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How to measure sustainability? – a study of the main techniques and indicators

GLEBERSON DE SANTANA DOS SANTOS
UNIVERSIDADE FEDERAL DE PELOTAS
glebersonsantana@hotmail.com

ANDREIA APARECIDA PANDOLFI DOS SANTOS
UNISUL - UNIVERSIDADE DO SUL DE SANTA CATARINA
andripandolfi@yahoo.com.br

HOW TO MEASURE SUSTAINABILITY? – A STUDY OF THE MAIN TECHNIQUES AND INDICATORS

Resumo. A sustentabilidade tem sido a tônica de diversas conferências, debates, fóruns. Tema relativamente recente, tendo suas primeiras discussões a partir dos movimentos ambientalistas na década de 1960, hodiernamente tem ganhado destaque, ao passo que conferências internacionais vêm questionando sobre os problemas ambientais, sociais e econômicos a nível global. Mas como mensurar a sustentabilidade? O objetivo deste trabalho é demonstrar os principais indicadores de sustentabilidade utilizados por empresas nacionais e internacionais consideradas sustentáveis. Trata-se de uma pesquisa secundária, de caráter qualitativo. Dos indicadores pesquisados, destacaram-se o Global Reporting Initiative, Ethos, Ecological Footprint, Dashboard of Sustainability e Barometer of Sustainability. Neste estudo foi possível notar que o uso de tais indicadores deve levar em consideração o contexto organizacional e saber o que se quer alcançar em comunhão com o planejamento. Não é tarefa fácil, pois requer a participação de todos, principalmente daqueles que irão medir e gestioná-los; a comunicação destes indicadores deverá ocorrer com os envolvidos direta ou indiretamente nos resultados, exigindo em alguns casos mudanças, alteração para estruturas pouco mais flexíveis, sendo necessária a quebra de alguns paradigmas e evitar comportamentos de resistência.

Palavras-chave: Sustentabilidade; Indicadores de Sustentabilidade; Global Reporting Initiative; Dashboard of Sustainability; Barometer of Sustainability.

Abstract. Sustainability has been the keynote of several conferences, meeting, debates, forums. Issue relatively recent, taking their first discussions from the environmental movement in the 1960s, in our times has gained prominence, while international conferences are questioning about the environmental, social and economic problems globally. But how to measure sustainability? The objective of this study is to demonstrate the key sustainability indicators used by national and international sustainable companies. This is a secondary research, with approach qualitative. The main indicators were Global Reporting Initiative, Ethos, Ecological Footprint, Dashboard of Sustainability and Barometer of Sustainability. In this study it was possible to note that the use of such indicators should take into account the organizational context and know what the company want to achieve in communion with the planning. It is no easy task, as it requires the participation of everyone, especially those who will measure and manages them; the communication of these indicators should take place with those directly or indirectly involved in the results, requiring in some cases change, change to little more flexible structures, requiring breaking some paradigms and behaviors to avoid resistance.

Keywords: Sustainability; Sustainability Indicators; Global Reporting Initiative; Dashboard of Sustainability; Barometer of Sustainability.

1 Introduction

In the Administration study the planning is a crucial role to shape the future of the organization. As important as planning undoubtedly is control - another function of management that is based on the monitoring of activities in order to ensure compliance with the planned and possible detection of deviations incurred in the execution process. From there, how to measure whether what was previously planned is being achieved by the organization? To answer this question is simple: through strategic indicators.

When it comes to indicators we think just the liquidity ratios, solvency, indebtedness, profitability, profitability, and other financial nature. However, with the resource-based view, companies in the search for competitive advantage through own resources (products) adopted by the ISOs certain production standards, focusing on the strategy of differentiation through quality. In the context in which we live, quality is no longer a competitive advantage and to became a requirement. Those organizations which do not have products with certain quality standards are certainly not competitive and therefore are doomed to failure.

In the context of sustainability, organizations and government agencies have sought the creation and adoption of sustainability indicators for, among other functions, to show society the degree of the company's commitment to the subject, and to disseminate its good practices. Some indexes are already known: the Dow Jones Sustainability, Corporate Sustainability Index Bovespa, the Ethos Indicators, IBase, emergence of new standards such as OHSAS 18001 and ISO 26000, in addition to the use of new initiatives such as the UN Global Compact and the Global Reporting Initiative. (Mastroti & Souza, 2011).

These sustainability indicators aim at show how the organization contributes, or aims to contribute to the improvement of economic, social and environmental conditions. "The reports on these indicators should seek to express the performance in relation to broader concepts of sustainability, involving the organization's performance in the context of the discussion of the limits and demands on environmental or social resources at the sectoral, local or global." (Callado, & Fensterseifer, 2009, p.217).

The sustainability indicators should include: about financial perspective, the direct economic impacts to key stakeholders of the organization (customers, suppliers, employees, investors and government); under environmental perspective, the impacts caused by the company's activity to the environment, tangenciado on the use of materials, energy, water, waste emissions etc .; and social perspective, aimed to labor practices, human rights, society and responsibility for goods and services, relating data on employment, employee relations, health and safety, human well-being, training and corporate education, diversity and others.

In this context, it makes objective of this study to demonstrate the key indicators of sustainability and environmental management models more propagated in the academic and corporate level used by sustainable companies both nationally as internationally.

