Towards a systematic use of quality review packages

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Abstract

The quality of Environmental Impact Statements (EIS) is key to Environmental Impact Assessment (EIA) effectiveness and a considerable effort has been applied in this topic, including the development of EIS quality review packages (QRP) to support and enhance EIA practice. The literature recognises the need for a clear and robust procedure to integrate the various elements of a typical EIS but, apparently, there is no consensus on how to integrate the different criteria proposed in QRPs to determine the quality considering a combination of criteria. This paper presents a standardised review strategy using relative weights coupled to Lee and Colley's Review Package, one of the most used QRPs in the globe. Analytic Hierarchy Process and experts consultation were applied as techniques to develop the different weights to subcategories, categories and areas of evaluation. The outcomes suggest a promising pathway to a more effective use of QRPs.

Introduction

Scientific research has been devoted to interpret the practice of Environmental Impact Assessment (EIA) using the quality of Environmental Impact Studies (EIS) as an indicator of its effectiveness (Lee & Colley 1992; Ross et al. 2006; L. A. Sandham et al. 2008; Phylip-Jones & Fischer 2013; Badr et al. 2011; Glasson et al. 2005; Sandham & Pretorius 2008; Chanchitpricha & Bond 2013; Momtaz & Kabir 2013; Loomis & Dziedzic 2018). Among others, the Lee and Colley Review Package (LCRP) has been widely used as a tool to review the quality of information delivered by environmental statements (Lee & Brown 1992; Lee & Dancey 1993; McGrath & Bond 1997; Sandham et al. 2008; Sandham & Pretorius 2008; Phylip-Jones & Fischer 2013; Sandham et al. 2013; Kabir & Momtaz 2014; Mounir 2015; Anifowose et al. 2016; Gwimbi & Nhamo 2016; Kamijo & Huang 2016).

LCRP's criteria are based on international best practice and structured into four areas, 17 categories and 52 subcategories. The criteria are organized in a hierarchical structure (Figure 1) with different tiers of evaluation. Review subcategories are placed in the lowest level, represented by three digits. The quality assessment of this level is used to assess the next highest level, the review categories, represented by two digits. Review category assessments are then used to evaluate the next higher level, the review areas, represented by one digit, which in turn are used for the overall evaluation of the EIS (Lee & Colley 1992). The evaluation follows the grades presented in Table 1 and should be accompanied by a summary text highlighting its main strengths and weaknesses, indicating any major deficiencies that need correction to bring it into a satisfactory condition ('C' or higher). Each study should be evaluated separately by two different reviewers and any differences should be discussed later (Lee & Colley 1992).

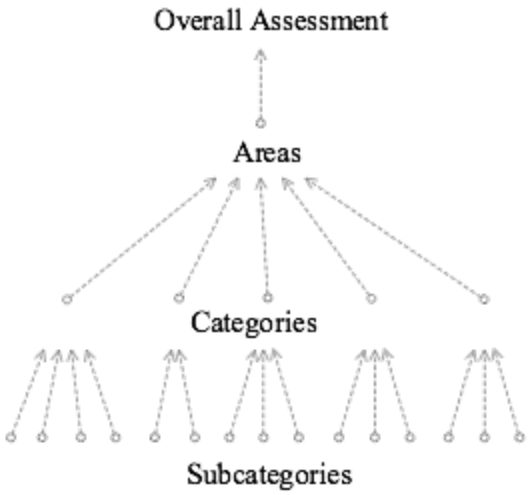

Fig. 1. Hierarchical structure of *Lee and Colley review package.*
Source: Adapted from Lee and Colley (1992).

Table 1 - Reviewing scores.

Symbol	Explanation Generally
A	Generally well performed, no important tasks left incomplete.
B	Generally satisfactory and complete, only minor omissions and inadequacies.
C	Can be considered just satisfactory despite omissions and/or inadequacies.
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions and/or inadequacies.
E	Not satisfactory, significant omissions or inadequacies.
F	Very unsatisfactory, important task(s) poorly done or not attempted.
NA	Not applicable. The Review Topic is not applicable or irrelevant in the context of this Statement.

