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“TEN YEARS WORKING TOGETHER FOR A SUSTAINABLE FUTURE”

Sustainability assessment criteria for a green building enterprise

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Abstract

Nature is finite, the semi-renewable resources and the ecosystems' capacity to absorb the pollutants has made the concern for sustainability rise. Some factors that are making resources limited are population growth and increased per capita consumption. It should be noted that the impact of buildings on natural resources is significant. The construction industry is identified as the sector with human activities that most consume natural resources, in addition to using energy intensively, causing negative environmental impacts. Besides the impacts related to the consumption of matter and energy, there are those associated to the generation of solid, liquid and gaseous wastes. Thus, it is estimated that more than 50% of the solid waste generated by all human activities comes from construction, so the limitation of the sources of resources and the finite capacity of the ecosystems are the challenges to achieve an ecologically sustainable economy. However, management professionals have been struggling to integrate their operations with sustainability issues. From the context, the research problem is presented: what are the results obtained from a process of evaluation of the sustainable operations of an organization in the civil construction segment? Thus, the objective was to identify the results obtained from an evaluation process of sustainable operations of an organization in the civil construction segment. This organization is the EuroBusiness, located in Curitiba, in the State of Paraná - Brazil, the first venture in the South of Brazil to receive the LEED Platinum Seal, the highest level of certification by LEED, accounting for less than 2% of Certified ventures around the world. To reach the proposed objective, the research is considered of an applied nature, with a qualitative approach and exploratory, descriptive and analytical objectives. Standardized data collection techniques involve a literature review and interviews with specialists. The results indicate that the strategy adopted by EuroBusiness involved aspects of envelopment, lighting, measurement and verification, green roofing, use and reuse of water and indoor air quality (IAQ) and contortion. In this way, it can be seen that the high technology used by the project throughout the project, reduces its operational cost and its environmental impact with the concern for saving natural resources.

Keywords: *sustainable green building, domotics, sustainable product development.*

1. Introduction

There is now a growing of ecological awareness among researchers and experts as well as in society in general. In this way, the commercial, industrial and civil construction sectors stand out. However, sustainability is still a challenge in the search for awareness and effective and definitive action in the search for a balance between economic, social and environmental aspects.

In order to overcome this challenge, the performance of companies needs to be guided by the three aspects that are part of the concept called the Triple Bottom Line (TBL), which is commonly used to define the dimensions of the impacts generated by the organizations that participate in a given industry.

Thus, organizations need to act in an integrated way, providing sustainability for the organization and the society in which it operates.

In the context of corporate social responsibility, the TBL coined by Elkington (1999) in 1998, which conceptualizes as an attempt to describe the impact of an organization's social and environmental activities in a measurable way, to its economic performance to show improvements or make an evaluation More in depth. TBL is understood as a 3P's approach: people, planet and profit. The implementation of sustainability in organizations is necessary due to the pattern of consumption that causes scarcity of natural resources (Williams et al, 2007). Thus, some organizations have presented, over the years in their corporate reports, non-financial performance indicators and have dedicated part of their audits to socio-environmental phenomena (TATE; ELLRAM; KIRCHOFF, 2010; ANDRADE; GOSLING; XAVIER, 2010; ISAKSSON; STEIMLE, 2009; SIENA, 2008).

Thus, the organizations have been dedicated to look for the aspects of sustainability that make up the TBL dimensions, such as Töpfer (2000) Elkington (1999), Tanga and Sean Zhou (2012) and Epstein, Buhovac and Yuthas (2015) who worked from the TBL approach. To this end, organizations have opted to integrate sustainable process strategies into their operations. What is justified by Ferrer (2008) is that sustainable operations must be considered as the implementation of sustainable business strategies.

Starting from the context, the problem of study is presented: What are the results obtained from a process of evaluation of sustainable operations of an organization in the civil construction segment? In order to answer this question, the objective of this article was to identify the results obtained from an evaluation process of sustainable operations of an organization in the construction segment.

The objective of the article is justified, due to the problems generated by the civil constructions, among them: the consumption of materials, the emission of polluting gases and the exorbitant consumption of water and energy. Having thus, total relevance the vision of economy of the natural resources, using them to the best possible way, including this awareness of sustainable operations management throughout the process. In the midst of this context comes the environmental certification process of the enterprise, which collaborates in minimizing the environmental impacts generated, using in a more conscious way the natural resources, bringing several benefits that will be presented later.

