Towards Sustainable Building: Case Study on Romania

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The purpose of this article is to analyze the actual situation of the green buildings in our country but also the degree in which the real estate developers are involved in such projects. The study was conducted by combining a wide variety of sources, such as regulations, position papers, as well as articles and research reports. The results of the research show that the market for green buildings in Romania is at an early stage of development however, there are prerequisites for its development. In the future, green building will become the standard in the construction industry.

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1. Introduction

Buildings are considered „green" if they are energy efficient and use less resource during construction and operation in comparison with

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other households. Increased energy efficiency leads to a decrease in the consumption of energy and gas and thus the carbon emissions are reduced.
Currently, the green building market is a growing sector, where more and more companies are designing, building and renovating spaces in compliance with the principles of sustainability and energy efficiency. These principles are the basis for the development of international certification schemes of green buildings, comprising a set of coherent rules and requirements.

2. Green buildings and sustainable development

According to the literature, sustainable development, a multidimensional concept, is defined as the development that answers the needs of the present without compromising the ability of future generations to meet their own needs [1].
Zavadska and Antucheviciene define the sustainable development as „a set of indicators in the multi criteria analysis to include environmental, social and economic aspects of sustainability" [2].
According to Sage, sustainable development proposes to fulfill the needs through the improvement of environment, social, economics, culture and technological progress. [3]
In conclusion, the development is sustainable when it is based both on economic objectives, as well as social and environmental objectives. Sustainable development is mainly aimed at continuous improvement of quality of life and well-being of present and future generations, through an integrated approach between economic development, environmental protection and social justice.
The definition given to the sustainable development has two key concepts: the concept of needs, meaning mainly the needs of the poor that should be given priority; the concept of limitations or thresholds imposed by the technological level and the social organisation

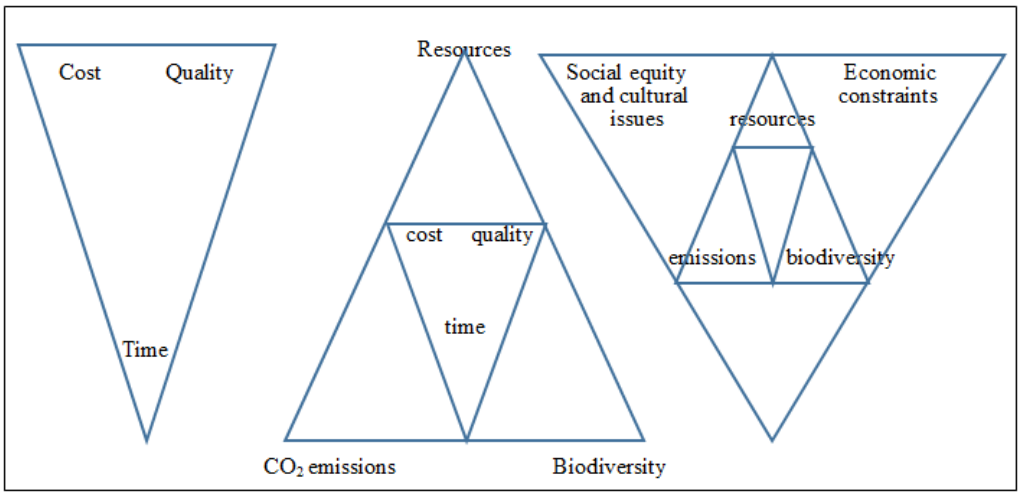
regarding the ability of the environment to meet the present and future needs.

An important objective of sustainable development is to reduce the impact of construction sector development on the environment. The construction sector represents on the one hand, an important component of the sustainable development and on the other hand, an important area of activity in most national economies.

Sustainable constructions promote the efficient use of resources both in the design stage as well as in the construction and occupation phases, using recyclable materials, technologies and materials with a reduced impact on the environment [4].

