

## Environmental Management

# Environmental licensing: quality evolution of Environmental Impact Assessment (ISE)

Licenciamento ambiental: evolução da qualidade do Estudo de Impacto Ambiental (EIA)

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## ABSTRACT

The Environmental Impact Assessment and Environmental Impact Report (ISE/EIR) are the main studies that subsidize the decision of the environmental agency in issuing the prior license, required to subsidize environmental licensing of enterprises with significant power of environmental degradation. The environmental licensing for ISE/EIR to be effectively applied are directly related to the quality of these studies. The aim of the study was to analyze the evolution of the quality of the ISE/EIR based on the perception of IBAMA's environmental analysts. For data were applied electronic questionnaires for environmental analysts responsible for IBAMA's environmental licensing between 2013 and 2018. The questions analyzed the environmental analysts' perception of the quality of the ISE/EIR and of the specific parts of the study, using as an analytical tool the Boxplot graphs and the non-parametric test Mann-Whitney U. The result indicated that the quality of ISE/EIR are low and didn't evolve between 2013 and 2018.

**Keywords:** Environmental management; Environmental impact assessment; Environmental policy

## RESUMO

O Estudo de Impacto Ambiental e o seu Relatório de Impacto Ambiental (EIA/RIMA) é o principal estudo que subsidia a decisão do órgão ambiental na emissão da licença prévia, trata-se de um documento exigido no licenciamento de empreendimentos com alto potencial de causar degradação ambiental. A efetividade do licenciamento ambiental dessas atividades está diretamente relacionada com a qualidade do EIA/RIMA. O objetivo do trabalho é de analisar a evolução da qualidade dos EIA/RIMA a partir da percepção dos analistas ambientais do IBAMA. Os dados foram coletados por meio da aplicação de questionário eletrônico para os analistas ambientais responsáveis pelo licenciamento ambiental do

IBAMA nos anos de 2013 e 2018. As questões do questionário analisaram a percepção dos analistas quanto à qualidade do EIA/RIMA e das partes específicas do estudo, utilizando como instrumental analítico os gráficos Boxplot e o teste não-paramétrico U de Mann-Whitney. Os resultados indicaram que a qualidade dos EIA/RIMAs é baixa e não evoluiu entre o período de 2013 até 2018.

**Palavras-chave:** Gestão ambiental; Avaliação de impacto ambiental; Política ambiental

## 1 INTRODUCTION

For the licensing of enterprises with significant power of environmental degradation in Brazil, The Environmental Impact Assessment and Environmental Impact Report (ISE/EIR) are studies required by the public authority through the competent environmental agency under Brazilian environmental legislation.

Licensing competence in Brazil is common among federal entities. In general, the division of this competence depends on the scope of environmental impacts, for example, enterprises that cause local environmental degradation the responsibility lies with the municipal environmental agency, if the impact goes beyond the city limits, the responsibility rests with the State and if go beyond the limits of the State the responsibility is of the Federal Government. Currently, there is no federal legislation regulating environmental licensing in Brazil. The theme is regulated by state and municipal laws and resolutions of The National Environment Council (CONAMA).

The Brazilian environmental licensing process consists of three Licensing Procedures, embracing the licenses: Prior License (LP), Installation License (LI) and Operation License (LO). In the case of smaller activities or those with less potential to harm the environment, the licensing agency may establish a simplified procedure, not being obligatory the Licensing Procedures.

The Prior License(LP) approves the location and the design of the project, attesting the environmental viability and establishing the basic requirements and constraints to be attended in the next Licensing Procedures. It is in the Prior License that the agency may require the elaboration of the ISE/EIR.

According to Sanchez (2013), the structure of the ISE/EIR is standard and must contain a logical sequence of procedures, each one dependent on the results of the previous procedure. The main steps in preparing an ISE are: 1) description of the project and its alternatives 2) environmental diagnosis 3) analysis of the impacts 4) management plan.

The ISE/EIR subsidize the decision-making process by the environmental agency and the quality of this study directly impacts the effectiveness of environmental licensing. The environmental licensing has been a common focus of criticism, being pointed out as an obstacle to development of a large scale of the productive sector, as well as accused by many environmentalists of being a process corrupted by economic interests and with no effectiveness from an environmental perspective.

Among the criticisms of environmental licensing, the most important were those dealing with the low quality of the ISE/EIR, what helps for the delay in the decision-making process or in making wrong decisions (Almeida *et al.*, 2016). Considering criticism from Moreira (1993), made almost three decades ago, Almeida *et al.* (2016) highlighted that the ISE coordination problems happened since the origin of this instrument, which has compromised its quality over time.