To reach the proposed objective, the research is considered of an applied nature, with a qualitative approach and exploratory and descriptive / analytical objectives. Standardized data collection techniques involve bibliographic surveys, interviews with specialists, managers and engineers with experience in the subject related to construction problems and benefits from LEED certification.

The case study is about the EuroBusiness venture, located in the Ecoville neighborhood of Curitiba in the state of Paraná-Brazil. The choice of the object of study is justified therefore EuroBusiness is the first venture of the South of Brazil to receive the distinction of the seal LEED in the category PLATINUM. This is the highest level of LEED certification, accounting for less than 2% of certified ventures worldwide.

The work is divided in five sections, from this introduction the problem of study, the objective, the justification and the relevance of the theme is presented. The second section will establish the relationship and concept of sustainable buildings from the Green Building and LEED certification. The third section presents the research methodology and the conceptual model adopted. The fourth section presents the case study related to the EuroBusiness enterprise followed by the final considerations.

2. Green Building: a sustainable business concept

In the last decades, management professionals have been having difficulties integrating their operations with sustainability issues. The greatest pressure on companies and the environment occurs due to the products and services offered and the processes implemented. (KLEINDORFER; SINGHAL; WASSENHOVE, 2005).

In the 1980s, sustainability entered the political and business agenda through the Brundtland Report, from the World Commission on Environment and Development. On this occasion, the concept of sustainable development was defined as: development that meets the needs without compromising the satisfaction of the needs of the next generations (BRUNDTLAND, 1987).

In Brazil, the Brazilian Council for Sustainable Construction (CBCS) was created in 2007, focusing on civil construction, whose objective is to use sustainable practices in the sector, bringing quality of life to users, workers and the environment in Brazil. Around building (SINDUSCON, 2008).

According to the International Construction Council (CIB), the construction industry is seen as the sector with human activities that most consume natural resources, in addition to using energy intensively, causing negative environmental impacts. It is estimated that more than 50% of solid waste generated by all human activities comes from construction.

Thus, the construction sector plays a key role in developing actions to achieve the global objectives of sustainable development, as initially pointed out in the Brundtland Report in 1987.

As of Agenda 21, sustainable construction was defined as: "a holistic process that aspires to restore and maintain harmony between natural and built environments, and to create settlements that affirm human dignity and encourage economic equity" (ECO , 1992, s / d). The challenges for the construction sector are diverse, but in a nutshell, they consist of reducing and optimizing the consumption of materials and energy, reducing waste generated, preserving the natural environment and improving the quality of the built environment. Therefore, it is recommended:

Changing the concepts of conventional architecture in the direction of flexible projects with the possibility of re-adjustment for future use changes and meeting new needs, reducing demolitions; Search for solutions that enhance the rational use of energy or renewable energies; Ecological water management; Reduction of the use of materials with high environmental impact; Reduction of building waste with modulation of components to reduce losses and specifications that allow the reuse of materials. In addition, the construction and management of the built environment should be viewed within the life cycle perspective (BRAZIL, 2016, s/d).

Thus, a green building prioritizes the life cycle of the product, investing in products with a life equal (=) or greater (>) than 20 years (GARCÍA, 2009). Life Cycle Assessment (LCA) was defined as an analytical tool used to describe broad aspects of the environmental issue (BAUMANN; BOONS; BRAGD, 2002; LOCKREY, 2015).

Environmental regulation issues are found from ISO 14000. Thus, according to ISO 14040 (2006, s / p), the LCA is defined as a "compilation and evaluation of the inputs, outputs and potential environmental impacts of a system throughout their life cycle ". The term "life cycle" refers to the main activities throughout the life of the product from its manufacture, use and maintenance, including the necessary acquisition of raw material to manufacture the product (EPA, 2006). Figure 1 identifies the Life Cycle phases of a Product.

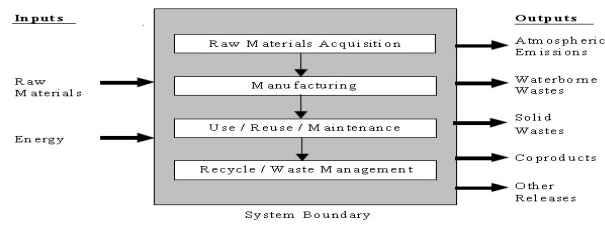


Fig. 1. Product lifecycle phases.

Source: EPA (1993).

Thus, the LCA refers to a tool that connects to the decision-making related to the development of products directly involving the environmental, social and economic issues of the sustainable product.