This paper is organized into six sections, plus the current. The next chapter deals with the sustainability and indicators theme, based on several authors. In the following section the methodological procedures are discussed. The fourth chapter is aimed at describing and analyzing the results. In the following section the main conclusions are presented and finally are pointed references used in this study.

2 Literature review

This section will present the main ideas about the theme of sustainability, historical context, concepts, their relationship with traditional and modern management of companies and triple bottom line. In addition, they will be presented concepts of sustainability indicators, its importance and conception.

2.1 Sustainability

Different theories about environmental protection are recent compared to the other theories belonging to other sciences. According Gaviolli, Francisco & Sehnem (2016), this issue, although recent, has been discussed from a historical process and awareness of environmental problems, economic crisis and social inequalities, being too complex and should be continuing and systematic.

In the early twentieth century was the division of theories on protection of the natural environment preserved land and conservationism. The first concerns up the idea of preserving the virgin areas of any use was not recreational and educational nature, while the second assumed to be efficient and rational planning of the use of natural resources like soil, forests, and wildlife water (Afonso, 2006).

The United Nations Conference on the Human Environment, in 1972, known as the Stockholm Conference is considered milestone in discussions of environmental issues by engaging political, social and economic environmental problems. At the conference they were confronted the interests of developed and undeveloped. The first concerned with increasing environmental degradation that resonated in the quality of life threat, while others suffer apprehensive export restrictions and barriers of their primary products and have their development stopped. One of the conclusions of the meeting to the solution of environmental problems was merely the poverty extinction (Nascimento, 2012).

The Club of Rome report contributed impact to the Stockholm meeting, proposing the deceleration of industrial development in developing countries and population growth in developing countries, since the model and industrialization process were highly polluting and poverty in developing countries was attributed to increased population. In addition to the report of the first to provide assistance to the latter could develop in the event it was shown that economic growth is on a collision course with environmental preservation (Morais Neto Pereira & Maccari, 2012). Created in 1968, the Club of Rome was formed by 36 scientists and economists who were busy studying the overall impact of the interrelations between industrial production and use of natural resources. (Meadows et al., 1972, Silva, & Pereira, 2008, Nascimento, 2012).

However, in view of the results achieved were insignificant in the face of continuous environmental degradation (Vizeu, Meneghetti & Seifert, 2012), in December 1983, the Secretary General of the United Nations pointed to coordinate an independent commission with an emphasis on problems related to environmental crisis and development the then Prime Minister of Norway Gro Harlem Brundtland, then. This initiative, known as the World Commission on Environment and Development, which had ended its work in 1987 with the publication of the report “Our Common Future”, also known as the “Brundtland Report”.

It was in the Brundtland report that the expression “sustainable development” was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. (World Commission On Economic Development – WCED, 1987, p. 43).

According Afonso (2006), sustainability is the result of discussions and debates started in the 1960s, involving the quantitative and qualitative maintenance of the stock of environmental resources, using such resources without damaging their sources or limit the supply capacity future, so that both current needs as those of the future can also be met.

In Araújo's view (2008, p. 23), sustainability is defined as the "ability to sustain and it incorporates two conditions within the concept of sustainability - a natural ability to support and sustain, both on the concept of durability". In this regard, Almeida (2009) confirms the

sustainability reflects the possibility of enjoying good quality of life without damaging or altering the ecosystem, that is, within the aspect of resilience.

Aligleri (2011) relates sustainability as a paradigm that enables continuity of life, ensuring the maintenance of human civilization throughout the generations and sets the harmonization of economic efficiency, social equity and ecological prudence implying the compatibility of models of production and management of institutions social with the system of organization and nature conservation. The author to define sustainability, has as fundamental studies of Elkington (2001), which confirms that the business context, organizations should develop a better understanding of the new visions of the meaning of social inequality, environmental justice and ethics, which It implies not only the financial aspect of capital, but covers the human and natural capital. (Elkington, 2001).

The principle of sustainability in the corporate perspective appears frequently invoking the triple bottom line, whose basic matrix is seeking continuity in the market and in the organization's growth from its economic viability, as well as harmonious coexistence with the environment and society. (Elkington, 2001, Hart & Milstein, 2004, Benites & Pólo, 2013).

In this sense, the integration of these pillars is generated so that, in the environmental sphere, natural resources are used in a manner not detrimental to future generations by reducing the action of the impacts of industries; the economic pillar, it is essential to preserve the company's profitability and not compromise their economic development; in social matters, including the issue of social justice, the ultimate goal is the development of a more just world through relationships with all stakeholders. (Elkington, 2001, Kneipp *et al*., 2012).

Defending this position, in the perception of Brandão, Barbieri, & Reyes (2015), sustainable development, mainly in the local dimension should be based on three pillars of sustainability, namely environmental protection, social justice and economic efficiency. His priority is to improve the quality of life of communities and achieving a more sustainable "modus vivendi".

The incorporation of sustainability in political and strategic scope of the organization, according Gavioli, Francisco & Sehnem (2016), has been the focus of corporate performance in recent times, which enables you to obtain positive results and reaffirm its commitment to sustainable development, bringing positive results, whereas stakholders can view their practices. They also ratify concerned organizations with sustainable development and a better quality of life of its stakeholders and the planet itself, have the immediate recognition of their public and consequently the expansion of its positive financial results. The model of sustainable value makes clear the nature and magnitude of the opportunities associated with sustainable development and connects the dimensions of value creation to the company (Gavioli, Francisco & Sehnem, 2016).

