EVALUATION OF ENVIRONMENTAL MANAGEMENT ACTIONS IN PROFESSIONAL AND TECHNOLOGICAL EDUCATION INSTITUTIONS
Avaliação de ações de gestão ambiental em instituições de educação profissional e tecnológica
Evaluación de acciones de gestión ambiental en instituciones de educación profesional y tecnológica

Aurélio Ferreira Borges*
Marcel Emerick Bizerra de Araújo**
Maria Helena Ferrari***
Marcos Aurélio Anequine de Macêdo****
Instituto Federal de Rondônia [IFRO] – Bra.

ABSTRACT
There is a research shortage on environmental education management indicators, which have allowed a specific sustainability criterion for schools. This study aimed to evaluate the effectiveness and use of Environmental Sustainability Indicators (ESI) in the Brazilian Federal Institutes of Education (BFIE) to verify the efficiency of environmental management education. The equation used in the survey indicates that rates close to zero suggest maximum inefficiency in conservational management, whereas an index of 1, suggests maximum efficiency in environmental management. The equation has the variables pi = score assigned to the variable i; n = total number of variables i, i = 1, ..., 09 and m = total number of campuses j, j = 1, ..., 230. The Index of Environmental Performance in Federal Institutes (IEPFI) obtained in this study showed that the campuses presented indexes that did not exceed the value 0.35, where the ideal value would be 1.0.

Keywords: Educational methodologies. Evaluation. Environmental Management Education.

RESUMO
Existe escassez de pesquisas sobre indicadores de gestão da educação ambiental, que permitiram um critério específico de sustentabilidade para as escolas. Este estudo objetivou avaliar a efetividade e utilização de Indicadores de Sustentabilidade Ambiental (ESI) nos Institutos Federais de Educação do Brasil (BFIE) para verificar a eficiência da educação em gestão ambiental. A equação usada na pesquisa indica que taxas próximas de zero sugerem ineficiência máxima no manejo conservacionista, enquanto o índice de 1 sugere eficiência máxima na gestão ambiental. A equação tem as variáveis pi = score atribuídas à variável i; n = número total de variáveis i, i = 1, ..., 09 e m = número total de campi j, j = 1, ..., 230. O Índice de Desempenho Ambiental em Institutos Federais (IEPFI) obtido neste estudo mostrou que os campi apresentavam índices que não ultrapassavam o valor 0,35, onde o valor ideal seria 1,0.

Palavras-chave: Metodologias Educacionais. Avaliação. Educação em Gestão Ambiental.

RESUMEN
Existe una escasez de investigación sobre los indicadores de gestión de la educación ambiental, que han permitido un criterio de sostenibilidad específico para las escuelas. Este estudio tuvo como objetivo evaluar la efectividad y el uso de los indicadores de sostenibilidad ambiental (ESI) en los Institutos Federales de Educación de Brasil (IFEB) para verificar la eficiencia de la educación en gestión ambiental. La ecuación utilizada en la encuesta indica que las tasas cercanas a cero sugieren la máxima ineficiencia en el manejo conservador, mientras que un índice de 1 sugiere la máxima eficiencia en la gestión ambiental. La ecuación tiene las variables pi = puntaje asignado a la variable i; n = número total de variables i, i = 1, ..., 09 y m = número total de campus j, j = 1, ..., 230. El índice de Desarrollo Ambiental en los Institutos Federales (IEPFI) obtenido en este estudio mostró que los campi presentaban índices que no excedían el valor 0.35, donde el valor ideal sería 1.0.

Palabras-clave: Metodologías Educacionales. Evaluación. Educación en Gestión ambiental.
Introduction

A serious attitude toward native forests only started in Brazil from the publication of the Forestry Legislation. Although, an overview of environmental degradation have allowed portray in the historical bibliography, the first Forest Code Legislation was enacted in 1934. Despite having lack of respect to the severe legislation, which established protection to some natural resources became a regular occurrence in the Brazilian society (BRAZIL, 2012).

