Organizational Sustainability: A Comparative Analysis of the Brazilian Building Industry

Julio Nichioka*, Osvaldo Luiz Gonçalves Quelhas*, Valdir Lameira+, Fernanda Gomes de Azevedo* e Marcelo Meiriño*

*Universidade Federal Fluminense, Brasil
+INESC Coimbra, Portugal

Email: nichioka@uerj.br, quelhas@latec.uff.br, vlameira@uol.com.br, fecauff@yahoo.com.br, marcelo@latec.uff.br

Abstract

The present study consists in establishing mechanisms of comparability between implemented aspects of Sustainability, which may allow an evaluation of the stage of maturity and the adherence to the Sustainability Management Systems of firms in the Buildings subsector of the Brazilian Civil Construction business. An analysis of the Sustainability Management Systems implemented by firms in the Civil Construction business was made, utilizing the evaluation tool developed, and conducting interviews with five firms in that segment. The results collected were treated under intracase and intercase methods, indicating the current maturity stage and the level of adherence to the Sustainability Management Systems. The utilization of a simulator made possible the determination of a final classification of the firms, in relation to the efficiency of their Sustainability Management Systems.

Key words: Sustainability Management Systems; Sustainability; Indicators of Sustainability Performance; Civil Construction.

1 Introduction

In order to carry out a comparative analysis, an evaluation tool was developed which included four dimensions – Leadership, Economic, Environmental and Social. The further subdivision of these dimensions resulted in 13 aspects, and later, 81 Sustainability performance indicators were identified, which became the basis for the Study of the Organizational Sustainability Evaluation, and for the questionnaire used to collect information for the study. The questionnaire is presented in Nichioka (2008) and was the instrument used for collecting information obtained from the five Civil Construction (CC) firms which participated in the study.

2 Sustainability and the Instruments for Evaluating Sustainability

The World Commission on Environment and Development (CMMAD, 1988), published, in 1987, the Brundtland Report, which provided the now accepted definition of Sustainable Development as "that which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs". Since then, and with the succession of worldwide events, there has been an increasing level of attention to ensuring that the pillars of business continuity (ELKINGTON, 1994) are met – economic, social and environmental, which are also aspects of sustainability.

Amaral (2003) declares that the process of establishing Sustainability performance indicators is partially scientific and political, since a given impact – atmospheric emissions – can be scientifically characterized as environmental, since it affects the air. But in relation to the political aspect, it can be essential or not to the company, when analyzed under the perspective of the acting influences and pressures at any given moment.

Mitchell (1997), on the other hand, declares that in relation to Sustainability Indicators, the debate is just starting, since there does not yet exist a single formula or recipe to evaluate that which is unsustainable.

There are several instruments or related documents for the evaluation of Sustainability, which, with small adaptations, can be utilized as reference documents, since they have been utilized by several Brazilian companies which demonstrate concern and carry out effective actions towards Sustainability.

Sustainability has been much discussed in the media as of the late 1990s, but little has been published in an academic level in Brazil (Silva (2003); Amaral (2003); Librelotto (2005); Vieira (2005); Santos (2007), and Deponti; Eckert and Azambuja (2002)). Among those Brazilian publications analyzed, five cover economic, environmental and social dimensions (EES), while one covers the technical dimension, in relation to agriculture. Only three are directed towards CC, but two of those are directed towards the product (buildings), and a third is related to strategic management, where the performance, positioning and conduct of the company, as well as its competitive advantages are evaluated.

In relation to the world, there are publications and methodologies directed at several segments: (Jung, Kim and Rhee (2001); Singh et al (2007); Labuschagn, Brent and Erck (2005); Montabon, Sroufe and Narasimhan (2007); Shen et al (2005); Tam et al (2006); Székely and Knirsch (2005)) – which utilize various instruments and methodologies of environmental and/or sustainability evaluation.

Observing the sectors which are the subject of the works identified, only two are related to CC, as follows:

- Shen et al (2005) – with a focus on measuring the environmental impacts of the CC business, through a life cycle analysis, and which utilized the Multi Dimensional Analysis Matrix as the measuring metric; and

- Tam et al (2006) – evaluates the performance of environmental indicators, using Regulatory Norms of Hong Kong and Management System Audits as instruments. The quantification of indicators was obtained by Weighted Average / Relative Importance.