Concerning the development of sustainable products, domotics (from the Latin Domotique - is used to designate every residence that employs automated services related to energy management, communication, environmental comfort, personal and patrimonial security). A concept that meets the needs of an increasingly competitive society, where the search for a competitive position is an essential part of any business that operates in the markets. Another point to highlight in the application of home automation is the monitoring of the change in the profile of the population that has an increasingly longer life expectancy and with this a greater need in relation to energy saving, comfort, entertainment, safety, and accessibility to elderly or disabled.

Complex buildings have been developed more frequently and are expected to perform more and more functions with better performance and greater reliability. For this, access to control systems needs to be expanded. Thus, home automation meets the need of architectural, electrical, and hydraulic projects and also involves the study of location, environmental impacts, performing analysis in all aspects that involve the sustainability of the enterprise.

Paiva (2007) points out that a green building is also a model of economy, considering that they aim at a better use of natural resources through the study of topography, geodesy, prevailing winds, micro climate, among other variables. According to Mariotoni and Junior (2001) there is a set of applications for domotics, which would be: security, energy management, home automation, cultural training and entertainment, monitoring of environmental comfort and in the operation and supervision of facilities. Considering these applications it is understood that a home automation system develops, therefore, a communication network becomes necessary to interconnect the equipment for data collection of the environment and a future action to manage it.

Amory and Junior (2001) identify four classes of benefits associated with home automation: safety, comfort, energy saving and communication. Table 1 presents the benefits in more detail.

Table 1 – Domotics' benefits

Class	Benefit
Safety	Technical alarms (flooding, gas leakage); Fire and smoke; Invasion and assault; Medical alarm, presence simulation.
Comfort	Automatic light; blinds; Centralization (single button to turn on/off the system); temperature control; Home appliance programming; Opening of gates.
Energy saving	Lighting; temperature control; Control of household appliances.
Communication	Security (activation of firefighters or police); Entertainment (audio/video interconnection); Connectivity (between environments that use home automation).

Source: Adapted from Amory and Junior (2001).

Considering the functions and benefits associated with home automation, it is clear the importance of addressing this concept associated with the development of sustainable products, since both seek to satisfy the need of a larger context that is to guarantee the sustainability of the business. And in this particular case, it is the analysis of green buildings, which through the GBC (Green Building Council) certification, for example, seeks to meet economic, environmental and social requirements.

The CBCS recognizes the contribution of environmental certification systems, which contribute to a sustainable future. In this way, some buildings have been certified as sustainable or green




constructions, being qualified by entities that have created methods and systems that study and evaluate the impacts of design, construction and operation of buildings. In Brazil, there are two environmental building certification systems, the LEED (Leadership in Energy Environmental Design) developed by the USA in 1991 and the HQE (Haute Qualité Environnementale) developed by France in 2002.

The model featured in this work is based on the environmental certification standards LEED - Leadership in Energy and Environmental Design, arises from the United States Green Building Council (United States Green Building Council - USGBC). The USGBC offers building certification, training and qualification of building professionals focused on green buildings. It is important to clarify that the USGBC certifies buildings and not just products. LEED certification ensures that the construction, construction process and subsequent operation follow standards set by the USGBC and can be called "green building" (GARCÍA, 2009).

The Green Building Council Brazil (GBC Brazil) is an NGO (Non-Governmental Organization) that aims to promote the sustainable construction industry in Brazil (GBC BRAZIL, 2016). When a building receives the LEED certification it means that it was built and operated using sustainable methods and renewable materials, this makes a green building an intelligent building (GARCÍA, 2009).

LEED certification encompasses four types that encompass various sectors of the market, to give a personalized experience that recognizes the specific needs of each project: new constructions (BD + C); Interior design (ID + C); Existing buildings (O + M); and neighborhoods (ND) (GBC BRASIL, 2016). Table 2 presents the benefits of LEED certification.

Table 2 – Benefits of LEED environmental certification.

DIMENSION	BENEFITS
 Economic	Decrease in operating costs. Decrease of regulatory risks. Valuation of property for resale or lease. Increase in occupancy speed. Increased retention. Modernization and less building obsolescence.
 Social	Improved safety and prioritization of workers and occupants health. Social inclusion and increased sense of community. Professional training. Awareness of workers and users. Increased employee productivity; Improvement in patient recovery (in Hospitals); Improvement in student performance (in Schools); Increase in consumer buying momentum (in Trade). Incentive to suppliers with greater socio-environmental responsibilities. Increased user satisfaction and well-being. Stimulating public policies to promote sustainable construction.
 Environmental	Rational use and reduction of natural resource extraction. Reduction of water and energy consumption. Conscious and orderly deployment. Mitigating the effects of climate change Use of materials and technologies of low environmental impact. Reduction, treatment and reuse of construction and operation waste.