In the 1930s, due to an intense native forests logging scenario, the first Forest Code Legislation emerges in Brazil, established by the Decree 23,793 on January 23rd, 1934 (BRAZIL, 1934). This legal instrument, pioneering in Brazil, launched a conservationist and preservationist stance regarding the use of the real state, guaranteeing the protection of areas that represents the natural ecosystems of a given environment. The first Forest Code Legislation determined the protection of 25% of the forest cover in a given property. According to Ribeiro (2011), this Forest Code Legislation performed a preservationist stance regarding the environment, as stated in its article among the reasons given to create forest reservations, it listed water supply preservation, protection against soil erosion, indigenous fauna preservation, dunes conservation and scenic areas perpetuation (BRAZIL, 1934).

After 31 years of existence, the first Brazilian Forest Code was annulled by Federal Act No. 4,771, on September 15th, 1965, which established the nation's second Forest Code (BRAZIL, 1965). According to Coimbra-Borges et al. (2011), the 1965 Forest Code Legislation is regarded as an update to the 1934 Code. The new code had an improvement in native vegetation conservation, which was understood and created as permanent preservation areas (PPA) and, therefore, the legal reserves (LR).

After several amendments and suspensions to the 1965 Forest Code, the New Forest Code of Brazil was enacted on May 25th, 2012, as Federal Act 12,651 number (BRAZIL, 2012). Among new and redefined concepts, the implemented rural area stands out in the New Forest Code, defined, in Article 3, item IV, as a rural property area, where human changed before July 22nd, 2008. Different studies, during the New Forest Code conception period, highlighted negative externalities resulted by the proposed changes. Objections touched several topics, such as, the biological diversity maintenance, public health, regional economies, population sanitary and life quality (DEVELEY and PONGILUPPI, 2010).

Environmental Management (EM), is the economic and social activities supervision in order to use rationally natural resources, whether renewable or non-renewable (Nogueiro and Ramos, 2014). Environmental management must aimed to employ practices that support permanence and biodiversity preservation, raw materials recycling, environmental impact reduction of human activities and compliance with environmental legislation on natural resources. In this sense, relevant knowledge on environmental management also includes techniques for the degraded areas recovery, reforestation techniques, procedures for the sustainable exploitation of natural resources and the environmental drafting risk and impact estimated for new productive and educational projects and activities to be environmentally fair (NOGUEIRO and RAMOS, 2014).

The 1988 Brazilian Federal Constitution (FC) (Brazil, 1988) deals, in separate articles, with the responsibility to legislate on, and the competence to manage the environment. Article 23 of the FC states as follows: “[...] The Union, States, Federal District, and Municipalities, shall have joint jurisdiction to: protect the environment and to fight pollution in any of its forms; preserve the forests, fauna, and flora”.

Environmental management has increasingly gained space in business. The ecological awareness development in different layers and global society sectors, ultimately also involve the education sector. It classifies human activities, which cause minimal impact on the environment, since the
choice of the best techniques to the environmental legislation implementation and human and financial resources correct allocation (DRUZIAN; SANTOS, 2006).

Higher education institutions have introduced environmental themes into their management diagrams from the 1960s. The first experiences occurred in the United States, together with the environmental science's professional appearance, which continued in the 1970s. According to Barata, Kligerman & Minayo (2007), it is necessary an environmental management system implementation of public management. These authors present economic arguments, based on the benefits accrued by private companies, which have allowed an adoption of eco-efficiency criteria, which, would be sufficient to justify the effective policy implementation of environmental management in public institutions.