The concept of sustainability in construction has evolved from a relatively simple approach that considered as competitive factors: cost, quality and length of time, to a new approach, with more elements of quantification of sustainability: resources, CO2 emissions and biodiversity, leading to the present, when we speak of a global sustainability model in the construction field, a model that is comprised of the elements from the first two stages but also new elements, specific to the international environment, such as cultural differences, economic constrains, the quality of the environment (see Figure 1) [5].

Figure 1.
The evolution of the sustainable development concept in constructions



The principles that underline the sustainability in construction are [6]: minimizing resource consumption; use of renewable and recyclable resources; environmental protection; maximization of resource reuse; creating a healthy and non-toxic environment; ensuring the quality in the construction area. Four basic pillars have been identified as crucial in the development of sustainable buildings: social, economic, technical and biophysical [7].

Green building require a design process in which the orientation, geometric conformation, the materials and technologies used have as a result an impact as low as possible on the environment in all the stages of existence of a construction – from the production of materials, their transportation and their usage, up to the exploitation and the after-use of the building – all these in parallel with obtaining optimum comfort conditions, to ensure that the chosen systems will be maintained for a long period of time. According to a study, the savings

resulted from the construction of a green building are significant: energy savings -30%; carbon savings- 35%; water use savings – 30-50%; waste cost savings 50-90% [8].

Green buildings, an important pillar of sustainable development in the construction field, are defined as "healthy facilities designed and built in a resource-efficient manner, using ecologically based principles" [9].

According to Hassan et al. [10] and Kolev [11], "a green building is designed and constructed in a way that is measurably less harmful to the environment and to the occupants than traditional buildings". In essence, green buildings attempt to solve complex issues associated with conventional buildings.

The Environmental Protection Agency describes a green building as one that reduces its "direct and indirect impact on the environment throughout its life – from the time construction begins, during occupancy, and eventually, when it's decommissioned."

In conclusion, green buildings are those constructions that are built and used responsibly in regard to the environment, throughout their lifecycle: design, construction, use, maintenance, renovation and demolition. The objectives, in the case of designing and green building construction are: protecting the health of the occupants, increasing employee productivity; using energy, water and other resources efficiently, reducing negative impact on the environment.

Sustainable buildings use modern technical solutions for thermal insulation, automation for efficient consumption registration, unconventional sources of energy and innovative facilities for its production, heating systems, air conditioning, air handling, lighting, fire protection, security and access control centralized through building management systems (Building Management System).

Green buildings offer many benefits such as economic, social and environmental improvement opportunities (Table 1).

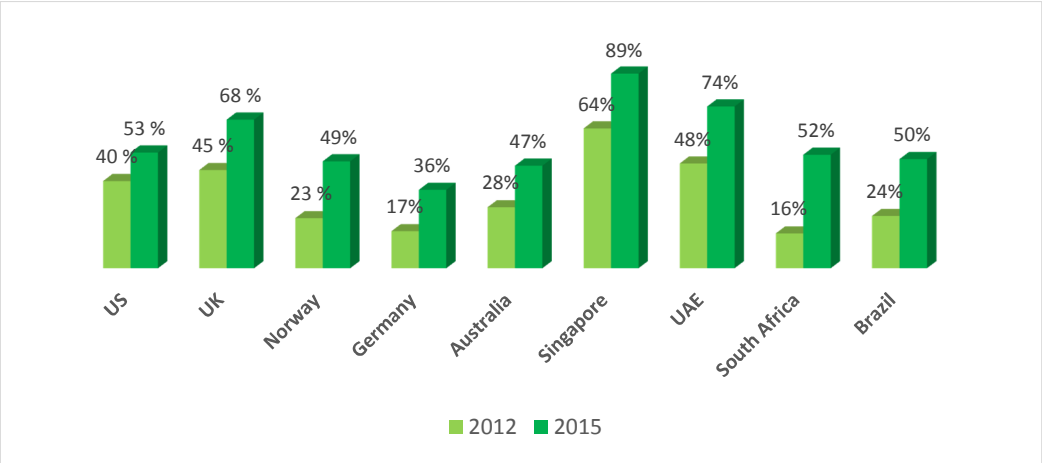
Table 1.