3 The Study of Organizational Sustainability Analysis

Three points must be highlighted as relevant:

a) The establishment of a study of Organizational Sustainability Management Evaluation for companies in the CC business, Buildings sector, which would furnish interested parties or development and investment banks with information for decision making;

b) Rising concerns among countries and international organizations, in relation to the social, economic and environmental impacts of activities, which seek not only economic efficiency of productive processes, but also an improvement of the standards of social wellbeing and environmental quality;

c) The recognition of intangible assets of companies as part of their valuation and as an instrument to facilitate the allocation of private funds among productive activities, since interested parties will evaluate organizations based on those assets, and those assets are measured and leveraged positively by the control and minimization of social and environmental impacts.

3.1 Methodology and The Structure of the Study

Regarding the methodology, this research initially investigate a group of fourteen public traded companies of the construction sector, that allowed their financial and societal information to the public by Bovespa site. After an initial analysis of data, only four companies were chosen for a multiple case study. A questionnaire was generated from the selection of dimensions, variables and constructs based on academic Surveys. The results allowed the construction of a comparative ranking of the most important variables dent of each company, as well as the construction of a ranking of the companies investigated.

The study contemplated four dimensions – Leadership, Economic, Environmental and Social. The subdivision of these dimensions resulted in 13 aspects, and later, 81 Sustainability performance indicators were identified, which became the basis for the evaluation questionnaire, and allowed it to become *the most adequate questionnaire applicable to the CC business, Buildings subsector*.

The 81 Sustainability performance indicators were consolidated according to the aspects of Organizational Sustainability considered by the GRI G3 (2006); the article "*The measure of corporate environmental performance and its application to the analysis of efficiency in oil industry*", by authors Jung; Kim and Rhee (2001) – Gscore Methodology; the Excellence Criteria of the Brazilian National Quality Foundation (Fundação Nacional da Qualidade) (Fundação Nacional da Qualidade, 2008); as well as the inclusion of specific criteria developed by the author, thus establishing the study of the Organizational Sustainability Analysis (OSA) proposed.

3.2 Selection of Civil Construction Companies

Some researchers recommend defining the size of the sample to be studied right at the beginning of the planning process, but Eisenhardt (1989) doesn't recommend this practice, but instead suggests that the limiting factor is attained when "theoretical saturation" is reached. This situation tends to occur, typically, in the interval between four and ten cases studied. Eisenhardt (1989) also emphasizes that in various investigations the ideal sample is detected when five cases are analyzed.

Three companies which went public on the BOVESPA market, and which are considered large (GP), were chosen as the first group of companies to be studied, as well as another company indicated by a professional in that field.

Another ten companies of medium or small size (MP) were selected because they were indicated by specialists who operate in companies in the CC business or who had a professional relationship with such companies.

It can be concluded that of the 14 companies identified for participation in the initial evaluation, the study was restricted to only five companies, which were subsequently codified as CC 1, CC 2, CC 3, CC 4 and CC 5.

The Mean of Importance of the Aspects IA value is obtained by calculating each IA, less the mean value considered (5) of the Likert scale. The results allow for the identification of the values which are above or below the Neutral Importance. The Mean IA-is called the Degree of Importance of the Aspects (IA) of Sustainability for the Companies Studied.

The degree of Importance of the Aspects (IA)of Sustainability for the companies can be calculated by utilizing the following expression:

ISC = Importance of Sustainability in Company CC = Sum of the IA of CC / nr. of aspects

Thus, calculating, we have:

Table 1: Degree of Importance of the Aspects of Sustainability for the Companies Studied

Importance of Sustainability for the Company	Value obtained	Importance	Classification
CC1	5,43.	Neutral	2º
CC2	5,02	Neutral	4º
CC3	1,22	None	5º
CC4	7,23	Important	**1º**
CC5	5,11	Neutral	3º