In connection with the historic dissatisfaction with environmental licensing, is found in the imminence of a vote on the federal legal framework for environmental licensing, which is found in discussion in the House of Representatives since 2004 with a draft model law nº 3.729/04 (BRAZIL, 2004). The draft model law nº 3.729/04 was intended to regulate the item IV from §1º of art. 225 of the Federal Constitution, for which it is demanded, in the law, the preliminary environmental impact study for the installation of the work or enterprises with significant power of environmental degradation (BRAZIL, 1988).

Facing with the importance of the ISE/EIR for the effectiveness of environmental licensing and historical criticisms of the instrument, the aim of the study is to analyze the evolution of the quality of ISE/EIR from the perception of

environmental analysts of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA).

## 2 THEORETICAL FRAMEWORK

Under the threat of irreparable damage to the natural and human resources from the planet, in the end from decade of 70 appears the idea that there are limits in natural systems and limits should be imposed on the pattern of industrial growth in effect until then. A document called "Report of the Club of Rome" has been drawn up, with the participation of industrialized countries, that highlighted an "environmental catastrophe" if the standard development model continued and the only way out to save the world would be the 'zero' growth policy (FOGLIATTI *et al.*, 2004).

The emergence of the Environmental Impact Assessment (EIA) have a legal basis in the rationalist lines of decisions that emerged in the 1960s, requiring an efficient technical assessment that provides data in the decision-making process (OWENS, *et al.*, 2004). Sharifi *et al.* (2013) have emphasized that the impact assessment tools must transform an overload of complex data on the environment into information that subsidize the decision-making process.

After creation of the Nacional Environment Policy (NEPA) from USA in 1969, the EIA and its environmental impact studies spread quickly on a global scale between the most different governments, becoming the most used tool and accepted to identify and evaluate he likely environmental consequences of actions and enterprises on different scales, thus facilitating the decision-making process and the effective environmental management (JAY *et al.*, 2007).

Since the 1970s, were developed within the EIA several specific forms of evaluate for many different areas, including the Social Impact Assessment, Health Impact Assessment and Strategic Environmental Assessment. To a certain level, some believe that these tools emerged through dissatisfaction with the EIA. The Social Impact Assessment, for example, developed strongly in the late 1980s

because the public felt that the EIA had a focus on the biophysical crankcase and neglected the social impacts (TAYLOR *et al.*, 2004).

Since de 70th decade, raised concerns about environmental issues in Brazil, having as influence the United Nations Stockholm Conference on the Human Environment, held in 1972 (MOTTA & PÊGO, 2013). After the signature of the Stockholm Declaration on the Human Environment, in Brazil, within the framework of the Ministry of Interior (MINTER), was created the Special Secretary for the Environment (SEMA), by means of Decree nº 73.030 of October 30,1973 (BRAZIL, 1973).

In 1981, through the law nº 6.938 that imposed the Brazilian Environmental Policy (PNMA) established by the Law nº 6.938, that there was a forecast model of the use of EIA in environmental licensing for potentially polluting activities in Brazil (BRAZIL, 1981). According to Barros *et al.* (2012), PNMA aims to control the economic activities that threatens the environment, by regulating and restricting the activities with potential of environmental degradation aimed at controlling the use of natural resources.

However, the EIA regulating in Brazil was established only in 1986 within the National Environmental Consultative Council Resolution nº 01/86 (BRAZIL, 1986), that establishes the primary criteria's and the broad guidelines for the Environmental Impact Assessments. According to this resolution, enterprises with significant power of environmental degradation required the Environmental Impact Assessment and Environmental Impact Report (ISE/EIR) studies.

## **3 MATERIALS AND METHODS**

### **3.1 Data**

For data were applied electronic questionnaires for environmental analysts linked to the Environmental Licensing Board from IBAMA. To evaluate the Evolution

of the analysts' perception of the quality of ISE/EIR, the questions was applied between 2013 and 2018, that is, five years after the first data collection the same questionnaire was reapplied for obtaining comparative data.

To evaluate the quality of ISE/EIR, the questions incorporated the analysts' perception of the general quality of the ISE/EIR and of the specific parts that make up this document (Chart 1). The questionnaire had 7 (seven) statements for environmental analysts to position themselves within the Likert scale (1932): 1) Strongly disagree (SD); 2) Disagree (D); 3) Indifferent (I); 4) Agree (A); and 5) Strongly agree (SA).