According to Tauchen and Brandli (2006), there are significant reasons to implement the Environmental Management System (EMS) in an institution of higher education, including the fact that colleges and universities are comparable to small urban centers, involving several teaching, research, and extension activities, as well as activities related to their operation, such as bars, restaurants, dormitories, convenience centers, and other facilities. According to these authors, a campus needs basic infrastructure, water and power networks, sewerage networks and rainwater collection and access roads. According to Matthews, Hendrickson and Christini (2004), there are at least four attributes that an Environmental Management System (EMS) must have in order to provide support to managers, which are as follows:

a) Process diagrams to identify materials and energy inputs-outputs. The process diagram indicates the steps necessary steps to have achieve maximum production, showing the materials and energy inputs and outputs.

b) Reliable methods to collect and disseminate environmental data. Data collection will be a task to people who has an environmental commitment, health and safety. The system must be connected to calendars and automated message delivery systems, in order to easily target the actors, for example, an audit.

c) Risk assessment of current and emerging environmental problems in operations and products. An example of emerging environmental problems is carbon dioxide emissions. The risk assessment tool is used to complete audits, set objectives and evaluate its progress.

The use of environmental indicators emerges as an essential tool in environmental management and assessment. Future directions for environmental indicators involve trying to reach the same stage of maturity of some economic and social indicators (NOGUEIRO & RAMOS, 2014). The research problem arises from the question: what are the values that indicate efficiency or inefficiency in environmental management in BFIE? Bearing this in mind, the present work is aimed to verify efficiency actions of environmental management education in BFIE.

Method

The questionnaire on environmental management practices was created and have allowed a diagnosis of environmental management practices in the target sector, leading to a profile definition for EMS. The questionnaire consisted of 38 closed questions divided into sub-items and grouped into categories. The questions were based on a theory proposed by Nogueiro and Ramos (2014). The statistical population, 82 campuses, corresponding to a response rate of 35.65%, was representative of the 37 institutions with 230 campuses (Table 1). According to this author 31% is an adequate response rate for this type of research.
Table 1 - Campus response rate.

| Population | Sample | Answers (%) |
|------------|--------|-------------|
| 230        | 82     | 35.65       |

Source: Survey data.

The sample factor analysis fitness was evaluated by Bartlett’s sphericity test. This test indicates whether the correlations among variables are significant. Significant correlations ($p \leq 0.000$), indicate that quantitative dependent variables in the diagnostic questionnaire on environmental management practices are intercorrelated and, therefore, factor analysis is warranted. Descriptive analysis was used to extract results from the questionnaire and for graphics creation related to responses percentage. Evaluation index environmental performance (EIEP) of the Federal Institutes of Education in Brazil (IEPFI) calculation, was carried out based on nine variables selection (NOGUEIRO and RAMOS, 2014):

- X1-Sector existence exclusively responsible for creating environmental management indicators.
- X2- Specialized professional Existence in Environment in charge of the EM of campus facilities.
- X3- Educational initiatives existence in EM for the staff in the educational institution.
- X4- Environment Management System Implementation.
- X5- Environment/Sustainability Reports Production.
- X6- Environmental Performance Indicators use.
- X7- Environmental Audit/Diagnostic Execution.
- X8- Environmental Criteria in Public Purchasing use.
- X9- Local Schedule 21 implementation or another Sustainable Development Strategy.

The scale for determining IEPFI indicators ranges from 0 (the worst environmental profile) to 1 (best environmental profile). The indicators were calculated from the statistical equation: Where:

$$\text{IEPFI} = \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{Pi}{m}$$

Pi = Score attributed to variable $i$.

n = Total number of $i$ variables, $i = 1, \ldots, 09$

m = Total number of $j$ campuses, $j = 1, \ldots, 230$

Five categories were established to rate the environmental performance provided by IEPFI, on a scale from 0 to 1 (very weak 0 - 0.20; low: 0.21 to 0.40, average: 0.41 to 0.60; good: 0.61-0.80; very good: 0.81 to 1). The software used for the descriptions was R 2.10.1.