Source: prepared by the authors

3.3 Degree of Adherence of the Management of Sustainability

Table 2: Degrees of Adherence of the Aspects (AA), for the companies studied

ASPECTS		**CC1**		**CC2**		**CC3**		**CC4**		**CC5**	
		AA	Mean AA	AA	Mean AA	AA	Mean AA	AA	Mean AA	AA	Mean AA
1º.	To have available an Effective Corporate Governance	5,80	+0,80	7,40	+2,80	2,00	-3,00	6,60	1,60	3,40	-1,60
2º.	To develop a pro-active organization, responsive to strategies and its objectives	4,71	-0,29	7,00	+2,00	3,00	-2,00	5,57	0,57	2,43	-2,57
3º.	To minimize direct economic impacts	4,33	-0,67	6,83	+1,83	0,50	-4,50	7,33	2,33	6,33	1,33
4º.	To obtain "social license of operations"	2,00	-3,00	5,25	+0,25	0,25	-4,75	4,00	-1,00	6,50	1,50
5º.	To effect positive indirect economic impacts	2,00	-3,00	4,67	-0,33	0,33	-4,67	7,00	2,00	4,33	-0,67
6º.	To reduce inputs in the materials and supplies processes, in relation to a standard productivity level	2,57	-2,43	4,14	-0,86	2,29	-2,71	5,57	0,57	5,00	0,00
7º.	To preserve nature	5,00	0,00	1,50	-3,50	0,00	-5,00	2,50	-2,50	2,50	-2,50
8º.	To increase production of good products	0,22	-4,78	1,11	-3,89	0,44	-4,56	2,33	-2,67	3,00	-2,00
9º.	To pollute less	2,75	-2,25	6,75	+1,75	0,50	-4,50	6,00	1,00	6,00	1,00
10º.	To establish correct and decent labor practices	4,45	-0,55	4,55	-0,45	1,27	-3,73	8,64	3,64	3,73	-1,27
11º.	To respect people	3,13	-1,87	4,50	+0,50	0,88	-4,12	7,75	2,75	3,63	-1,38
12º.	To reduce the impact to communities and society	2,88	-2,12	2,88	-1,22	0,63	-4,37	7,75	2,75	3,25	-1,75
13º.	To reduce the impact of Product Responsibility aspects	4,83	-0,17	5,50	+0,50	0,63	-4,37	7,33	2,33	5,33	0,33

Source: prepared by the authors

The Mean AA value is obtained by calculating each AA, less the mean value considered (5) of the Likert scale. The results allow for the identification of the values which are above or below the Neutral Adherence. The Mean AA-is called the Degree of Adherence of the Aspects of the company in relation to the mean.

The ASC was calculated as the arithmetic mean of all aspects, according to the following equation:

ASC= Adherence of the Management of Sustainability of Company CC = Sum of the AA of CC / nr. of aspects

Thus, calculating, we have:

Table 3: Adherence of Management of Sustainability for the companies studied

Adherence of the Management of Sustainability	Value obtainbed	Characterization	Classification
ASC1	3,37	The practice is non-existent, but will be implemented soon	4º
ASC2	4,78	Occasionally practiced	2º
ASC3	0,98	Practice does not exist	5º
ASC4	6,04	Between occasionally practiced and practiced routinely, but not documented	1º
ASC5	4,26	Occasionally practiced	3º

Source: prepared by the authors

3.4 Intercase Analyses

The intercase analysis allowed for comparing the degree of maturity with its practice in the Management of Sustainability of the companies in relation to the dimensions and the aspects contemplated in the OSA study.

The degrees obtained in each dimension were observed, and the description of the degrees obtained for the aspects, and in some situations, the basic comments about the probable reasons for differences in the final results.

Company **CC4** stands out as the one which has the highest degree of maturity, since it considers the aspects of sustainability as "important" (value of **7,23**) in the corporate management, while Company **CC3** had the smallest degree of maturity, with the result of "without any importance" (value **1,17**).

The other three companies studied are categorized as "neutral importance", with less than 7,5% difference between them (highest = 5,43 and lowest = 5,02). Thus we can say that there is not much difference in the management of Sustainability among those organizations.