Chart 1 – Questionnaire applied

<b>Deficiencies</b>	<b>Affix</b>
1) The study of alternatives to the enterprise is well done in most ISE/EIR.	AltS
2) The delimitation of the area of influence is well done in most ISE/EIR.	IADel
3) The environmental diagnosis is well done in most ISE/EIR.	EnvD
4) The prediction of impacts is well done in most ISE/EIR.	ImPr
5) Evaluating the importance of impacts is well done in most ISE/EIR.	ImEv
6) The environmental management plans presented in most ISE/EIR are well done.	EnvM
7) In general, ISE/EIR are well done.	ISEQ

Source: Authors (2021)

In addition to questions about the quality of ISE/EIR studies, the questionnaire also included questions that identified the sampling profile about the professional experience of analysts. Then, the time of experience working with environmental licensing was asked and the number of ISE/EIR analyzed in different types of large enterprises.

For statistical evaluation of data collected, the interviewees' opinions were quantified, obeying scores between 1 to 5, where the highest values indicate the highest degree about the statement and a more positive perception about the quality of ISE/EIR studies.

### 3.2 Profile and sample size

In 2013, the study had 74 responses, reaching a representativeness of 21% of the population of 354 analysts working at Environmental Licensing Board from IBAMA. Analysts who participated in this data collection had an average experience of 8 years with environmental licensing, being the least experienced analyst with 2 years of experience and the most experienced with 32 years in the area of environmental licensing. In general, these analysts analyzed between one and five ISE for different types of studies, highlighting hydroelectric and transmission lines, where 53 analysts said they had some experience in these areas.

The sample for the year 2018 had the participation of 44 analysts, the average experience was 10 years working in environmental licensing, totaling a representativeness of 16% of the population of 274 analysts in 2018. The least experienced analyst had 2 years of experience and the most experienced had 26 years of experience. In a similar way to the profile of 2013, these analysts analyzed between two and five ISE for different types of studies, highlighting highways and transmission lines, where 28 analysts reported having had some experience in these areas.

The evaluation of the sample size was based on the method of the proportion of a finite population (FÁVERO & BELFIORE, 2017), by the Equation (1).

$$n = \frac{N \cdot 0,25 \cdot \left(\frac{Z_a}{2}\right)^2}{0,25 \cdot \left(\frac{Z_a}{2}\right)^2 + (N-1) \cdot E^2} \quad (1)$$

Where:

n = Number of individuals in the sample;

N = Population size;

Z<sub>a</sub>/2 = Critical value that corresponds to the degree of confidence requested;

E = Maximum estimate error.

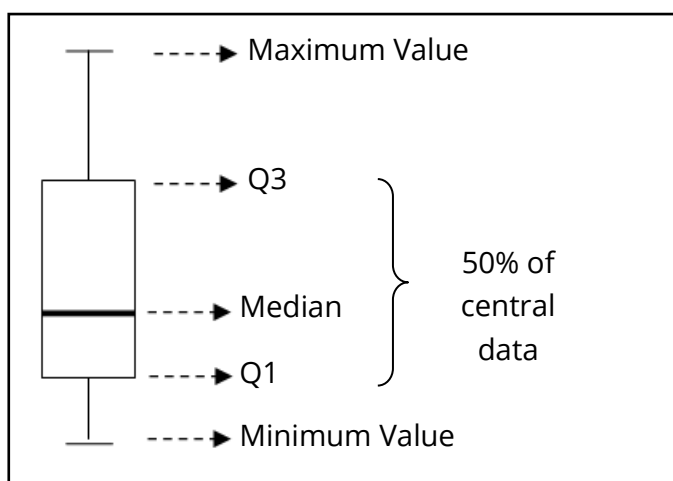
Within a 95% confidence level in the tests, the value of 1,96 for parameter  $Z_{\alpha/2}$ , the main aim of Equation 1 is to demonstrate the error margins of the samples, allowing the reader to judge the limitations of the results, because an increase in the sample is not possible, since it does not depend only on the researcher.

### 3.3 Statistical analysis

#### 3.3.1 Boxplot

The statistical analysis started with the presentation of the data through Boxplot graphs, exposing the position, symmetry and distribution of the data and thus facilitating the understanding of the results of statistical tests. According to Fávero e Belfiore (2017), Boxplot is a graphic representation of five position measures for a given variable: 1) minimum value; 2) first quartile (Q1); 3) second quartile (Q2) or median; 4) third quartile (Q3) and 5) maximum value (Figure 1).