Results

The components 1 and 2, i.e., X and Y axes, explained the observed variation. All the variables included in the model were necessary. This means that all variables are important. The campuses could not be separated from each attribute. For example, campuses 1, 2 and 3 could not be grouped for displaying feature Y, nor could campuses 4, 5 and 6 be grouped for having characteristic Z. As demonstrates, there was homogeneity in the inefficiency in environmental education management in the studied sample (Figure 1).
It was evaluated which activities they consider to have negative impacts on the environment. These activities were as follows: infrastructure construction and maintenance, pesticides application, public safety, green spaces management, laboratory activities, solid waste management, water waste management, water resources management, water for human consumption management, maintenance, repair and overhaul of vehicles and equipment, surveillance, studies and planning, forest fires prevention and suppression, pollution prevention and control, materials storage, road traffic control, management and administration, and other impacts. This study only obtained the following answers: pesticides application (90.9%) and public safety (9.1%), in Table 2.

| Answers                     | Percentage (%) |
|-----------------------------|----------------|
| Public safety               | 9.1            |
| Pesticides application      | 90.9           |
| Total                       | 100.0          |

For questions related to environmental pressures associated with activities in the campus, similar responses were obtained in all campuses where have allowed to score as many questions as they wanted. The 8 activities, in ascending order, from a total of 25, the campuses judged to cause more negative impacts on the environment, which were as follows: 1\textsuperscript{st} - Activity 2: electricity consumption (4.6%); 2\textsuperscript{nd} - Activity 19: waste of water industrial production (4.6%); 3\textsuperscript{rd} - Activity 4: toner and printing ink consumption (4.3%); 4\textsuperscript{th} - Activity 12: vegetable oils waste production (4.3%); 5\textsuperscript{th} - activity 14: Construction and demolition waste production (4.3%); 6\textsuperscript{th} - Activity 15: electrical and electronic equipment waste production (4.3%); 7\textsuperscript{th} - Activity 11: Medical waste production (4.3%) and 8\textsuperscript{th} - Activity 5: Gasoline, diesel, and fuel ethanol consumption (4.3%). The other 17 activities had achieved values lower than 4.3% (Table 3).
Table 3 - Environmental pressures variable results associated with the campuses activities.

| Answers                                              | Percentage (%) |
|------------------------------------------------------|----------------|
| Toner and printing ink consumption                   | 4.3            |
| Vegetable oils waste production                      | 4.3            |
| Construction and demolition waste production         | 4.3            |
| Electrical equipment waste production                | 4.3            |
| Medical waste production                             | 4.3            |
| Gasoline, diesel, and fuel ethanol consumption        | 4.3            |
| Electricity consumption                              | 4.6            |
| Waste of water industrial production                 | 4.6            |
| The other 17 activities                              | 65.0           |
| Total                                                | 100.0          |

Source: Survey data.

From the issues descriptive analysis, which have been selected to form the IEPFI, 1.22% of the campuses did not mark the item that indicated their environmental performance; 13.42% considered their environmental performance very weak; 24.40% considered their environmental performance as weak; 41.46% rated their environmental performance as medium; 15.85% rated their performance as good; and only 3.65% considered their performance very good (Table 4).

Table 4 - Campuses variable environmental performance.

| Answers                                                  | Percentage (%) |
|----------------------------------------------------------|----------------|
| Didn't tag survey item                                   | 1.22           |
| Considered their performance very good                   | 3.65           |
| Considered their environmental performance very weak     | 13.42          |
| Rated their performance as good                          | 15.85          |
| Considered their environmental performance as weak        | 24.40          |
| Rated their environmental performance as medium          | 41.46          |
| Total                                                    | 100.0          |

Source: Survey data.

As for the implementation of an EMS, 2.44% of the campuses did not mark any answer; 6.10% said they are in implementation phase; 7.31% said it is in the implementation phase; 73.17% said they have not implemented any EMS, but intend to deploy; 4.88% said their campuses do not intend to implement an EMS, and 6.1% said they did not know about EMS (Table 5).

Table 5 - Results of the variable implementation of an EMS.

| Answers                                                          | Percentage (%) |
|------------------------------------------------------------------|----------------|
| Did not mark any answer                                          | 2.44           |
| Said their campuses do not intend to implement an EMS            | 4.88           |
| Said they are in implementation phase                            | 6.10           |
| Said they did not know about EMS                                 | 6.10           |
| Said it is in the implementation phase                           | 7.31           |
| Said they have not implemented any EMS                           | 73.17          |
| Total                                                            | 100.0          |

Source: Survey data.