2.2 Sustainability Indicators

According Aligleri (2011), grows increasingly the search for a management model that enables a balance between demands for low cost, high quality standards and increased competitiveness with the analysis of ethical, social and environmental issues, helping to provide consistency in the link between the company's relationship with the demands and expectations of society.

Tachizawa (2011) corroborates this assumption stating that a management model depends on measurement, reporting and analysis. Thus, he suggests that the methodological approach are defined indicators that can be structured as a relationship between two variables in the form of numerator and denominator in their attributes and values are measurement feasible. According to Callado (2010, p. 39), indicators "are central tools for allowing

monitoring of the main variables of interest of the company and enable planning of actions aiming performance improvement."

Hanai & Espíndola (2011) conceptualize indicators as variables representing an attribute, whether, quality, characteristic or property of a system, which aim to synthesize the essential information about their viability and their transformation and inform the state a system, and to intervene and correct its direction to certain goals. According to Souza (2011), indicators are selected parameters addressed individually or together, considered important to reflect on certain conditions of the systems under consideration. For Raupp, Selig & Viegas (2011, p. 130) authors, indicators are nothing more than "descriptors that report on progress toward a goal set, or elements that indicate trends not always easily detectable." In Van Bellen's (2006) view, indicators should provide ease in the communication process on the theme sustainability, representing the concept of numerical data, descriptive measures and guideline signs.

Hanai & Espíndola (2011) point out that in the case of sustainability, its measurement can not be seen from the point of view of a static situation, but as an integrated measurement over time to document processes, able to show trends in line to inherent inserted temporal dimension in the concept of sustainable development. For Raupp, Selig & Viegas (2011) sustainability indicators enable assessing of the evolution of certain trends and situations facing the ecosystem aspects, human societies and their interrelations.

According to Vasconcelos, Andrade & Cândido (2009), the construction of sustainability indicators is complex because it seeks to demonstrate the relationship between society and the environment in a broad perspective, considering numerous factors involved. "Adopting a systemic approach on this issue is necessary so that we can understand the reality of the facts, since forming elements have mutual influence". (Vasconcelos, Andrade & Cândido, 2009, p. 108).

For Tachizawa (2011), the indicators need to be easy to measure and easy to understand for those who will use them daily. Furthermore, they should reflect the corporate strategies of the organization, being a tool of control. The information needed for the evaluation and performance improvement include those related to the production process, product performance, the market, suppliers, employees and other aspects.

Mazon (2007) contributes stating that the nature and purpose of sustainability indicators must be accurate, repeatable, reproducible and stable, in the sense that ownership of the precision and reproducibility will not deteriorate over time. The selection of indicators should pass the test of "utility" and "practicality", including its complexity, possible resistance and the costs involved in its observation.

To incorporate indicators in the traditional routine management of the companies they have to be shown to employees the gains and advantages that the definition of good indicators will bring. Therefore, the indicators need to be developed and defined involving the professionals who will measure them. Employees need to feel part of the management system so that there is effectiveness in the process of measurement and control indicators. To perform results dissemination moments, with regular meetings, demonstrates the importance that the organization gives to the indicators and to actions taken by responsible, to be manager, director or leaders (Matroti, & Souza, 2011).

However, the use of such indicators should take into account the organizational context and know what the corporation want to achieve in communion with the planning. This is no easy task, as it requires the participation of everyone, especially those who will measure and manages them; communication of these indicators should take place with those directly or indirectly involved in the results, requiring in some cases change, modify to more flexible structures, requiring even breaking some paradigms, and the need to avoid behavior of resistance. All these prerequisites are necessary for organizational control guarantee more

efficient and effective through the use of indicators. (Matroti, & Souza, 2011, Tachizawa, 2011).

3 Methodology

For the study used a qualitative approach, based on the study that describes and analyzes a situation in the light of theories. In this case, it correlated with the perception of some authors on the subject of sustainability indicators and indices of sustainability and sustainable management models. In qualitative research "the natural environment is the direct source for data collection and the researcher is the key tool". (Kauark, Manhães & Medeiros, 2010, p. 26).

This is a secondary search, which carried out a survey of the main tools of analysis of sustainable development cited and used in academia. The described tools are: the Global Reporting Initiative, Ethos Indicators of Social Responsibility, Ecological Footprint, Dashboard of Sustainability and Barometer of Sustainability.

4 Presentation and Analysis of Results

The studies directed to the discussion of sustainable development often face difficulties in dealing with the lack of information that can measure the sustainability of a region (Rodrigues, Rippel, 2015). According Sehnem et al. (2012) research on the topic of sustainability and the measurement techniques is very recent and is in its early stage in Brazil, a field to be fully explored and investigated. Although recent, there are some measurement tools that are widely used in national and international level.

4.1 Global Reporting Initiative

This instrument is classified by Barbieri & Cajazeira (2009) as one that aims to ensure transparency and communication with stakeholders, first developed in 1997 in the United States, with the aim of improving the quality of environmental information available and the risk of the companies performance.