Source: Adapted from GBC Brazil (2016).

The LEED certification adapts to all buildings as well can be applied at any time in the enterprise. According to the GBC Brazil (2016) projects that seek LEED certification are analyzed in 7 dimensions. All have prerequisites (compulsory practices) and credits (recommendations) that, as they are answered, guarantee points for building. The certification level is defined according to the number of points acquired, ranging from 40 points to 110 points (Certificate (40-49 points), Silver (50-59 points), Gold (60-79 points) and Platinum (80 -110 points)]. The following are the dimensions evaluated and the number of points that can be obtained in the home dimension: i) Sustainable sites (26 points); ii) Water efficiency (10 points); iii) Energy & atmosphere (35 points); iv) Materials & resources (14 points); v) Indoor environmental quality (15 points); vi) Innovation in design or innovation in operations (6 points); (vii) Regional priority credits (4 points) (GBC BRASIL, 2016; GARCÍA, 2009).

It is worth mentioning that any product, regardless of the material used (wood, glass, plastic, metal, among others), causes a certain environmental impact, whether related to its production process or to

the raw materials it consumes, or due to its use and final destination (CHEBEBE, 1997). Due to the environmental discussions in the globalized world, it is possible to affirm that sustainable business is a differential factor for the success of an enterprise.

3. Methodology

For the development of this research considered of an applied nature - because it aims to generate knowledge for practical application directed to the solution of specific problems and involves local truths and interests (Silva and Menezes, 2001), with a qualitative approach - because it does not have the concern to develop a numerical representativity, however, must possess the deepening of the compression of a social group of an organization (Minayo and Sanches 1993), and exploratory and descriptive objectives - this is because it aims to describe the characteristics of a particular population or phenomenon or establishment of relationships between variables and involves the use of standardized techniques of data collection and the one that aims to provide greater familiarity with the problem in order to make it explicit or to construct hypotheses and involves bibliographical survey, interviews with people who have had practical experiences with the problem researched, analysis of examples (Gil, 2010), were defined as technical procedures that would help in the generation of conclusive results, the process approach - which arose from the need to formalize processes to develop a strategy, adopting auditing processes through task, in order to raise the aspects and activities considered important for the formulation of a methodological process. (Soria, Lima, Costa, 2005), and the case study from the moment we seek to understand questions of the "how" and "why" nature of an organization scenario (Yin, 2001).

In order to make the research feasible, a survey was first made of articles that deal with the main themes (sustainable operations, sustainable construction, home automation, sustainable product development) in the Scopus database and the Web of Science to establish a conceptual model which would guide the process of analyzing a real case. Based on the established conceptual model, a form was created that would aid the process of collecting data and information in the company selected to carry out the case study. In order to establish this form, the process approach was considered as a reference.

3.1 The conceptual model

First, a key word search was carried out on the basis of Scopus and the Web of Science, from 2012 to 2016, resulting in 1,643 articles (with the elimination of articles duplicated in the databases), which were classified as: process models, models of structure, evaluation/audit models and articles that had no relation with the definition of some model. After this classification were selected the articles that helped in the definition of an audit model for civil construction organizations. Considering the concept of auditing and the scope of this project, a conceptual model was defined as shown in Figure 2.

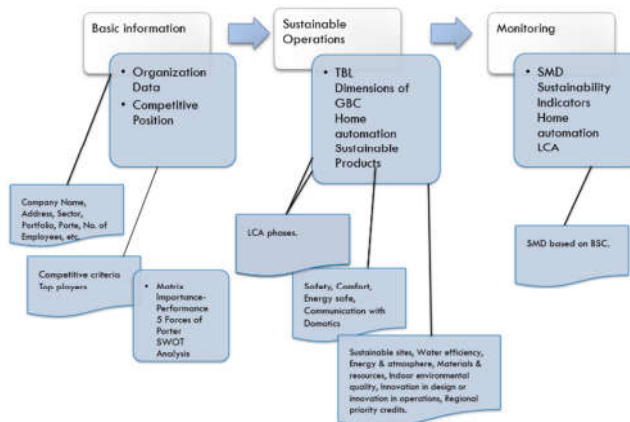


Fig. 2. Conceptual model – *sustainable green building*
Source: the authors 2017.

Based on the conceptual model and using the process approach as reference, task sheets were established that should aid the data collection process. As a way of validating the concepts associated

with green building was carried out in a case study - EuroBusiness, which will be presented in sequence.