The advantages of green buildings

Economic benefits	Social benefits	Environmental benefits
-Reduce operational costs -Create, develop and form the market for green products and services -Improve the productivity of inhabitants -Optimize the construction lifetime and increase economic performance	-Improve the comfort and health of the inhabitants -Reduce the overloading of the local infrastructure -Improve the quality of life in general -Improve the aesthetic quality	-Improve and protect the biodiversity and the ecosystem -Improve the quality of air and water -Reduce the waste stream -Conserve and restore the natural resources

The development of green buildings is driven by economic factors such as the demand occurred at the request of property developers, real estate investors and users of buildings; financial restrictions, for example: the increase in prices of raw materials, energy, as well as ecological factors / social responsibility, such as environmental sustainability and social responsibility [12]. The activity in the green building area started to develop in 2008, when only 17 countries had officially established Green Building Councils. In Europe, the United Kingdom has seniority in this field, with over 52% of the companies involved in green building; the number is expected to double by 2015 [13].

Figure 2.
The share of companies involved in green building



3. Regulations in the field of green buildings

A series of regulations have been adopted in order to lead to the development of the sustainable construction sector. The international Standardization Organisation has developed the "Sustainability in Building Construction", "Sustainability of construction works" framework introduced by European Committee for Standardization [14].

The first major attempt to establish an European framework in energy performance for buildings took place in 2002 when the Energy Performance of Buildings Directive (EPBD) established a series of requirements for the Member States from setting up building certification schemes (the so-called energy performance certificates-EPC) to inspection regimes for large heating and air-conditioning equipment also including performance standards in construction. From various points of view EPBD has raised the bar in terms of standards in all the EU Member States to align them to the best

existing performances. For example, Denmark and the Netherlands had already instituted certification schemes for buildings and EPBD urged the other Member States to introduce similar schemes [15].
Although the initial EPBD directive has generated progress in a number of areas, its implementation in the Member States has been slow and incomplete and some provisions have not had the desired effect. Given this, the European Commission launched a review in 2009 which led to the Reformed Directive introduced in 2010. Currently, the new Directive on Energy Performance of Buildings (EPBD II) brings major changes. It requires as a mandatory measure the refurbishing of at least 3% of the total floor area of the buildings owned by public authorities, the obligation being extended to the purchase of only the buildings that comply with the minimum energy performance requirements.
Romania. Beginning with the 31st of December 2014, the Law no. 220/2008 imposes a minimum level of renewable energy that must be integrated in the buildings. Law no. 211/2011 undertakes the provisions of the Directive 2008/98 / EC which deals with the problem of waste in construction and treats backfilling operations using waste to substitute other materials and the reuse, recycling and recovery of materials from buildings that are safe and from the waste resulting from demolition, in a proportion of at least 75% of their weight. Law 372/2005 was amended and harmonized with the European regulations through Law 159/2013, which transposes into the Romanian legislation the provisions of the EPBD directive.
According to the European legislation, by 2018, all new public buildings will have to comply with the standard building regulations with an energy consumption of almost zero. The new private buildings will comply with this requirement starting with 2021. Also at the European Union level an agenda was drawn up for sustainable construction in the region, which envisages, under Article 6 of the Treaty of Amsterdam, that the environmental protection requirements

be integrated into the definition and implementation of the Community policies and activities, especially in order to promote sustainable development.

At international level there are several green building certification systems: in the United Kingdom, since 1990, there is the BREEAM - Building Research Establishment Environmental Assessment Method certification system - as a tool for measuring the sustainability of non-residential buildings. BREEAM is currently one of the most comprehensive certification schemes for environmental performance of buildings also internationally recognized. BREEAM addresses the following issues: Management; Health and well-being; Energy; Transport; Water; Minerals and waste; Land use and ecology; Pollution [16] [17].

