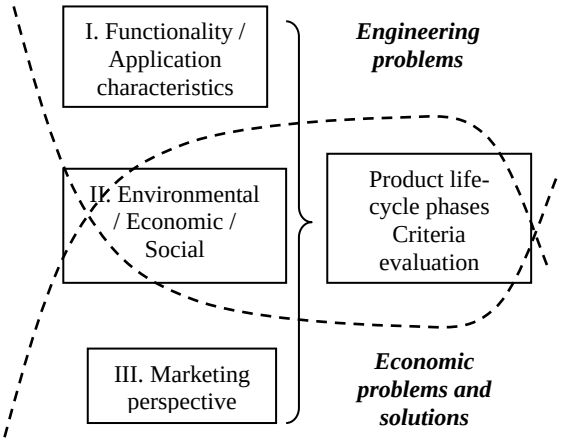


Fig. 6. New criteria evaluation of the product life-cycle importance

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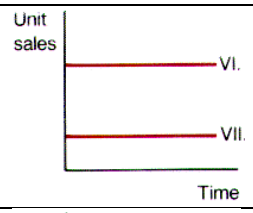
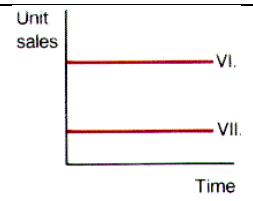
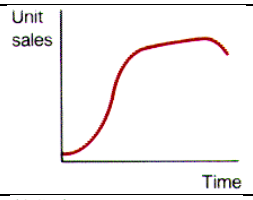
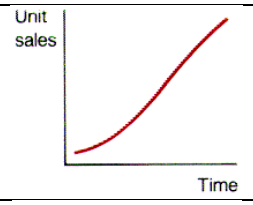
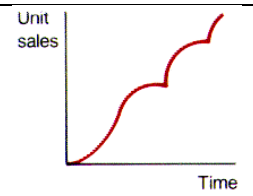
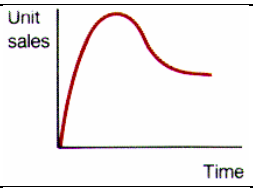
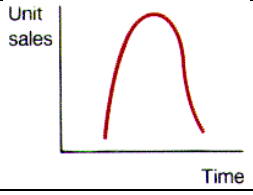
	High Plateau - mature product with more performance and features or lower production cost relative to competition.	
7	**Low Plateau**– mature product with less performance and features or higher production cost relative to competition.	
8	**Stable Maturity** – a variant of the classical life-cycle with products called "cash cows". Every entrepreneur hopes for a stable mature product. This curve is typical for patentable products and processes.	
9	**Growth Maturity** - a variant of the classical life-cycle where a product exhibits continued growth over time (Figure 4g). This curve is typical for non-durable consumer such as paper and food products used across increasing populations of consumers.	
10	**Innovative Maturity** - exhibits sustained growth through product or process innovation. This curve is typical for durable consumer such as audio and computer equipment.	
11	**Growth-Decline-Plateau** - new and innovative products exhibit a "spike" in demand as consumers' exhibit "me-too" habits. Typical of toys (recall the Super Soaker) and new technology such as compact disks and digital TV.	
12	**Rapid Penetration** - products with short life-cycles, high competitive turbulence, and emotional response. This life-cycle curve is typical for industrial chemicals.	

IV. CONCLUSIONS AND FINAL REMARKS

The context of our research is that we treated various issues related to explain product behavior according to the importance of their life-cycle phases on the market. For this aim, we have considered first the product life-cycle is decomposed into five main stages: materials production, product manufacturing, distribution, use and disposal/recycling. This approach is described from the technical point of view. The following relation shows the link between product category and the different life-cycle phases.

$$P = f(LC_{phases}) = f(MP, PM, D, U, D/R) \quad (1)$$

where P is the symbol for product/different products categories;

LC_{phases} – Life-cycle phases;
MP - Material production;
PM - Product manufacturing;
D – Distribution;
U – Use;
D/R - disposal/recycling.

The presented stages reflect engineering problems or aspect. The design stage is not included in this decomposition as it concerns a mental activity.

The evaluation of the importance of product life-cycle phases is done according to specific criteria. Two different types of criteria are distinguished as main tools for the evaluation of the importance of the life-cycle phases of products (Fig. 1) [3, 10]:

(i) Functionality and application characteristic criteria and