4. EuroBusiness – more than a venture, a business model

EuroBusiness is the first venture in Southern Brazil to receive the LEED label distinction in the PLATINUM category. Being the highest possible level of certification, accounting for less than 2% of certified ventures worldwide. This project is a result of the commitment of the companies BBB Management and Planning and Engemática Builder with the environment and the human being that implemented solutions that correspond to the economy of natural resources and the introduction of new technologies to the work, reducing its operational cost and its environmental impact. So EuroBusiness would be a real estate project like any other, if it were not for the fact that it consumes 50% less energy, 80% less water, and get more than 80 points in LEED certification. (EUROBUSINESS, 2016).

EuroBusiness is a shopping center that had its work started in 2011, still from the traditional perspectives of civil construction. Only in August of 2012 was the concept of sustainable operations implemented (MARCOS; EUCLIDES; IGNACHEWSKI, 2016).

Based on green building strategies, the enterprise was the first in the South of Brazil and the second in Latin America to receive the LEED seal in the PLATINUM category, second only to the Eldorado Business Tower, located in São Paulo, which reached 46 Points of a ranking of 61 points in version 2.0 Platinum in the year 2009.

EuroBusiness was evaluated from version 3.0 Platinum reaching 86 out of 110 possible points. To achieve such a high performance, it was necessary to plan and execute successfully (MARCOS; EUCLIDES; IGNACHEWSKI, 2016). Figure 3 shows the EuroBusiness enterprise.



Fig. 3. EuroBusiness.

Source: EuroBusiness Facebook (2016).

The solutions adopted by Eurobusiness (2016) involved high technology throughout the work, reducing its operational cost and its environmental impact with the concern of saving natural resources. Table 3 presents the main strategies adopted for the enterprise.

Table 3 – EuroBusiness strategies.

Feature	Description
Wrapping	The facade reduce the thermal load, ensure the comfort of its occupants and ensure economy in the air conditioning system.
Lighting	Light control is automated, ensuring rational consumption of electrical energy and providing the perfect amount of light for the well being and quality of life at work.
Green roof	It reduces the thermal load, improves the efficiency of the enterprise and reduces the re-emissivity responsible for the greenhouse effect.
Measurement and verification	All systems that consume energy, both in the common and private areas, are monitored. The tenant can connect your meter and monitor your own consumption.
Water use	High efficiency equipment has been installed that reduces water consumption by up to 40%. With the treatment and reuse of water the economy reaches 80%
IAQ & Comfort	"Indoor Air Quality" is one of the hallmarks of a LEED building. Internal air quality control is obsolete. All EuroBusiness environments have the world's most modern air conditioning system, which provides air renewal, filtration and humidity control, ensuring fresh air free of pollutants.

Source: Adapted from EuroBusiness (2016).

Two characteristics stand out in relation to the way in which the management of the enterprise took place: (1) From the moment the certification decision was taken, the management focused on the search for technologies that would guarantee the sustainability of the construction and the vision that it should have a long life (30 years was the period that served as the basis for the development of all projects). All stakeholders were concerned with identifying the most advanced technologies that would ensure compliance with the GBC Aspects, the durability and the low risk of technology obsolescence. (2) The relationship with suppliers, since it was clear to those involved that the win-win relationship was beneficial to all. In this way the search for the best solutions was developed together with the suppliers that eventually became partners.

The project stands out in several dimensions of evaluation, but an aspect that draws attention is the water and sewage treatment system, as can be observed in Figure 4. The treatment of effluents is composed of 9 steps: i) toilet, With efficient discharges, by means of a cyclone system in Sanagloss crockery (nanotechnology), with a double drive of 4,8/3l in recessed box and horizontal outlet; ii) vermifilter, consists of a box of solids, composed of bacterial filters and Californian earthworms (*Eisenia Andrei*); iii) aerator, dilution of black water with drainage water. Oxygenation accelerating the oxygenation of organic matter. Second stage of treatment: iv) Green tower, it is a Biofilter of descending flow that has colony of bacteria, fungi and protozoa filtering the effluent, removing the organic load. The fluent filtered is percolated directly to the Wetland on the green roof; v) Green roof, is a laminar system composed of macrophytic roots and plants (*Papirus*, *Formia* and *Iris*). The process receives water from the rain, which dilutes the effluent and improves the quality of the water. Plants and bacteria located in the roots make the secondary treatment of water; vi) Sand filter and activated charcoal that remove the color, turbidity, taste and odor of the water. Being the 5th step of the treatment; vii) Ozonation. Ozone eliminates all pathogens. And the 6th stage of the treatment called polishing: viii) UV-C treatment. The UV-C post-reaction system of ozone-hydrogen peroxide does a purification of water by eliminating residual hydrogen peroxide and ozone. At this moment the water is fully purified; ix) Coloring agent. Precision chlorine and colorator dispenser. Dyes the treated water with a biodegradable dye of blue color to identify the water as being of reuse.