Figure 1 – Boxplot Diagram



Source: Authors (2021)

In addition to providing an idea of the distribution of the data, Boxplot also identifies data that are divergent, the “outliers”. According to Pestana e Gageiro



(2005), atypical observations are those that are more than 1,5 quartiles from the end of the box [ $3 \times (Q3 - Q1)$  from the minimum or maximum value].

### 3.3.2 The Mann-Whitney U test

The statistical test applied to compare the evolution of the analysts' perception was the Mann-Whitney U non-parametric test for independent samples. Reasons for the choice of that method was because the data were measured on an ordinal scale. According Siegel e Castellan (2006), the Mann-Whitney U Test is one of the best non-parametric tests, being a useful alternative for the parametric test t when the measurement in the survey is weaker than that given on an interval scale.

The parametric test t compares the means of two independent samples, and the Mann-Whitney U Test compares the location center of the two samples using of a measure of central tendency, known as "rank means", thus detecting the existence of a statistically significant difference between the variables compared (PESTANA & GAGEIRO, 2005).

The 5% significance level was adopted ( $p < 0,05$ ) using a two-tailed test, that is, the two probabilities are not equal, defining the following hypotheses for each compared variable:  $H_0$  – there is no statistically significant difference in the evolution of the perception of analysts between 2013 and 2018, and  $H_1$  – there is a statistically significant difference in the evolution of the perception of analysts between 2013 and 2018.

## 4 RESULTS AND DISCUSSION

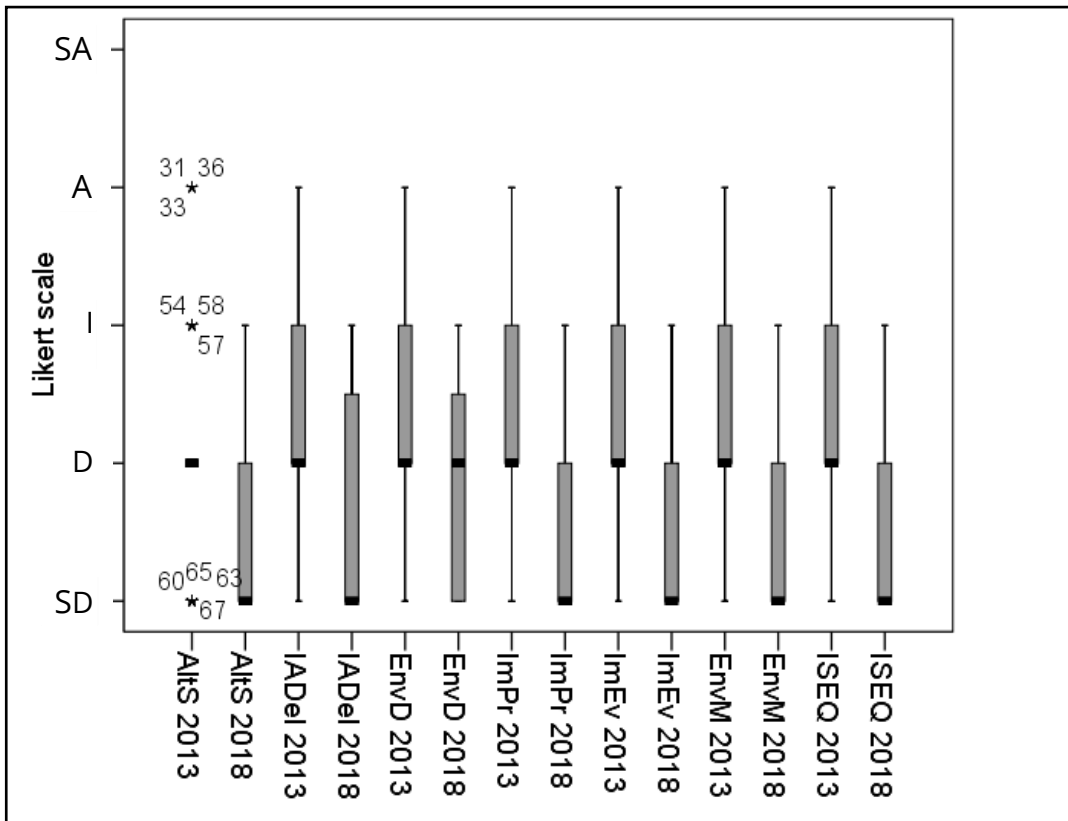
The error margins calculated using the finite population proportion method indicated a margin of error of 10% for the sample collected in 2013 and 13,5% for the collection of 2018. Both samples were considered representative of the population even if the error margins are higher than the normally arbitrated value

of 5%. The increase in the sample does not depend only on the researcher, considering that the entire population of environmental analysts received the questionnaire, however responding to the survey is voluntary. Thus, the importance of calculating the margin of error is to provide information about the limitations of the research, contributing to the judgment of the limits in the extrapolation of the results to other contexts of analysis.