To complement the information provided, Company CC4 obtained the highest score in the aspects of Corporate Governance (8,60); Leadership and Performance Analysis (8,14); Economic Performance (8,33); Indirect Economic Impacts (8,33); Reduction of Consumption of Materials and Supplies (7,57); Products, Services and Conformity (8,00); Labor Practices (9,00); Human Rights (8,50); Society (8,50); and Product Responsibility (8,00).

Regarding the aspects which are above neutral importance in each organization, it is believed that the higher values for importance are associated with indicators that show that the company is already utilizing management concepts in its projects, or even if it does not use them, it has prior knowledge about trends in the application of these concepts in its business sector.

The aspect with least importance can be seen to be that of emissions, effluents and wastes, which suggests that the introduction of new concepts is required at the technological level, as well as in the methodological and cultural levels.

The leadership dimension was rated high at three organizations: Company CC4, with 8,37; Company CC1, with 7,55; and Company CC2, with 7,40.

From the statements given, and not only by its final score, it can be seen that Company CC4 already has a well defined organizational structure, with a vision that entails functional management and management by processes, besides utilizing six committees and management instruments that give it the dynamism required by its corporate management.

The Economic Dimension had three of the highest scores: Company CC4 with 7,39; Company CC5 com 6,61; and Company CC2 with 5,75.

The Environmental Dimension had Company CC4 with the highest score, of 5,27, followed by Company CC1, with 5,13, and Company CC5, with 4,90. The three companies achieved values near "neutral importance", showing that there is still much to be done in the environmental approach, so that significant results will be achieved in the CC field.

The Social dimension had Company CC4 with the highest score, of 8,50, followed by Company CC1, with 5,61, and Company CC5, with 4,84. A large difference can be seen between Company CC4 and the others, so it is hoped that its positive results will eventually be matched by the others.

3.4.1 Degree of Adherence of the Aspects of the OSA study

The highest global Adherence to Sustainability was achieved by Company CC4, with the value of 6,03 – between practiced routinely and occasionally practiced, followed by Company CC2, with 4,78 (occasionally practiced) and Company CC5, with 4,26 (between occasionally practiced and practice does not exist but will be implemented soon).

With the analyses done in relation to the importance of the dimensions and aspects, once more it can be concluded that Company CC4 has a higher degree of maturity than the other companies which participated in the study.

To complement the information provided, Company CC4 obtained the highest score in the aspects of Economic Performance (7,33); Indirect Economic Impacts (7,00); Reduction of Consumption of Materials and Supplies (5,57); Labor Practices (8,64); Human Rights (7,75); Society (7,75); and Product Responsibility (7,33).

The company which showed the best result in relation to the Adherence of the Aspects of Sustainability in the business is Company CC4, while Company CC3 showed that the practice does not exist in its organization.

Company CC2 stands out in the Leadership dimension, where it achieved a score of 7,20, which represents that this aspect is "practiced routinely, but not documented".

In relation to the Economic and Social dimensions, Company CC4 achieved the highest scores, obtaining, respectively, 6,11 (between "occasionally practiced" and "practiced routinely, but not documented") and 7,87 (between "practiced routinely, but not documented" and "practiced routinely and documented").

In relation to the Environmental dimension, Company CC5 had the highest score, with 4,13 (between "the practice is non-existent, but will be implemented soon" and "occasionally practiced").

With the analyses done in relation to the Adherence of the dimensions and aspects, once more it can be concluded that Company CC4 achieved the highest score, of 6,03, which represents between "occasionally practiced" and "practiced routinely, but not documented". It can be seen that Company CC4 has a better routine practice of Sustainability management than the other companies which participated in the study.

In order to provide a better understanding, with a synthetic and conclusive view, Table 4 was prepared with the information presented so far.

Table 4 – Synthesis of the Evaluation of the Companies in the Civil Construction Business

	Importance		Adherence	
	Result	**Interpretation**	**Result**	**Interpretation**
CC1	5,43	Neutral Importance	3,37	Practice is non-existent, but will be implemented soon
CC2	5,02	Neutral Importance	4,78	Occasionally practiced
CC3	1,22	No importance	1,03	Practice is non-existent
CC4	7,23	Important	6,03	Between "occasionally practiced" and "practiced routinely, but not documented"
CC5	5,11	Neutral Importance	4,26	Between "occasionally practiced" and "practice is non-existent, but will be implemented soon"

Source: prepared by the authors

3.4.2 Analysis of the Efficiency of the Sustainability Management Systems

Carrying out comparisons of SMS composed of elements with different valuations, as a function of the initial stage of the establishment of the concepts involved in Sustainability, required using a simulation with weights for each component element of the OSA. The weighing of the indicators was obtained by using averages of the values given for the indicators, as provided by the managers interviewed, since all of them are active in CC, Buildings subsector, and are knowledgeable about the impacts of the indicators on their companies.