Leadership in Energy and Environmental Design (LEED) is the predominant system of certification of sustainable construction in the United States based on criteria such as: energy efficiency, reducing water consumption, emissions of carbon dioxide, improving air quality inside buildings and resource saving in general. LEED has also gained popularity abroad.

Other green building certification systems are in: France (HQE), Germany (DGNB- Deutsche Gesellschaft fur Nachhaltiges Bauen and CEPHEUS), Netherlands (BREEM Netherlands), Switzerland (Minergie), Italy (Protocollo Itacaand Green Building Counsil Italia), Portugal (Lider A) and Spain (VERDE).

Currently, in our country there is a lack of a clear legislative measures framework (to support the green building) but also a weak enforcement of the legislation regarding the energy performance of buildings (which is meant to encourage developers to build green).

The certification of green buildings in Romania

In Romania, green building certification process is divided into two stages: the main stage, design, and the second stage, post construction. In the first phase, the project is adjusted and harmonized with the

principles of sustainable construction, according to the basic features of the building as well as regarding budgetary constraints, resulting in a provisional certification. In the second stage, post-construction, the assessment is based on the building yard documentation and the final project.

In the case of existing buildings, the approach of the two certification systems BREEAM and LEED are completely different. The LEED certification system maintains the same rules as for new buildings but adjusted to the conditions of a completed construction, giving a final certificate. BREEAM certification system is simpler, as the certification is done by the developer, which leads to a reduction of time and certification costs.

The certification under both schemes is carried out concurrently with the stages of construction of a new building and each stage lasts between six months and one year. For the certification of existing buildings, the duration is different between the two systems due to their approach: a LEED type certification takes about a year and a BREEAM certification can be achieved in a few months. In Romania, the certifications requests for new buildings are increasing compared to previous years; most developers are interested in obtaining a certification that states the sustainability and quality of the constructions with a worldwide recognition.

4. Case studies on the state of green building in Romania

4.1. *Data and Methodology*

The research was conducted nationwide, using an online questionnaire and from the 200 questionnaires collected only 183 have been validated. We tried to cover a wide range of respondents, people from private entities but also people working in the public sector, all involved throughout the stages of design, development and marketing of green buildings such as: architectural and design firms, civil and industrial construction companies, real estate developers,

representatives of the Ion Mincu Bucharest University of Architecture, the Technical Construction University, municipalities and prefectures, consulting firms, property owners.
The 183 valid questionnaires were distributed as follows: construction companies 37.04%, architectural and design firms 13.23%, real estate developers 10.58%, consultancies 5.29%, real estate owners 26.46%, representatives of the state authorities including public universities 7.41%.
In terms of regional distribution, a nationwide coverage was attempted by interviewing respondents from all seven development regions. Therefore we observed an uneven distribution of respondents according to the major sectors of activity developed in the region and the level of economic development in the area.
The first place was occupied by the Bucuresti-Ilfov region followed by the South region and the Northeast region.
The collected data were processed using Microsoft Excel 2010 for both centralization and processing.
In the next section the survey results are presented, identifying the geographical distribution of green buildings in Romania, their end use, but also the extent to which specialized companies are involved in green real estate projects.