The perception of environmental analysts about all variables analyzed and in the two periods sampled, 2013 and 2018, indicated a low quality of ISE/EIR studies.

Environmental analysts disagreed with the claims that the ISE and its parts are well prepared, according to the median values presented in Figure 2.

Figure 2 - Evolution of the perception of environmental analysts in the analyzed variables



Source: Authors (2021)

The Boxplot results suggest a worsening in the perception of the quality of ISE between 2013 and 2018, indicating a difficulty in improving the instrument over time. Still, the dispersion of responses among analysts surveyed in 2018, compared to 2013, was apparently less. These results may have been influenced by the difference in the experience of the consulted analysts. In addition to the experience of analysts consulted in 2018 being slightly higher, this was highlighted in highway and transmission line studies. However, the analysts who answered the questionnaire in 2013 had more experience in transmission line and hydroelectric.

Boxplot are very useful for an initial and descriptive analysis of the data, however they don't allow greater inferences and judgments. The Mann-Whitney U Test was Applied and the difference between the variables analyzed was statistically evaluated (Table 1).

Table 1 – Evolution of Perception of the IBAMA's Environmental Analysts

Question	Affix	U Test	
		2013	2018
1) The study of alternatives to the enterprise is well done in most ISE/EIR.	AltS	66,3	38,3*
2) The delimitation of the area of influence is well done in most ISE/EIR.	IADel	62,9	40,2*
3) The environmental diagnosis is well done in most ISE/EIR.	EnvD	61,1	43,4*
4) The prediction of impacts is well done in most ISE/EIR.	ImPr	63,4	39,0*
5) Evaluating the importance of impacts is well done in most ISE/EIR.	ImEv	66,0	35,9*
6) The environmental management plans presented in most ISE/EIR are well done.	EnvM	66,1	37,6*
7) In general, ISE/EIR are well done.	ISEQ	64,1	37,6*

Source: Authors (2021)

Note: \*, \*\* difference between the raque averages at the significance level of 1% and 5%; respectively

Based on the results of U test (Table 2), the perception of IBAMA's environmental analysts regarding the quality of the ISE/EIR worsened between 2013 and 2018. All the variables analyzed, these corresponding to the parts of the

ISE/EIR, were perceived to be worse off in 2018 when compared to the opinions collected in 2013.

It is important to note that all parts of the ISE/EIR are concatenated, therefore, a poorly prepared part may have the effect of compromising other subsequent parts, for instance, a poorly made environmental diagnosis can cause an inaccurate impact analysis and, consequently, the development of ineffective environmental management programs and plans.

The results found are worrying, because in addition to indicating a difficulty in improving the instrument over time, the responses in the two sample periods, (2013 and 2018) focused on the attributes “disagree” and “completely disagree” that the ISE/EIR and its parts are well done.

The worsening of the results for the year 2018 can be explained by other factors that can lead to a loss of quality in environmental studies. The way that the government has responded to the delay in environmental licensing has been by simplifying the processes and limitation in the deadlines for analysis of the studies, that is, the difficult solution to shorten licensing time without loss of quality.

Within the strategic planning initiatives for a quicker environmental licensing, including foreseen in the New Legal Framework that is on the verge of being approved (PL nº 3.729/04), few initiatives aimed at increasing and preparing technical staff to carry out and analyze environmental studies have been thought of or done. Independent of the bureaucracy adopted, without an environmental management done by technically prepared professionals and in an adequate quantity, the problem of environmental licensing will continue.

## **5 CONCLUSION**

Environmental licensing in Brazil has become an inefficient mechanism for economic development and, also, is ineffective for environmental protection. The ISE/EIR is the main document of environmental licensing and subsidizes the

decision-making process of enterprises with significant power of environmental degradation.