The weighing of the aspects and dimensions was obtained in a "workshop" with Production Engineering graduate students from a university, with the rounding of the values to whole numbers. The range of scores went from 0 to 5, for each element.

a) Values of the Indicators

The results for each item of the questionnaire, obtained during the interviews, correspond to the indicators – the values of the Importance of the Sustainability Indicator. For the simulation, the values used for the adherence of the aspects are those declared by the persons interviewed.

b) Values of the Aspects

The final value of each aspect of an organization was obtained by calculating the weighted average of the values of the indicators (results from the interviews), pertaining to each aspect, and the mean of the values of the indicators. The column "Mean" was computed as the arithmetic mean of the evaluations given to the same indicator, by the managers of the companies.

The values of the aspects of each company were obtained by utilizing the weighted average, which is the sum of the products of the scores attributed by those interviewed (columns CC) and the respective means (column Mean), divided by the sum of the means. The calculation for Company CC1 is shown as follows:

Corporate Governance Aspect of Company CC1 = AGC1

$$AGC1 = \frac{7X7,4 + 9X6,8 + 7X4,0 + 7X7,0 + 9,0X7,4}{7,4 + 6,8 + 4,0 + 7,0 + 7,4} = 7,9$$

The choice of the weighted average was based on the principle that each decision maker values, perceives and has a different vision, when he analyzes any theme, thus it is desirable to adjust the methodology for each item calculated by means of an appropriate weighing. It is worth noting that if the same weight were

to be given to all the indicators, which is the concept underlying the arithmetic average, one would return to the condition developed in the prior chapter of this study.

c) Values of the Dimensions

For the calculation of the values of the dimensions, weights were also chosen to be allocated to aspects.

The weights of the aspects and the dimensions were obtained in a "*workshop*", with Production Engineering graduate students from a university. The group was composed of 18 students, who gave scores between 0 and 5, to the aspects and dimensions. The mean values obtained were rounded to whole numbers.

Then, the Leadership dimension was obtained by the weighted average of the values of the component aspects of each dimension. Maintaining the same computing logic, the other dimensions can likewise be obtained.

d) Values of the OSA Study

Based on the values calculated for the dimensions, again taking the weighted average of those values, with the weights described before, the following results, shown in Table 5, were obtained:

- Company **CC4** in **1º** place **- best efficiency of the SMS** – with a final average of **8,2,** out of a possible 9,0;
- Company **CC1** in **2º** place, with a final average of **6,7,** out of a possible 9,0;
- Company **CC2** in **3º** place, with a final average of **6,6,** out of a possible 9,0;
- Company **CC5** in **4º**.place, with a final average of **5,3,** out of a possible 9,0;
- Company **CC3** in **5º** place **– worst efficiency of the SMS -** with a final average of **2,2,** out of a possible 9,0.

Table 5: Scores achieved by the companies studied

	CC1	CC2	CC3	CC4	CC5	Dimension	Weight	CC1	CC2	CC3	CC4	CC5
ASO	**6,7**	**6,6**	**2,2**	**8,2**	**5,3**	1.Leadership	5	7,7	7,8	4,0	8,5	4,1
						2. Economic	2	5,3	6,7	0,3	7,7	7,0
						3.Environmental	3	6,1	5,2	1,3	7,7	6,1
						4. Social	2	6,8	5,6	1,0	8,7	5,5

Source: prepared by the authors

For Company CC4, the final value obtained, despite being the result of a self-evaluation process, shows that there is only a small variation between the four dimensions studied, equal to 1,0, which demonstrates that the management of the organization follows a well drawn path. The highest value calculated was for the social dimension, with 8,7, and the lowest value calculated was for the economic dimension, with 7,7. These results demonstrate well that Organizational Sustainability is being implemented as a directive established within its business strategy, and that it is backed by a real commitment on the part of its Top Management. Some evidences, such as the creation of a specific Committee for Sustainability, with effective performance analyses coordinated by management, reflect its pro-active institutional stance.