GRI is a non-profit organization, based in the Netherlands, which has sought to provide guidelines and matrices of indicators which allow to all organizations, whether corporations, businesses, government organizations and non-governmental organizations (NGOs), regardless of their structure, size, economic sector or location, to structure its sustainable reporting, both in terms of content and in terms of coverage. The GRI has positioned itself as an international standard for developing consistent approaches to publication of the environmental performance of companies through reports in order to measure and certify companies with parameters beyond the issue of transparency and good corporate governance. (Carreira & Palma, 2012, Benites & Pólo, 2013, Calixto, 2013, GRI, 2013).

The GRI aims to meet the need for a clear and transparent communication on a global sphere sharing structures concepts presented in a coherent language through a reliable framework for the preparation of sustainability reports, and may be adopted by all sizes organizations and economic segments of any locations. (Souza & Lopes, 2010, Corrêa, Ribeiro & Souza, 2014).

The GRI went through reformulations and implementation of indicators and aspects of its primary version in 2000 to the present, in 2013. In its first version, the G1, in 2000, the GRI released the first "framework" of guidance for sustainable reporting with 50 organizations to adopt it in the same year. (Rosa *et al*, 2013).

The effort to improve the transparency of reporting allowed launched in 2002, a second picture, more full of guidelines, G2, and 150 organizations have developed sustainability reports this year, following the guidelines of the GRI. In 2006 the GRI released the G3, the third generation of guidelines for reporting, which contains a large number of indicators as well as guidelines for the inclusion of content, with respect to the relevance and extent of reporting. (Rosa, 2011; Carreira & Palma, 2012).

Sustainable reporting assumes increasingly the character of transparency desired by stakeholders. Six years later, in 2011, the GRI provides a further update on sustainable reporting, the G3.1. This version turns out to be a completion of the previous G3, which provides guidance on how organizations can disclose their sustainability performance, expanding the story and covering aspects related to Human Rights, the Impacts on the Local Community and Gender. The commitment of the GRI is continuous so that in 2013 announced its fourth generation, G4, whose aspects are mentioned by Table 1. [Rosa, 2011, Carreira & Palma, 2012; Rosa *et al*, 2013]. Table 1 shows the categories and aspects dealt with in the fourth generation of the GRI model.

Table 1 – Categories and aspects of the GRI-G4 guidelines

Category	**Economic**	**Environmental**		
Aspects	Economic Performance; Market Presence; Indirect economic impacts; Purchasing practices.	Materials; Energy; Water; Biodiversity; Emissions; Effluents and waste; Products and services; Conformity; Transport; General; Environmental assessment of suppliers; Mechanisms for complaints and complaints regarding environmental impacts.		
Category	**Social**			
Sub-categorys	**- Labor practices and decent work**	**Human rights**	**Society**	**Product responsibility**
Aspects	Employment; Working relationships; Health and safety at Work; Training and education; Diversity and equal opportunities; Equal pay for women and men; Evaluation of suppliers in labor practices; Mechanisms for complaints and complaints related to labor practices.	Investments; Non-discrimination; Freedom of association and collective bargaining; Child labor; forced or compulsory labor; Safety practices; Indigenous rights; Evaluation; Evaluation of suppliers for Human Rights; Mechanisms for complaints and grievances related to human rights.	Local Communities; Fight against corruption; Public policy; Unfair competition; Conformity; Supplier evaluation on impacts on society; Mechanisms for complaints and claims relating to impact on society.	Customer health and safety; Labeling of products and services; marketing communications; customer privacy; Conformity..

Sourch: *Global Reporting Initiative* (2013, p. 71).

It is necessary to mention that the GRI is complex and deals with indicators organized into three broad categories, economic, environmental and social, and this is presented four

subcategories: labor practices and decent work, human rights, society and product responsibility.

4.2 Ethos Social Responsibility Indicators

The Ethos Institute of Social Responsibility is a nonprofit organization whose foundation is dated 1998 and developed, making available to society indicators focused on social responsibility, providing resources and information to prepare a Social Report. Such indicators, which cover the issues values, transparency and governance, internal public, environment, suppliers, consumers and customers, community and government and society are built-in tools that enable diagnosis and evaluation of management regarding the incorporation of social responsibility. The mission of the Ethos Institute is guided to mobilize, sensitize and help companies manage their socially responsible form of business, forming partnerships in building a more sustainable and just society. (Campos, 2005, Mazon, 2007, Aligleri, 2011, Ethos, 2014).

The Ethos Institute (2014) seeks to disseminate the practice of corporate social responsibility, helping organizations to: - to understand and incorporate progressively the concept of socially responsible corporate behavior; - to implement policies and practices that meet high ethical criteria, contributing to the achievement of sustainable economic success in the long term; - to assume its responsibilities with all those affected by their activities.

4.3 Ecological Footprint – EF

The Ecological Footprint has emerged in 1996 through the launch of the book "Our ecological footprint" of Wackernagel and Rees (1996) and aims to measure more specifically the use of nature by human communities. This indicator works as a representation of the ecological space to sustain a given system or unit. (Van Bellen, 2006, Veiga, 2010, 2013; Carvalho, 2012).

According to Veiga (2010, p. 181-182), “starting from the fact that the productive area available to each inhabitant of the planet does not reach 2 hectares (1.86 ha), this NGO Californian showed that each US resident already It uses more than five times (9.71 ha)”. Souza (2011) reports that this indicator identifies the dependency relationships between human activities and natural resources needed for maintenance.