Among the campuses that used some indicator of environmental performance, 85.36% were unable to specify which indicator was used; 0.00% answered nothing to the indicator water consumption; 3.65% answered the indicator energy consumption; 1.22% reported the indicator production, recovery and final disposal of waste; 0.00% reported for the indicator expenses and investments in...
environmental protection; 7.33% reported the indicator environmental education and awareness raising; 1.22% reported the indicator emissions of air pollutants and 1.22% reported other environmental indicators (Table 6).

Table 6 - Variable environmental indicators results used in campuses.

| Answers                                      | Percentage (%) |
|----------------------------------------------|----------------|
| The indicator production and final disposal of waste | 1.22           |
| Reported other environmental indicators       | 1.22           |
| Reported the indicator emissions of air pollutants | 1.22           |
| The indicator energy consumption              | 3.65           |
| The indicator environmental education and awareness raising | 7.33           |
| Were unable to specify which indicator was used | 85.36          |
| Total                                        | 100.0          |

Source: Survey data.

In fact, from 82 evaluated campuses in the 5 regions of the Brazilian states, 3.65% did not mark any option to indicate whether or not environmental audit was carried out in the campuses; only 19.52% performed environmental analysis audit; 75.61% of campuses, did not carry out an environmental audit and 1.22% were unaware if environmental audits had achieved a performance on campus (Table 7).

Table 7 - Results of the variable performance of audit for environmental analysis.

| Answers                                      | Percentage (%) |
|----------------------------------------------|----------------|
| Didn’t know about environmental audits        | 1.22           |
| Not environmental audit was carried out in the campuses | 3.65           |
| Performed environmental analysis audit       | 19.52          |
| Did not carry out an environmental audit     | 75.61          |
| Total                                        | 100.0          |

Source: Survey data.

It was observed that for the implementation of a local Schedule 21 or another sustainable development strategy, 2.44% did not mark any of the response options regarding sustainable development strategies; 0.00% did not mark the option to confirm the implementation of sustainable development strategy at the campuses; 2.44% reported it is in the implementation phase; 53.66% reported not having any strategy implemented, but planning to do it; 10.97% reported not having a local Schedule 21 strategy, but had planned another sustainable development strategy; 4.88% reported having an environmental plan for the campuses; 18.30% reported not intending to program another sustainable development strategy, and 7.31% reported being unaware about planning a local Schedule 21 or another sustainable development strategy (Table 8).

Table 8 - Implementation of a local Schedule 21 or another sustainable development strategy.

| Answers                                      | Percentage (%) |
|----------------------------------------------|----------------|
| Not mark any options regarding sustainable development strategies | 2.44           |
| Reported it is in the implementation phase   | 2.44           |
| Reported having an environmental plan for the campuses | 4.88           |
| Reported being unaware about planning a local Schedule 21 | 7.31           |
| Not having a local Schedule 21 strategy     | 10.97          |
| Not intending to program another sustainable development strategy | 18.30          |
| Not having any strategy implemented, but planning to do it | 53.66          |
| Total                                        | 100.0          |

Source: Survey data.
From 82 surveyed campuses, 37.80% reported in line with the requirements of Brazilian Federal Law 6,938/1981 (Brazil, 1981). 57.31% said they did not fulfill the requirements of this act, and 4.89% said they did not know if they followed the requirements of this act. This Law determined that the government has instruments to ensure the right to a balanced environment, such as environmental impact assessments, environmental licensing, environmental zoning and inspection.

From 82 surveyed campuses, 37.8% reported the National Council of the Environmental Regulation requirements (NCER) 237/1997 (Conama, 1997); 58.5% said they did not follow those requirements, and 3.70% reported not knowing whether they followed the requirements. This regulation sets criteria used in environmental licensing, in order to implement the use of licensing as an environmental management tool; and it creates the National Environmental Policy.