4 Final Considerations

This study sought to establish comparability mechanisms for the Sustainability aspects implemented within Brazilian companies in the Civil Construction (CC) business.

- With the OSA the maturity stage of the adherence of the Sustainability Management of Brazilian companies in the CC business, Buildings subsector, could be evaluated;
- The *constructs* of the OSA were fundamental in order to evaluate the level of implementation of the aspects of Sustainability of a company, and to allow the quantification of the indicators established;
- The operation of the OSA study occurred by generating and applying the supporting instruments/documents during the interviews at the companies, which then allowed new evaluations to be made of the management of Sustainability;
- Through the collection of data and information, the study resulted in metrics which allowed the quantification and subsequent comparison between different Sustainability Management Systems;
- In developing an evaluation of the Civil Construction Companies, the study made possible the analysis of the maturity and the adherence in relation to the Sustainability Management System, allowing a comparative and quantitative analysis. It was found that Company CC4 showed the highest degree of maturity and adherence, while Company CC3 obtained the lowest score in maturity and adherence;
- In performing efficiency analyses of the Sustainability Management Systems, it became possible to convert those values to a referential basis, through the utilization of a simulator, which allowed the development of an index for comparison and relative positioning.

After carrying out the study, it is hoped that it will contribute towards:

- Greater dissemination of the concepts of Sustainability and of Organizational Sustainability Management Systems in the Buildings subsector of the Civil Construction business;
- Including the aspects of Organizational Sustainability in the strategic business directives of companies in the Buildings subsector of the Civil Construction business;
- Creating a culture of establishing metrics for the aspects of Sustainability in business activities, both on an operational level and on a strategic level;

Despite the fact that the Brazilian Civil Construction segment is stigmatized as being conservative, the present study identified signs of a change in that posture, likely due to globalization and the constant threat of the entry of foreign capital into that segment. It was clear during the execution of this study, that there are clear signs of a managerial redirectioning, towards Green Building, as well as towards the insertion of Sustainability in the management of the projects of those companies.

References

AMARAL, Sérgio Pinto. Estabelecimento de indicadores e modelo de relatório de sustentabilidade ambiental, social e econômica: Uma proposta para Indústria do Petróleo Brasileiro. Tese de Doutorado. Rio de Janeiro: COPPE/UFRJ, 2003.

BRAZILIAN BUSINESS. Investimento Consciente. Entrevista com Fábio Colletti Barbosa. Brazilian Business, maio, 2008.

CMMAD. Comissão Mundial Sobre Meio Ambiente E Desenvolvimento. Nosso Futuro Comum. Rio de Janeiro, Fundação Getúlio Vargas, 1988.

DEPONTI,. C. M., ECKERT, C: AZAMBUJA, J. L. M. Estratégia para Construção de Indicadores para Avaliação da Sustentabilidade e Monitoramento. de Sistemas. Agroecol. e Desenv. Rural Sustentável. Porto Alegre, v.3, n.4, out/dez, 2002.

EISENHARDT, K. M. Building Theories from Case Study Research. The Academy of Management Review, 14, 4, 1989..

FNQ. Fundação Nacional da Qualidade. Critérios de Excelência 2008. Avaliação e Diagnóstico da Gestão Organizacional. Fundação Nacional da Qualidade, S. Paulo, 2008. Disponível em http://www.fnq.org.br/site/484/default.aspx. Acessado em 20/02/08.

GRI. Global Reporting Initiative. Sustainability Reporting Guidelines. Amsterdam, 2006. Disponível em http://www.globalreporting.org/NR/rdonlyres/812DB764-D217-4CE8-B4DE-15F790EE2BF3/0/G3_GuidelinesPTG.pdf. Acessado em junho de 2007.