The author also explains that this is an assessment and analysis of the impact of human actions at the national, regional and per capita in relation to the ecosystem load capacities. In this phenomenon capacity of ecosystems forward to the action of man, Almeida (2009) alludes to the “resilience” and Veiga (2013, p. 85-87) cites the “biocapacity”. The first concept is related to the ability of a system to withstand impacts while the second concerns the “capacity of ecosystems to produce useful biological materials and to absorb waste generated by human populations, in accordance with current technological standards and management”.

The Ecological Footprint is represented at an equivalent area, expressed in global hectares (gha) and aims to indicate the area of the biosphere needed to support certain demand caused by human consumption.

According to the Global Footprint Network (GFN, 2014), growth in Ecological Footprint is largely attributable to the carbon footprint, which increased to understand 53% (fifty-three percent) of the Footprint in 2010, against 36% (thirty-six percent) in 1961. Carbon emissions (in particular) and food demand are the main climbing Footprint engines. Moreover, from the years 1961-2010, the global human population has increased from 3.1 to 6.9 billion, and per capita Ecological Footprint increased 2.5-2.6 global hectares. Figure 1

displays the "biocapacity" world average by country, they were considered all countries with larger populations of 1 million people. Brazil appears in the 53rd position in the ranking of countries with the highest per capita Ecological Footprint global hectares required per person on average 3 hag, while the world average biocapacity per person was 1.7 gha in 2010 (Global Footprint Network, 2014)

4.4 Dashboard of Sustainability

Early research on the Dashboard of Sustainability dating from the second half of the 1990s, in order to formulate a robust tool of sustainability indicators that were internationally accepted. In an effort of various institutions, the research was led by the Consultative Group on Sustainable Development Indicators, CGSDI, created in 2006 with the mission to promote cooperation, coordination and strategies among individuals and key institutions involved in the development and use of development indicators sustainable.

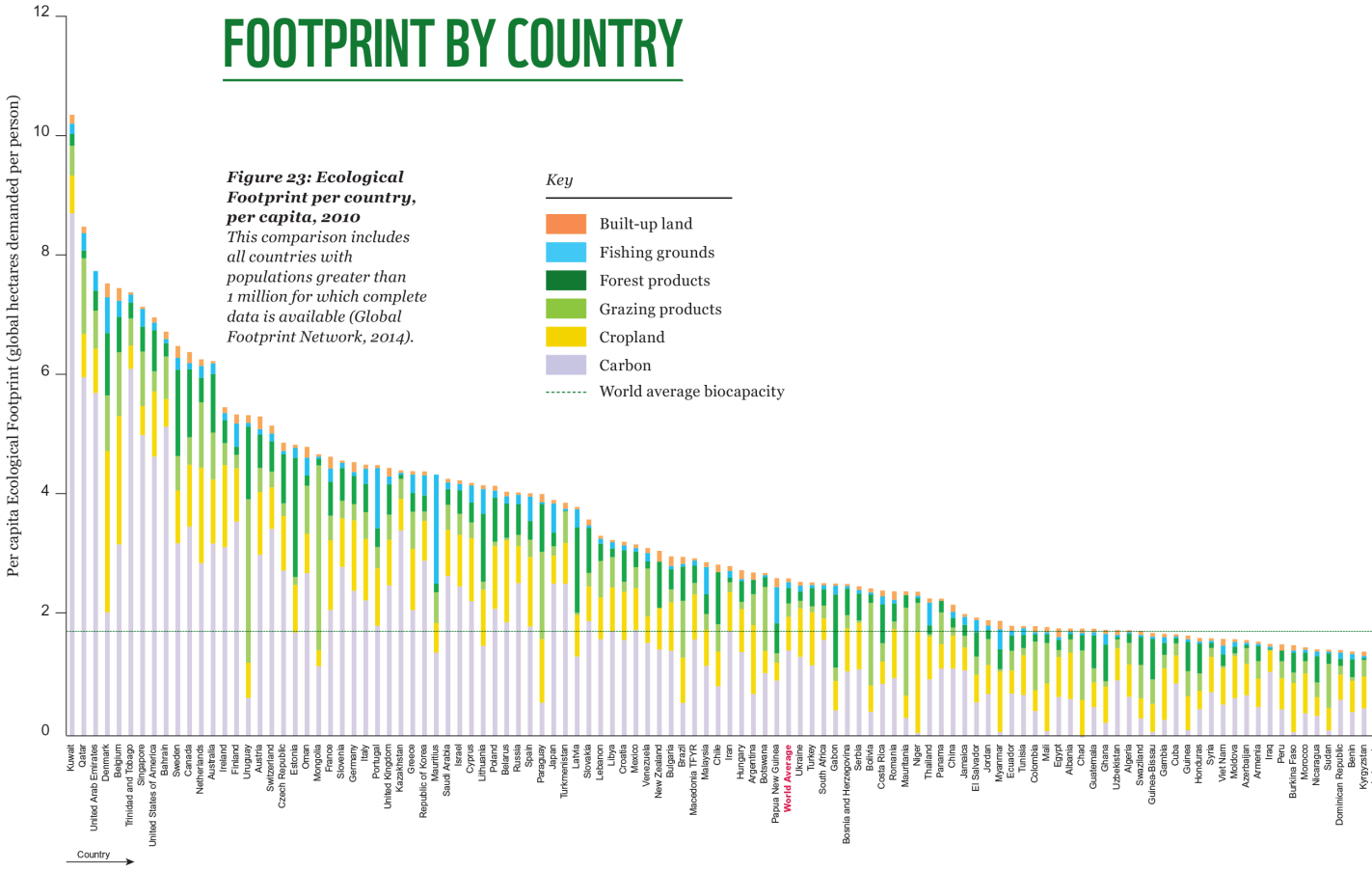
After discussions and meetings, the CGSDI created an aggregate conceptual system that provided information about the path of development and the degree of sustainability; This system called Compass of Sustainability, in 1998. Soon after, the following year, the group created a model called Dashboard of Sustainability. Dashboard because it alludes to the set of control instruments simulating the windshield of a car, a kind of metaphor to assess the degree and direction of the object of study (country, region, or any other unit of interest, as a municipality and organizations) in relation to sustainability.