According to the perception of IBAMA's environmental analysts the quality of ISE/EIR is low and has not evolved between the period of 2013 until 2018. Over this period, occurred bureaucratic initiatives to simplify and limit the terms of environmental licensing however, initiatives to qualify and increase the technical staff of professionals who prepare and evaluate environmental studies are insufficient.

## REFERENCES

ALMEIDA, A. N.; OLIVEIRA, N. B.; SILVA, J. C. G. L.; ANGELO, H. Principais deficiências dos Estudos de Impacto Ambiental. **Revista Brasileira de Gestão Ambiental e Sustentabilidade**, v. 3, n. 4, p. 3-14, Junho, 2016. DOI: <https://doi.org/10.21438/rbgas.040704>

BARROS, D. A.; BORGES, L. A. C.; NASCIMENTO, G. O.; PEREIRA J. A. A.; REZENDE, J. L. P.; SILVA R. Breve análise dos instrumentos da política de gestão ambiental brasileira. **Política e Sociedade**, v. 11, n. 2. p. 155-179, Novembro, 2012. DOI: <https://doi.org/10.5007/2175-7984.2012v11n22p155>

BRAZIL. **Decreto nº 73.030, de 30 de outubro de 1973**. Cria, no âmbito do Ministério do Interior, a Secretaria Especial do Meio Ambiente - SEMA, e dá outras providências.

BRAZIL. **Lei Nº 6.938, de 31 agosto de 1981**. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências.

BRAZIL. **Resolução CONAMA nº 001, de 23 de janeiro de 1986**. Dispõe sobre critérios básicos e diretrizes gerais para a avaliação de impacto ambiental.

BRAZIL. **Constituição da República Federativa do Brasil**. Brasília, DF: Senado Federal: Centro Gráfico, 1988.

BRAZIL. **Projeto de Lei nº 3.729 de 2004**. Dispõe sobre o licenciamento ambiental, regulamenta o inciso IV do § 1º do art. 225 da Constituição Federal, e dá outras providências.

FÁVERO, L. P.; BELFIORE, P. **Manual de análise de dados**. 1ª ed. Rio de Janeiro: Elsevier, 2017

FOGLIATTI, M. C.; FILLIPO, S.; GOUDARD, F. **Avaliação de impactos ambiental: aplicação aos sistemas de transporte**. Rio de Janeiro: Interciência, 2004.

JAY, S., JONES C., SLINN P., WOOD C. Environmental impact assessment: Retrospect and prospect. **Environmental Impact Assessment Review**, v. 27, p. 287-300, January, 2007. DOI: <https://doi.org/10.1016/j.eiar.2006.12.001>

LIKERT, R. A technique for the measurement of attitudes. **Archives of Psychology**. v. 22, n. 140, p. 44-53, June, 1932.

MOREIRA, I. V. D. A experiência brasileira em avaliação de impacto ambiental. *In*: SÁNCHEZ, L. E. (Org.). **Avaliação de impacto ambiental: situação atual e perspectivas**. São Paulo: EPUSP, 1993. p. 39-46.

MOTTA, D. M.; PÊGO, B. (orgs.). **Licenciamento ambiental para o desenvolvimento urbano: avaliação de instrumentos e procedimentos**. Rio de Janeiro: Ipea, 2013.

OWENS, S.; RAYNER, T.; BINA, O. New Agendas for Appraisal: Reflections on Theory, Practice, and Research. **Environment and Planning A: Economy and Space**, v. 36, n. 11, p. 1943-1959, November, 2004. DOI: <https://doi.org/10.1068/a36281>

PESTANA, M. H; GAGEIRO, J. N. **Análise de Sados para Ciências Sociais – A Complementaridade do SPSS**. 4 ed. Lisboa: Edições Silabo, 2005.

SHARIFI, A.; MURAYAMA, A. A critical review of seven selected neighborhood sustainability assessment tools. **Environmental Impact Assessment Review**, v. 38, p. 73-87, January, 2013. DOI: <https://doi.org/10.1016/j.eiar.2012.06.006>

SÁNCHEZ, L. E. **Avaliação de impacto ambiental: conceitos e método**. 2 ed. São Paulo: Oficina de Textos, 2013.

SIEGEL, S.; CASTELLAN, N. J. **Estatística Não-Paramétrica para as Ciências do Comportamento**. 2º ed. Porto Alegre: Bookman, 2006.

TAYLOR, C. N.; BRYAN C. H.; GOODRICH. C. G. **Social Assessment: Theory, Process and Techniques, Environmental Practice**. 3rd Edition. Social Ecology Press, Middleton, 2004.

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