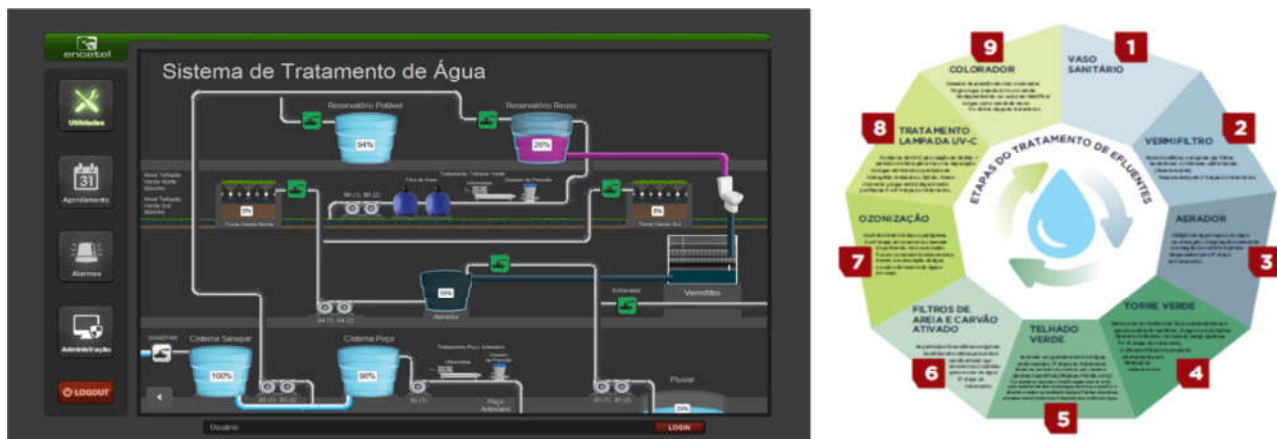


Fig.4. EuroBusiness water and effluent treatment system.
Source: EuroBusiness (2016).

5. Analysis and discussion of data

From a set of specifications obtained from the literature, namely: operations strategies focused on technology (home automation), life cycle analysis with focus on the product (the built building), LEED Certification, added to the concept of Green Building, resulted in the conceptual model presented in the methodology of this article.

Based on the field visit and interview with the entrepreneurs who conceived the EuroBusiness, it was noticeable that the decisions made by them influenced the project of the enterprise and consequently influenced the final product that is the building. This relationship chain of business model and product design added to the conceptual model. Risks stating that the enterprise can be considered beyond a simple building built, is a sustainable business model, therefore, has the design of business model to

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lease and not for sale, in this way, was sought high quality materials, which can further enhance the life of the building. This finding comes from the LCA.

It can be observed that the arrangement involving the conceptual model is aligned with the decisions made by the EuroBusiness administrators, since the sustainable product and the technologies adopted coincide with the literature.

The LEED Certification goes beyond the environmental issue, related to energy reduction or the reuse of water in closed cycle. Quality of life is also considered, whether of the product or in the civil construction, but above all, the elements influence the people's quality of life who will occupy the built environments, being this the health bias.

Based on the audit model (Annex 1) developed and applied to the EuroBusiness enterprise in December/2016, the following evaluation criteria are highlighted:

- The organization clearly understands which competitive criteria are order winners in view of the fact that is a completely innovative enterprise within the market in which it is inserted.
- They formulated a business strategy considering a vision that ensures the sustainability of the organization in the long term. And this characteristic describes the business model adopted by them.
- They planned and developed the venture considering all the dimensions of analysis of Green Buildings. In this way, anticipating the needs for the certification process and going beyond this limit, considering also social aspects that are extremely relevant in the process.
- They sought technological solutions seeking to achieve not only safety, comfort, energy saving and communication. They went beyond identifying and developing technologies with suppliers - in the search for a win-win relationship within the value chain.
- The concern and awareness of the importance of LCA from the time of planning a new business was also clear. This vision guarantee to the business the achievement of its objectives making operations sustainable, because they make the organization consider all aspects related to the areas that were addressed in this research.