An early version of the Dashboard of Sustainability in 2000, was built by a dashboard of three visual displays corresponding to three groups or blocks aimed at measuring the economic performance, social and environmental aspects of the object of study (Souza, Cruz & Ribeiro, 2006, Van Bellen, 2006, Campos & Ribeiro, 2007; Souza, 2011).

According to Van Bellen (2006), the Dashboard of Sustainability was formulated from the holistic view with a related approach to systems theory, in which sustainability indicators refer to a combination of environmental, economic and social trends. These allow it to display the interaction of these three dimensions. In this sense, it is a communication tool that can serve as an important guide for decision makers and the general public, using visual means of presentation to show the primary dimensions of sustainability by providing quantitative and qualitative information on progress towards sustainability. A more recent representation of the Dashboard of Sustainability is shown by Figure 2.

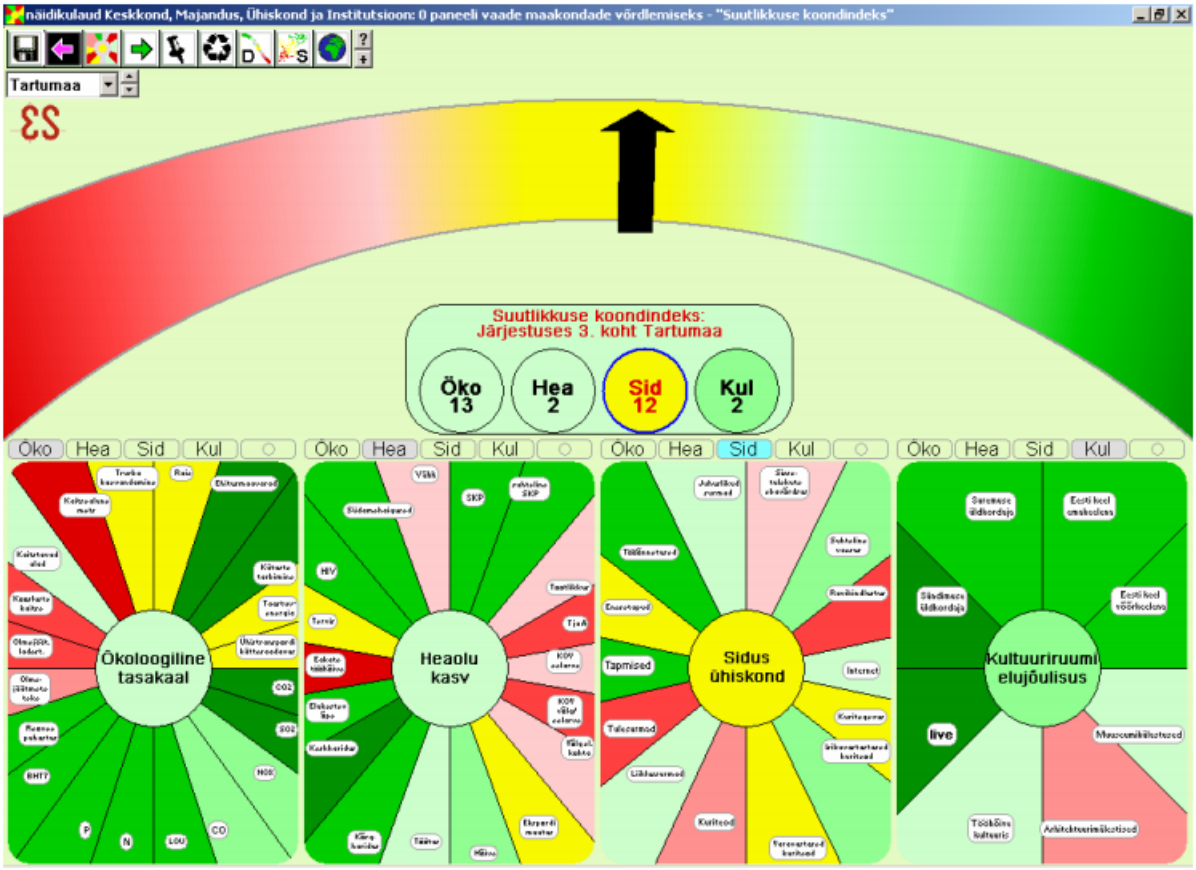
The dimensions of the Dashboard of Sustainability are four: ecological, social, economic and institutional, measured across a range of colors ranging from green, yellow to red. These colors are defined for each indicator from the simple linear regression of data between two extreme values, where the highest value receives 1000 (thousand) points and the lowest value receives a score of 0 (zero). Green represents performance had "excellent", yellow "medium" and red is a performance "critical". According to the classification performance of the variables of the Dashboard of Sustainability, are presented nine gradations of these colors. (Van Bellen, 2006, Dashboard Of Sustainability Manual, CGSDI 2015). The main indicators of flow and stock for each size of the Dashboard of Sustainability, is shown in Table 2, in the section Appendix A.