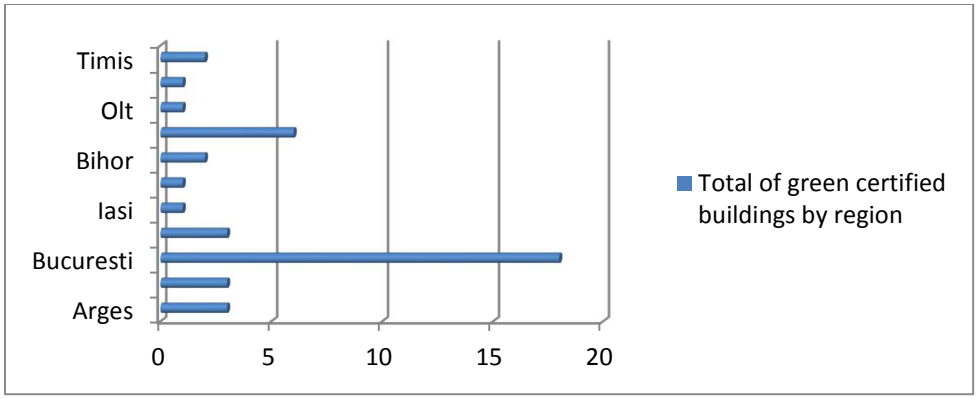
3. Results

3.1. The regional distribution of green buildings in Romania

A first analysis was performed on the situation of existing green buildings in the year 2014 based on the answers provided by the owners of all certified green buildings in our country until the time of the study.
After processing the responses of all the 41 certified green building owners in Romania at the end of 2014 the following aspects of their regional distribution were highlighted:

The grouping of the 41 green certified buildings in Romania is as follows: in general in the Bucharest-Ilfov region where there were in 2014 a total of 18 buildings, area followed by Prahova (6), Brasov (3), Arges (3) Cluj (3) Timis (2), Bihor (2), Olt, Ilfov, Dambovita and Iasi 1 building each (see chart below).

Figure 3.
The regional distribution of green certified buildings in Romania.

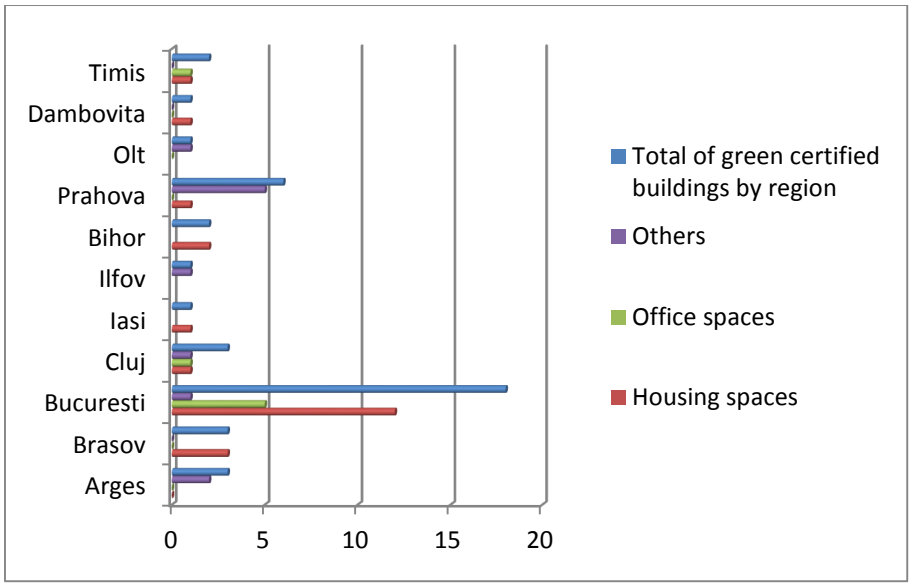


Source: authors calculations

3.2. Green building typology based on the final destination of use

In terms of the typology of the final destination of use of certified green buildings one can see a preponderance of collective households and offices, the real estate developers / owners rarely obtaining certifications for buildings that have as final aim the industrial sector or commercial areas (malls).

Figure 4.
The regional distribution of green certified buildings in Romania 2014 according to their final use



Source: authors calculations

The increase in the number of green buildings was approximately 60% in 2014 compared to 2013 and their regional spread throughout the country demonstrates that there is a constant concern in the area of construction and certification for such buildings and not just an isolated trend at the level of particular regions. In the past years green buildings were mainly distributed in the Bucharest-Ilfov area due to the development of real estate and the share of the construction sector share in the area of activity.