From the evaluated campuses, 42.68% reported they follow the requirements of the Law 9,605/1998 (Brazil, 1998); 57.31% said they did not follow those requirements; 7.32% said they did not know if they follow those requirements. This Law establishes who, in any way, contributes to the commission of the crimes foreseen in this Law, affects the penalties to which they are committed, to the extent of their culpability, as well as the director, manager, board member and technical body, the auditor, the manager, the agent of a legal person, who, knowing of the criminal conduct of another, ceases to impede his practice, when he could act to avoid it.

From the 82 evaluated campuses, 46.34% declared they follow the requirements of Act 9,795/1999 (Brazil, 1999); 48.78% said they did not follow those requirements, and 4.88% were unaware of those requirements. This act sets parameters for environmental education and establishes the National Environmental Education Policy (Table 9).

**Table 9 - Campuses that followed, did not follow and did not know 4 environmental standards.**

| Environmental Regulation | Yes (%) | No (%) | Do not know (%) | Total (%) |
|--------------------------|---------|--------|-----------------|-----------|
| Conama 237/1997 number   | 37.80   | 58.50  | 3.70            | 100.0     |
| Law 6.938/1981 number    | 37.80   | 57.31  | 4.89            | 100.0     |
| Law 9.605/1998 number    | 42.68   | 50.00  | 7.32            | 100.0     |
| Law 9.795/1999 number    | 46.34   | 48.78  | 4.88            | 100.0     |

Source: Survey data.

**Discussion and conclusion**

That it was not observed any characteristic of the evaluated BFIE, which have allowed a diagnosis of some environmental practice in the studied profiles. In short, among the items answered, there is no question that stands out about the environmental practice. The similarity among campuses may be related to low IEPFI values and similar answers on issues related to topics that have a negative impact on the campuses. Respondents were asked what activities of the campus they believe have more negative impact on the environment. They were asked to mark five activities they judge the most relevant, from 18 activities.

The Local Schedule 21 arose from discussions at the Eco-92 conference. It declares that it is important that each country reflects on how their governments, companies, non-governmental organizations and other civil sectors could cooperate to propose solutions to social and environmental problems. In several campuses, there are lack of theoretical and practical knowledge implementation that would allow them to implement environmental management effectively. Regarding the implementation of a Local Schedule 21 processes, 2.44% did not mark any of the response options; 0.00% did not mark the option to confirm the implementation of a Local Schedule 21 processes; 2.44% reported it is in the implementation phase; 53.66% reported having any implemented strategy, but planning to do it; 10.97% reported not having scheduled a local Schedule 21 strategy, but instead planned another sustainable development strategy; 4.88% reported having an environmental plan for the campuses; 18.30% reported not intending to program another sustainable development strategy, and 7.31% reported being unaware of the planning of a Local Schedule 21 processes.
In the answers to the evaluated variables, whether the campuses had implemented environmental management system (EMS) in their facilities, over half of the campuses declared not having implemented an EMS. The campuses had achieved trouble following the legal requirements of four environmental legislations: NCER Regulation 237/1997 number, Law 9,795/1999 number, Law 9,605/1998 number, and Law 6,938/1981 number. Out of the surveyed campuses, 37.8% reported following the requirements of NCER Regulation 237/1997 Conama number; 58.5% said they did not follow the Regulation; and 3.70% reported not knowing whether they followed the Regulation. Out of the 82 campuses surveyed, 37.80% reported being on the internet with the requirements of Brazilian Federal Law 6,938/1981 number, 57.31% said they did not fulfill the requirements of this Act, and 4.89% said they did not know this environmental Law.

Out of the evaluated campuses, 42.68% reported they follow the requirements of Law 9,605/1998 number; 57.31% said they did not follow those requirements; 7.32% said they did not know this environmental Law. Out of the 82 campuses evaluated, 46.34% declared they follow the requirements of Law 9,795/1999 number. 48.78% said they did not follow those requirements; and 4.88% said they were unaware of this environmental Law. The research carried out in this study highlights the importance of standardizing the indicators used to assess ESI dimensions, which need to be considered for the development of public policies in the BFIE. There is an indication that public health and the perception of environmental legislation can be important conditions for ESI for BFIEs. A limited number of clear indicators are likely to lead to better evaluation and policy direction to improve ESI. ESI assessment can be explored throughout the development of new indicators covering different dimensions of sustainable development.