Figure 1 – Ecological Footprint by Country (global hectares demanded per person)



Sourch: *Global Footprint Network* (2014).

Figure 2 – Current version of the representation of the Dashboard of Sustainability.



Sourch: Manual Dashboard of Sustainability Consultative Group on Sustainable Development Indicators (CGSDI, 2015).

According Van Bellen (2006), Souza, Cruz & Ribeiro (2006), Campos & Ribeiro (2007), Souza (2011), Carvalho (2012) the Dashboard of Sustainability system also has some limitations, requiring improvements. One is that the preliminary indicators should consider internationally recognized set of indicators, so that the tool becomes more relevant and attractive enough to the main actors involved with evaluation experience; these indicators should relate to the suggested by the Sustainable Development Commission of the United Nations, addressing four dimensions: economic, social, ecological and institutional; the software must be further refined and to allow the use of a larger database to make an interactive basis.

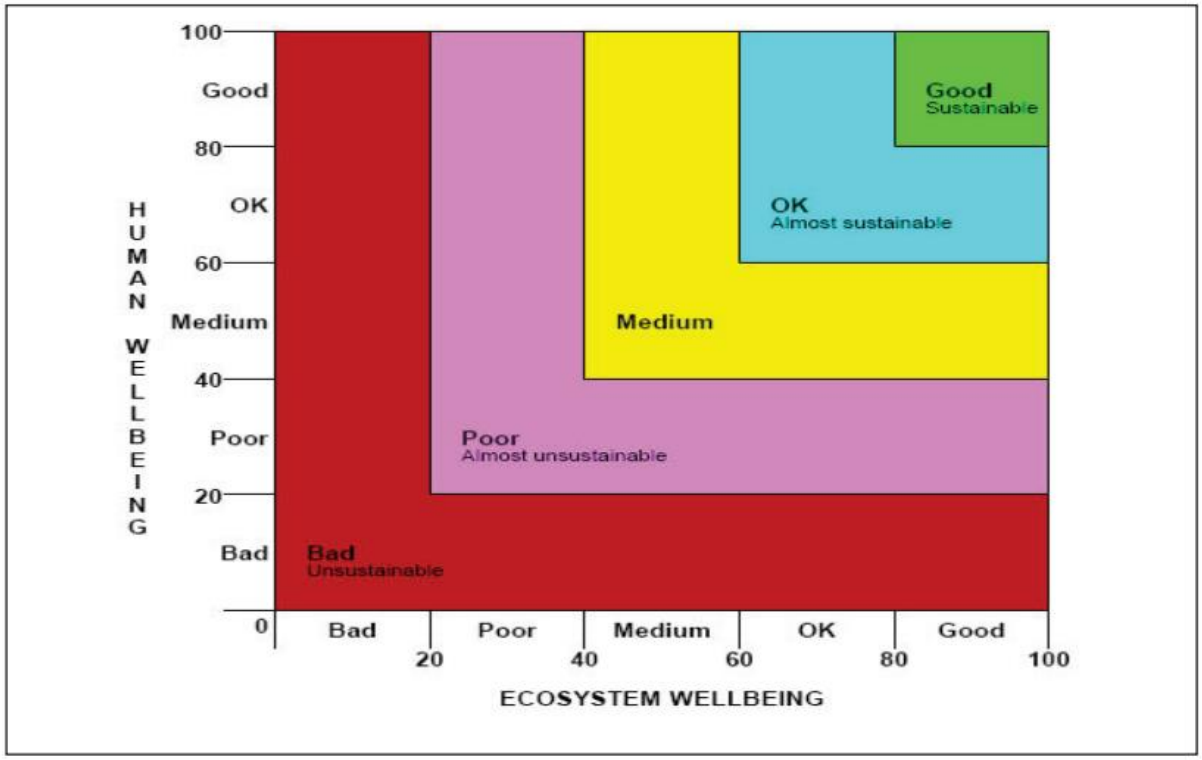
4.5 Barometer of Sustainability

The Barometer of Sustainability was developed as a systemic model directed primarily to its users, in particular to governmental and non-governmental agencies, decision makers and people involved with issues of sustainable development, in order to measure sustainability. This assessment tool was formulated by experts and scholars related to institutes The World Conservation Union, WCU and The International Development Research Centre, IDRC, and Prescott-Allen as one of the researchers involved in the development of such a system. (Van Bellen, 2006, Souza, 2011).

The Barometer of Sustainability is a methodology that proposes to assess and report on progress towards sustainable societies and integrating coherently, several social and environmental nature of indicators, providing an assessment of the state of people and the environment through an index scale ranging from 0 (zero) to 100 (one hundred) divided into

five sectors every 20 points, and each sector corresponds to a color ranging from red to green, which assigned rating is assessed as bad, poor, average, reasonable and good to call, according to theoretical orientation, as untenable, potentially unsustainable, intermediate, potentially sustainable and sustainable. The related indexes are presented through a graphical representation, as shown in Figure 3, to facilitate understanding and provide an overview of the state of the environment and society (Prescott-Allen, 1999, Van Bellen, 2006, Souza, 2011, Carvalho, 2012, Oliveira, Oliveira & Carniello, 2015).