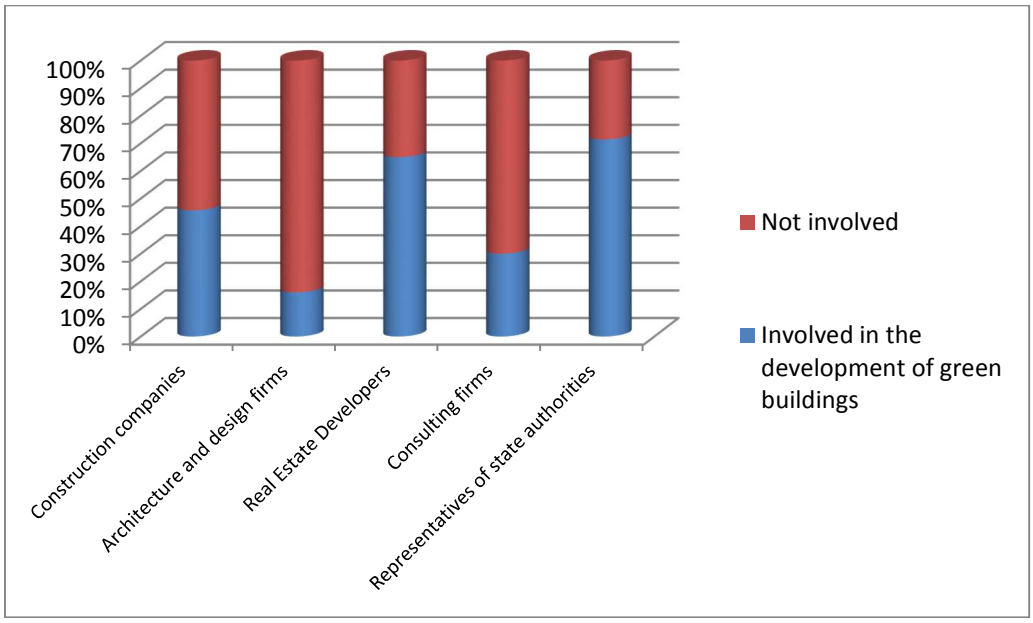
3.3. The involvement of companies in the construction and design of green buildings

After processing the data we were able to have a clear image of the involvement in the construction and design of green buildings from architecture and design firms, construction companies, developers and consulting firms.

In terms of the specific activity of the entities involved in the development of green building projects we have observed that a very small share from the total current activities was allocated to this endeavor.

Figure 5.

The share of the involvement of companies in the development of green building activities