6. Conclusion

Several decisions that determine the impact of a company's sustainability are related to sustainable operations management flows, such as product development, choice of technologies, and supply chain management. Therefore, when organizations consider operations management in a sustainable way, they consider operational decisions with the intention of identifying potential opportunities and threats related to the improvement of their ecological efficiency. (DRAKE; SPINLER, 2013).

Today, when thinking about Sustainable Construction, it is clear the relationship that exists with the concept of SOM, since the intention of both concepts is to guarantee the comply with the TBL guaranteeing the sustainability of the business in the market in which it operates, that is, ensuring that the organization reaches and/or maintains its competitive position. Moreover, for this to become possible organizations use a range of technologies (home automation, sustainable products) to ensure that their goals are met.

So, an important part of the sustainable building decision making process is the identification of technologies (product and process) that ensure the achievement of your long-term goals. The selection/decision/acquisition/adoption of the technologies must be completely aligned with the business objectives so that it makes sense to plan the organization.

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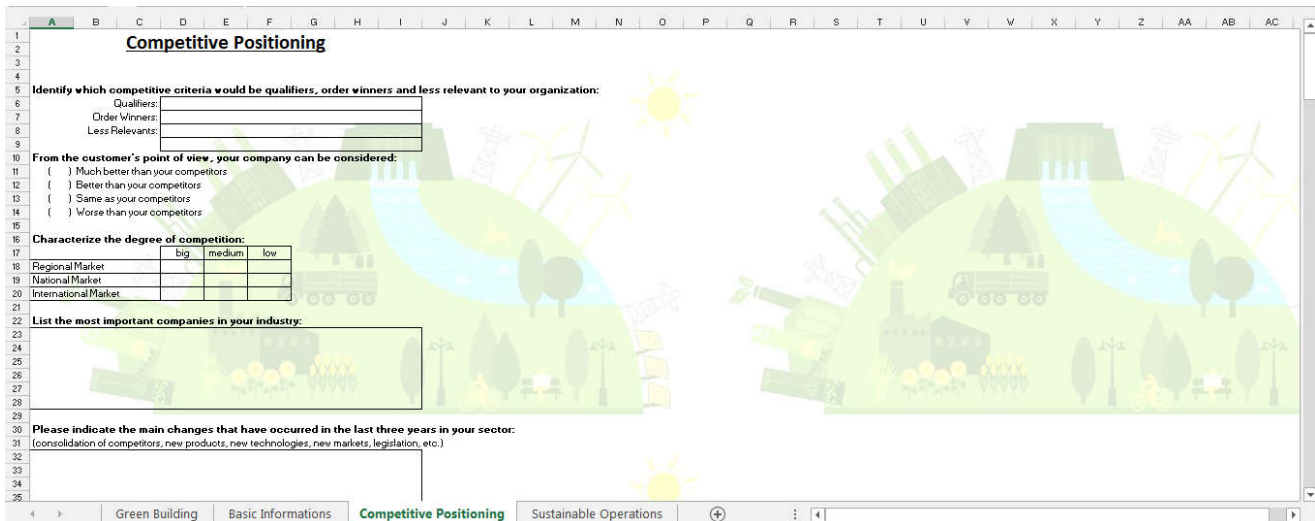
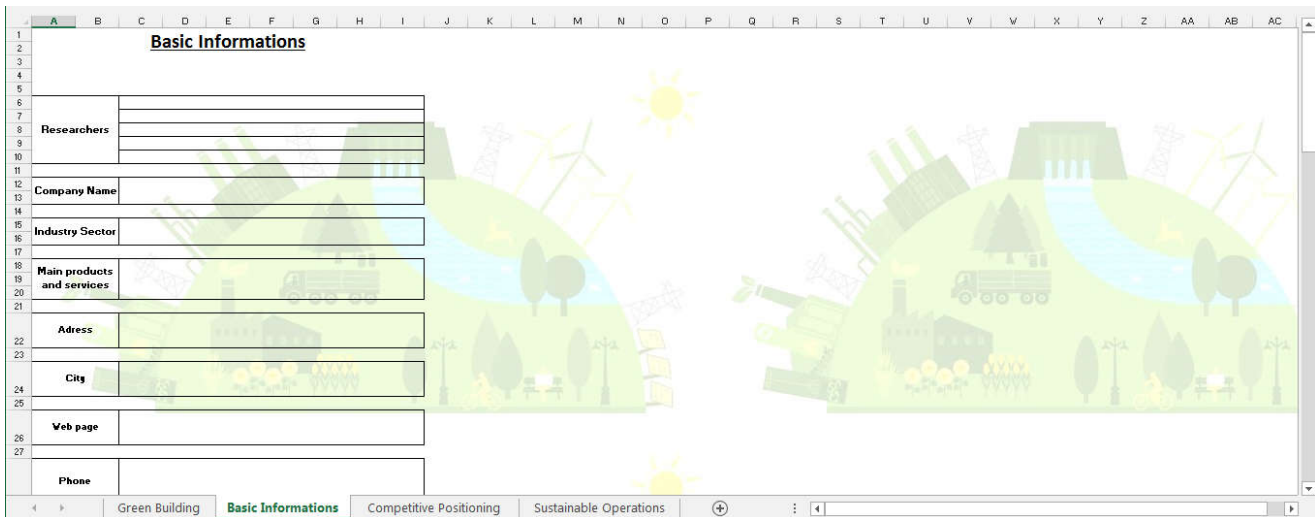
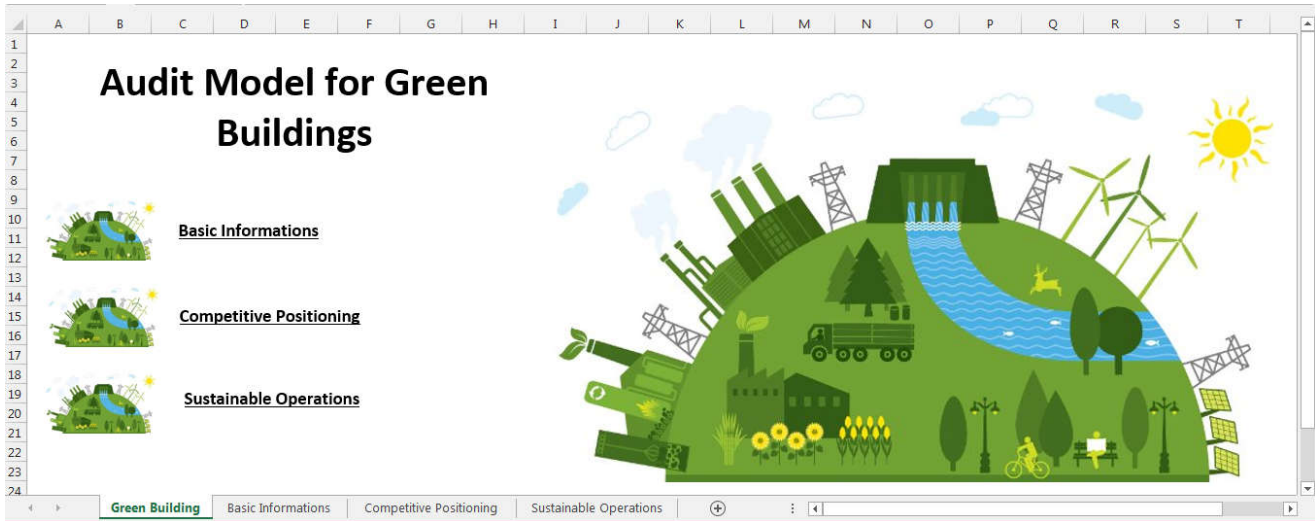
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Annex 1 – Audit Model