Figure 3 – *Barometer of Sustainability*.



Sourch: Prescott-Allen (1999).

In the Barometer of Sustainability, the sustainability is based on the values for the contents of the "ecosphere" and the social well-being, where is possible add sub-indices if they exist. In the first aspect, the social welfare, identifies trends of ecological function in time, and the related subaspects water, earth, air, biodiversity and use of resources. But the social aspect is well is the welfare level of the society, being a function of individual well-being, health, education, unemployment, poverty, income, crime and human and business activities. The condition generated by the Barometer of Sustainability is that a company will be close to sustainability if your welfare condition is high and stress on the ecological system, which is interpreted as opposed to environmental well-being is low. (Van Bellen, 2006, Souza, 2011, Oliveira, Oliveira & Carniello, 2015).

The barometer tool uses two subsystems, human and environmental, of which derive five dimensions each, as shown in Table 3 of Appendix B, in order to formulate a system for all evaluations.

5. Final considerations

The objective of this study was to demonstrate the key indicators of sustainability and environmental management models more propagated in the academic and corporate level used by companies considered sustainable. According Brandão, Barbieri & Reyes Jr. (2015),

indicators usually respond to issues relating to natural resources, concerns about economic sustainability, issues relating to cultural assets and social values.

About the sustainability indicators, Mazon (2007) reports that the nature and purpose of indicators, they must be accurate, repeatable, reproducible and stable, in the sense that ownership of the precision and reproducibility will not deteriorate over time. The selection of indicators should pass the test of "utility" and "practicality", including its complexity, possible resistance and the costs involved in its observation.

To incorporate indicators in the traditional routine management of the companies is important that they have being shown to employees the gains that the definition of good indicators will. Therefore, the indicators need to be developed and defined involving the professionals who will measure them. To perform results dissemination moments, with regular meetings it demonstrates the importance that the organization gives indicators and actions taken by responsible (Mastroti & Souza, 2011).

According to Sehnem, Lukas & Marques (2015) authors, the preparation of a sustainability report, such as the GRI models stems from a process of engagement of stakeholders adopted by the organization in its ongoing activities, where the documentation is essential processes and approach taken in the decision-making process. Therefore, it is vital to have trained human resources and available to develop such actions. Engagement with stakeholders to seek compliance with internationally recognized standards and to inform organizational processes, and business is of paramount importance.

In this study it was possible to note that the use of such indicators should take into account the organizational context and know what the company want to achieve in communion with the planning. It is no easy task, as it requires the participation of everyone, especially those who will measure and manages them; the communication of these indicators should take place with those directly or indirectly involved in the results, requiring in some cases change, change to little more flexible structures, requiring breaking some paradigms and behaviors to avoid resistance. All these prerequisites are necessary for organizational control guarantee more efficient and effective through the use of indicators (Mastroti & Souza, 2011, Tachizawa, 2011).

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Appendix A
Flow indicators and stock Dashboard of Sustainability

Van Bellen (2006, p. 135) presents the main flow indicators and stock for each size of the Dashboard of Sustainability, as shown in Table 2.

Table 2 – Flow indicators and stock Dashboard of Sustainability

Dimension	Indicator
Ecological	- Climate change; - Depletion of the ozone layer; - Air quality; - Agriculture; - Forests; - Desertification; - Urbanization; - Coastal zone; - Fishing; - Amount of water; - Ecosystem; - Species.
Social	- Poverty index; - Gender equality; - Nutritional support; - Cheers; - Mortality - Sanitary conditions; - Potable water; - Educational level; - Literacy; - Home; - Violence; - Population.
Economic	- Economic performance; - Trade; - Financial status; - Consumption of materials; - Energy consumption; - Generation and waste management; - Transport.
Institutional	- Strategic Implementation of sustainable development; - International cooperation; - Access to information; - Infrastructure communication; - Science and technology; - Natural disasters - preparedness and response; - Monitoring of sustainable development.

Sourch: Van Bellen (2006, p. 135).

Appendix B
Common system of dimensions for construction of the Barometer of Sustainability

The barometer tool uses two subsystems, human and environmental, of which derive five dimensions each, as shown in Table 3, in order to formulate a system for all evaluations.

Table 3 – Common system of dimensions for construction of the Barometer of Sustainability

Subsystems	Dimensions	Questions and Objectives
- Society / People	- Health & population	Mental and physical health, disease, mortality, fertility, population change.
	- Wealth	Economy, financial system, income, poverty, inflation, employment, trade, material goods, basic needs for food, water and protection.
	- Knowledge and culture	Education, research, knowledge, communication, belief system and values.
	- Community	Rights and freedoms, governance, institutions, law, peace, crime, civil rules.
	- Equity	Distribution of benefits between races, genders, ethnic groups and other social divisions.
- Ecosystem	- Land	Diversity and quality of forest areas, farming and other ecosystems, including modification, conversion and degradation.
	- Water	Diversity and water quality in marine ecosystems, including modification, pollution and depletion.
	- Air	Quality of internal and external air, global atmospheric condition.
	- Species & populations	Wild species, population, genetic diversity.
	- Resource use	Energy, generation of waste, recycling, pressure of agriculture, fishing, mining.

Sourch: Van Bellen (2006, p. 152).