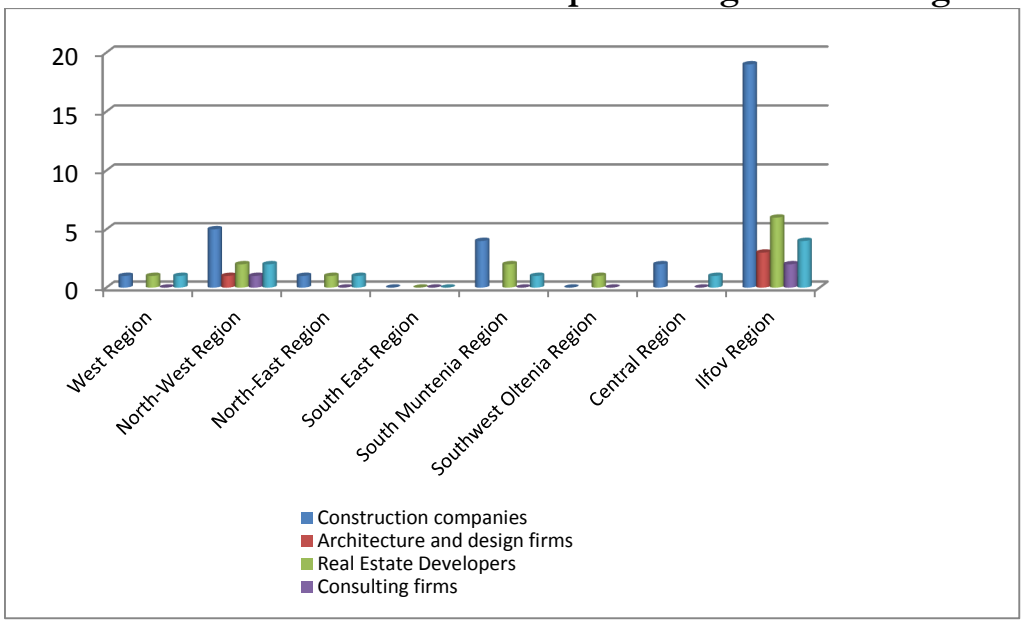


Source: authors calculations.

Nationwide only 44.60% of the architecture and design firms, construction companies, developers and consulting firms have

reported that they had been involved in the development and / or implementation of a project that involves construction of a green building and only 38,70% of them were directly involved in obtaining the certification for that project. Regarding the regional distribution of respondents engaged in the development of green buildings we have observed a high concentration in the Bucharest-Ilfov area followed by the South-Muntenia area and Northwest as was analyzed and shown in the graph below.

Figure 6.
The regional distribution of companies that have reported to have been involved in the development of green buildings.



Source: authors calculations

Regarding the intention of involving themselves in the next two years (2016-2017) in development activities regarding the design,

construction and marketing of green buildings, 94.03% of the respondents have said that they intend to address this sector.

4. Discussion

The above results show that the green real estate market in Romania is still at the beginning and there are major differences between the seven development regions of the country. Fiscal incentives, tax reductions may explain, to some extent, the concentration of green buildings in the center and western development areas.

In Romania there are many reasons that lead to the need to promote green buildings. The growing demand from tenants due to the lower operating costs, higher labor productivity and the need for better reputation could force the construction sector to adopt effective construction techniques. Overall, the operating costs for holding a leading position in certificated constructions according to the terms of Energy and Environmental design are 8-9% lower than for conventional constructions. Throughout the lifecycle of a building these savings offsets the higher initial costs, investors also seeking investments with a higher degree of social consciousness.

The green building market is also fueled by the CSR policy adopted by international corporations who seek sustainable offices. In Romania, the most certified green buildings are rented to large corporations.

Future research directions may also be highlighted. An interesting idea is to further develop the study of green buildings, in order to try to identify if there is a measurable correlation between a certification of this type and the productivity of employees that carry out their work activity in a sustainable construction.

5. Conclusions

The development of buildings that have a low environmental impact is not only a necessity in the context of concerns regarding the

improvement of the quality of life but also a boost for investments in the current economic climate.

Measures are needed to increase the number of buildings which not only meet but also exceed the current minimum requirements of energy performance, thereby reducing both energy consumption and carbon dioxide emissions. To this end, Member States have developed national plans for increasing the number of buildings whose energy consumption is nearly zero and they regularly report such plans to the Commission.

The construction of green buildings requires a holistic approach. Currently, this approach lacks the end user pressure, which must be the main vector of change. One solution would be green contracts by which tenants are obliged to follow certain practices during the renting period for a green building.

The development of the green real estate market is explained primarily by the fact that both the investors and the occupiers are starting to understand the value that a green building brings, not only on the economic level but also regarding the productivity benefits obtained from a healthier work space with more natural light, with access to transportation, with a better and more qualitative design.

In Romania, even if there is substantial demand for sustainable constructions, voluntary initiatives such as green procurement and eco-labeling for products and services are not encouraged and those that exist are hardly promoted by public authorities.

More and more developers understand and implement the concept of green building, and more and more green buildings in the country have exceeded the minimum certification ratings. Sustainable development is a concept that not only captures increasingly more interest from developers and builders, but also becomes a real necessity for Romania.

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