The current lack of BFIE approaches targeting bottom-up initiatives or involving different actors does not reflect the recent trend in the literature. ESI awareness initiatives are weak in the BFIE. There is a lack of political commitment to fostering the community for discussions on these issues. In addition, learning through international networks is important, since almost all experiences are developed in relative local isolation, strongly focused on the particular context of your school. There is little effort to learn from participating or being involved in international networks.

This study evaluated the IEPFI, which showed indexes that did not exceed the value 0.35, where the ideal value would be 1.0. In fact, some BFIE authorities have difficulty integrating the school population environmental concerns into their own operational activities as part of their responsibilities. In this sense, the results obtained for each environmental tool adopted by BFIE indicate that IEPFI level, for most of them, is weak. However, some initiatives have been undertaken, revealing growing interest in achieving better ESI. Given these concerns, this study aimed to influence awareness and support to BFIE in assessing the integration of certain environmental and sustainability practices and tools for the adoption of new policies and measures improvement.

Acknowledgments

We thank to National Council for Scientific and Technological Development (CNPq) and Coordination for the Improvement of Higher Education Personnel (CAPES) for the financial support.

References

BARATA, M. M. D. L.; KLIGERMAN, D. C.; MINAYO-GOMEZ, C. A gestão ambiental no setor público: uma questão de relevância social e econômica. Ciência & Saúde Coletiva, 12(1), p. 165-170, 2007. Available in: http://www.scielo.sp.org/pdf/csc/v12n1/15.pdf. Accessed in: may 5, 2019.

BRAZIL. Constitution of 1988. Constitution of the Federative Republic of Brazil State. Brasília, FD, October 5, 1988. Available in:
Evaluation of environmental management actions in professional and technological education...

http://www.planalto.gov.br/ccivil_03/constituicao/constituicaoocompilado.htm. Accessed in: may 5, 2019.

BRAZIL. Federal Decree 4,771 number of 1965. Establishing the New Forest Code. Brasilia, FD, September 15, 1965. Available in: http://www.planalto.gov.br/ccivil_03/leis/l4771.htm. Accessed in: may 5, 2019.

BRAZIL. Law 12.651 number of 2012. It provides for the protection of native vegetation; amending the Laws in 6,938, of August 31, 1,981, 9,393. Brasilia, FD, May 25, 2012. Available in: http://www.planalto.gov.br/ccivil_03/ato2011-2014/2012/lei/l12651.htm. Accessed in: may 5, 2019.

BRAZIL. Law 9.605 number of 1998. It provides for criminal and administrative sanctions derived from conduct and activities harmful to the environment. Brasilia, FD, February 12, 1998. Available in: http://www.planalto.gov.br/ccivil_03/leis/lei9605.htm. Accessed in: may 5, 2019.

BRAZIL. Law 9.795 number of 1999. It provides for environmental education, establishing the national environmental education policy and other measures. Brasilia, FD, April 27, 1999. Available in: http://www.planalto.gov.br/ccivil_03/leis/L9795.htm. Accessed: may 5, 2019.

BRAZIL. Federal Decree 24.643 number of 1934. Decree the code of waters. Rio de Janeiro, july 10, 1934. Available in: http://www.planalto.gov.br/ccivil_03/decreto/d24643.htm. Accessed in: may 5, 2019.

BRAZIL. Law 6,938 number of 1981. It provides for the national environmental policy, its purposes and mechanisms of formulation and implementation, and other measures. Brasilia, FD, August 31, 1981. Available in: http://www.planalto.gov.br/ccivil_03/leis/l6938compilada.htm. Accessed in: may 5, 2019.