Sustainable Operations

In relation to the items presented below indicate which situation best corresponds to the current condition of the organization:
 [where -2 corresponds to an extremely unfavorable condition and +2 corresponds to a very favorable condition]

Item	Scale				
	-2	-1	0	1	2
9 It encourages strategies that minimize the impact on the ecosystem during the implementation of the building and addresses fundamental issues of large urban centers, such as reduction of car use and heat islands.					
10 It promotes innovations for the rational use of water, with a focus on reducing the consumption of drinking water and alternatives of treatment and resource reuse.					
11 It promotes energy efficiency in buildings through simple and innovative strategies, such as energy simulations, measurements, commissioning of systems and use of efficient equipment and systems.					
12 It encourages the use of materials of low environmental impact (recycled, regional, recyclable, of reuse, etc.) and reduces the generation of waste, besides promoting the conscious discard, diverting the volume of waste generated from the landfills.					
13 It promotes the internal environmental quality of the air, essential for environments with high permanence of people, focusing on the choice of materials with low emission of volatile organic compounds, controllability of systems, thermal comfort and prioritization of spaces with external view and natural light.					
14 It encourages the search for knowledge about Green Buildings, as well as the creation of design measures not described in the LEED categories. Exemplary performance.					

Legend:
 GBC (Green Building Council)
 Domotics (Smart Home Technology)
 Sustainable products

Navigation: Green Building | Basic Informations | Competitive Positioning | **Sustainable Operations**