INSTITUTO ETHOS. Critérios Essenciais de Responsabilidade Social Empresarial e Seus Mecanismos de Indução no Brasil. Instituto Ethos, São Paulo, 2006. Disponível em http://www.uniethos.org.br/_Uniethos/Documents/criterios_essenciais_web.pdf Acessado em 5 mar 2008.

_____. Guia de Elaboração de Relatório e Balanço Anual de Responsabilidade Social Empresarial. Instituto Ethos, São Paulo, 2007. Disponível em http://www.uniethos.org.br/DesktopDefault.aspx?TabID=3706&Alias=uniethos&Lang=pt-BR. Acessado em 5 mar 2008.

JUNG, E. J. ; KIM, J. S. ; RHEE, S. K. The Measurement of Corporate Environmental Performance and its Application to the Analysis of Efficiency in Oil Industry. Elsevier, Journal of Cleaner Production 9, p. 551-563, 2001

LABUSCHAGNE, E. C ; BRENT, A. C. ; ERCK, R. P. G. Assessing the Sustainability Performance of Industries. Elsevier, Journal of Cleaner Production 13, p 373-383, 2005

LIBRELOTTO, L. I. Modelo para Avaliação da Sustentabilidade na Construção Civil nas Dimensões Econômica, Social e Ambiental (ESA): Aplicação no Setor de Edificações. Tese de Doutorado. Florianópolis, PPGEP-UFSC, 2005.

MITCHELL, G. Problems and Fundamentals of Sustainable Development Indicators [1997]. Disponível em: http:// www.lec.leeds.ac.uk/people/gordon. html (Acesso em 13/07/01)

MONTABON, F.; SROUFE, R.; NARASIMHAN, R. An examination of Corporate Reporting, Environmental Management Practices and Firm Performance. Elsevier, Journal of Operations Management 25, p 998-1014, 2007.

NICHIOKA, J. Análise da sustentabilidade organizacional : o caso da construção civil. 2008. 268 f. Tese (Doutorado em Engenharia Civil) – Departamento de Engenharia Civil, Universidade Federal Fluminense, Niterói. 2008.

QUELHAS, O. L. G. e ARAÚJO, F. O. Responsabilidade Social e Estratégia Corporativa: Uma Proposta Orientada à Sustentabilidade Organizacional na Indústria Automobilística Brasileira. In. Boletim Técnico Organização & Estratégia 2(1) 1-28, 2006.

QUELHAS, O. L. G. e SILVA, L. S. A. Sustentabilidade Empresarial e o Impacto no Custo de Capital Próprio das Empresas de Capital Aberto. Ins. Gestão e Produção, v.13, n.3, p 385-395, set-dez, 2006.

SANTOS, L. L. Sustentabilidade na Construção Civil: Proposta para um Conjunto Residencial Popular Sustentável. Monografia. Belo Horizonte, Escola de Engenharia da UFMG, 2007

SHEN, L. Y.; LU, W. S.; Yao, H.; Wu, D.H. A Computer-based Scoring Method for Measuring the Environmental Performance of Construction Activities. Elsevier, Automation in Construction 14, p 297-309, 2005.

SILVA, Vanessa Gomes da. Avaliação da sustentabilidade de edifícios de escritórios brasileiros: diretrizes e base metodológica. Tese de Doutorado. Escola Politécnica da Universidade de São Paulo, São Paulo, 2003.

SINGH, R. K.; MURTY, H. R.; GUPTA, S. K.; DIKSHIT, A. K. Development of Composite Sustainability Performance Index for Steel Industry. Elsevier, Ecological Indicators 7, p 565-588, 2007

SZÉKELY, F.; KNIRSCH, M. Responsible Leadership and Corporate Social Responsibility: Metrics for Sustainable Performance. Pergamon, European Management Journal, vol. 23, n° 6, p. 628-647, 2005

TAM, V.W., TAM, C.M., ZENG, S.X., CHAN, K.K. Environmental performance measurement indicators in construction. Elsevier, Building and Environment 41, p. 164-173, 2006

VIEIRA, T. M. P. Proposta de indicadores de sustentabilidade para o setor de distribuição de combustíveis: o caso da Petrobras Distribuidora S.A. Dissertação de Mestrado. Niterói, UFF, 2005.