COIMBRA BORGES, L. A., PEREIRA de REZENDE, J. L., ALVES PEREIRA, J. A., COELHO JÚNIOR, L. M.; ARANTES de BARROS, D. (2011). Áreas de preservação permanente na legislação ambiental brasileira. Ciência Rural, 41(7), p. 1202-1210, 2011. Available in: http://www.scielo.br/pdf/cr/v41n7/a5611cr4051.pdf. Accessed in: may 5, 2019.

CONAMA. National Environmental Council. Resolution 237 number which provides for the review and completion of the procedures and criteria used for environmental licensing. Brasilia, FD, December 19, 1997. Available in: http://www.mma.gov.br/port/conama/legiabre.cfm?codlegi=2372. Accessed in: may 5, 2019.

DEVELEY, P. F.; PONGILUPPI, T. Potential impacts of the changes proposed in the Brazilian Forest Code on birds. Biota Neotropica, 10(4), p. 44-45, 2010. Available in: http://www.biotaneotropica.org.br/v10n4/pt/fullpaper?bn00610042010+pt. Accessed in: may 5, 2019.

DRUZZIAN, E. T. V. Sistema de gerenciamento ambiental (SGA): buscando uma resposta para os resíduos de laboratórios das instituições de ensino médio e profissionalizante. Revista Liberato, 7(7), p. 40-44, 2006. Available in: http://www.liberato.com.br/sier. Accessed in: may 5, 2019.

MATTHEWS, D. H.; CHRISTINI, G. C.; HENDRICKSON, C. T. Five elements for organizational decision-making with an environmental management system. Environmental science & technology, 38(7), p. 1927-1932, 2004. Available in: http://europepmc.org/abstract/med/15112790. Accessed in: may 5, 2019.

NOGUEIRO, L.; RAMOS, T. B. The integration of environmental practices and tools in the Portuguese local public administration. Journal of cleaner production, 76, p. 20-31, 2014. Available in: http://sci-hub.tw/10.1016/j.jclepro.2014.03.096. Accessed in: may 5, 2019.
PIRES, S. M.; FIDÊLIS, T. Local sustainability indicators in Portugal: assessing implementation and use in governance contexts. Journal of Cleaner Production, 86, p. 289-300, 2015. Available in: https://core.ac.uk/download/pdf/43578236.pdf. Accessed in: may 5, 2019.

RIBEIRO, G. V. B. A origem histórica do conceito de Área de Preservação Permanente no Brasil. Revista Thema, 8(1), 2011. Available in: http://dx.doi.org/10.15536/thema.8.2011.25p.67. Accessed in: may 5, 2019.

STREZOV, V.; EVANS, A.; EVANS, T. J. Assessment of the Economic, Social and Environmental Dimensions of the Indicators for Sustainable Development. Sustainable Development, 25(3), p. 242-253, 2017. Available in: https://onlinelibrary.wiley.com/doi/abs/10.1002/sd.1649. Accessed in: may 5, 2019.

TAUCHEN, J.; BRANDLI, L. L. Environmental management in higher-education institutions: a model for implementation at a university campi. Gestão & Produção, 13(3), p. 503-515, 2006. Available in: https://dx.doi.org/10.1590/S0104-530X2006000300012. Accessed in: may 5, 2019.

*Doutorado em Engenharia Florestal; Professor e Pesquisador; Instituto Federal de Educação no Estado de Rondônia; Departamento de Educação. E-mail: aurelio.ferreira@ifro.edu.br.

**Mestre em Geografia; Professor e Pesquisador; Instituto Federal de Educação no Estado de Rondônia; Departamento de Educação. E-mail: marcel.emerick@ifro.edu.br.

***Mestrado em Educação; Professor e Pesquisador; Instituto Federal de Educação no Estado de Rondônia; Departamento de Educação. E-mail: maria.helena@ifro.edu.br.

****Professor e Pesquisador; Instituto Federal de Educação no Estado de Rondônia; Departamento de Educação. E-mail: marcos.anequine@ifro.edu.br.

Recebido em 25/07/2019
Aprovado em 30/10/2019