Source: Lee and Colley (1992, p.14).

The authors themselves advise being careful while assigning grades to categories and areas and overall assessment, and emphasize that this analysis should not be made as a simple average of the grades attributed to the items that compose them, but instead using as reference the text of Table 1 and "the relative importance" of the criteria, as exemplified in the two following text fragments:

> In assessing the higher levels, reviewers are expected to use personal judgements about the relative importance of the various subtopics and additional knowledge gained from the Statement as well as their assessments of the level immediately below […] (Lee & Colley 1992, p.8).
> [...] Note that the assessment of the Category should not be derived by a simple averaging of the assessments of the component Subcategories. Your evaluation of both the relative importance of these subcategories and any information in the Statement not covered by them, should also be taken into account [...] (Lee & Colley 1992, p.37).

In practical terms, however, the assignment of upper-level grades is a major challenge since this relative importance depends on the perspective of the subject (reviewer) and ends up bringing more subjectivity to the analysis. This gap is highlighted by several studies that suggest the possible benefits related to the use of specific weights for each evaluated item (McGrath & Bond 1997; Sandham & Pretorius 2008; Põder & Lukki 2011; Pretorius 2006). This work fills this gap, proposing relative weights to the set of criteria, contributing to decreasing the subjectivity in the application of the tool. Therefore, this proposal does not aim to present a modification of the Lee and Colley Review Package, but rather to contribute to diminish the subjectivity and discrepancy between the results from different applications.

Methodology

The weight proposition was carried out by conducting an expert elicitation. Eight EIA experts in four countries were consulted and strictly following the application of the Hierarchical Process Analysis (AHP) using the Saaty scale (Saaty 1977) as presented in Table 2. The scale ranges from one to nine, with one meaning 'equal importance' of one criterion relative to the other, and nine meaning 'absolute importance' of one criterion relative to another.

Table 2 - The fundamental scale of Saaty.

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favour one activity over another
5	Essential or strong importance	Experience and judgment strongly favour one activity over another
7	Demonstrated importance	An activity is strong favored and its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is need

Source: Saaty (1977).

The consultation was carried out using an Excel spreadsheet which was sent by email to the experts. The results were stored in a square matrix, named matrix of parity comparisons. The analysis was performed separately by each expert, including a verification of the consistency of experts' judgments according to Saaty (1977). The evaluations of five experts were considered totally consistent, two experts presented up to two inconsistencies and only one expert presented more than

two inconsistencies (index of consistency> 0.1) and therefore were withdrawn from the analysis. More details about the Saaty scale, AHP protocol and the procedures to calculate the square matrix, vector of priorities, consistency index and consistency ratio can be obtained in the suggested bibliography: Saaty (1977), Saaty (2008) and Saaty (2013).

Discussion

Figure 2 presents the four Review Areas: Area 1 – Description of the development, the local environment and baseline conditions; Area 2 – Identification and evaluation of key impacts; Area 3 – Alternatives and mitigation of impacts; Area 4 – Communication of results. The relative weights resulting from experts elicitation and AHP, presented in parentheses, indicate more importance to the Area 2 and less importance to the Area 4.

Similarly, previous work have already suggested that areas 2 and 3 should be considered more important than areas 1 and 4, assuming that they are more complex compared to the others, requiring not only the study of the environment, but also the need to make predictions based on scientific data, combined to the experience of the team preparing an EIS (Pretorius 2006; Sandham & Pretorius 2008; Sandham et al. 2013).

It is suggested that the Lee and Colley review package be applied using the relative weights presented in Figure 2. It is important to emphasize that the relative weights should be used as a reference, thus not replacing a case-by-case analysis that each particular context may require.

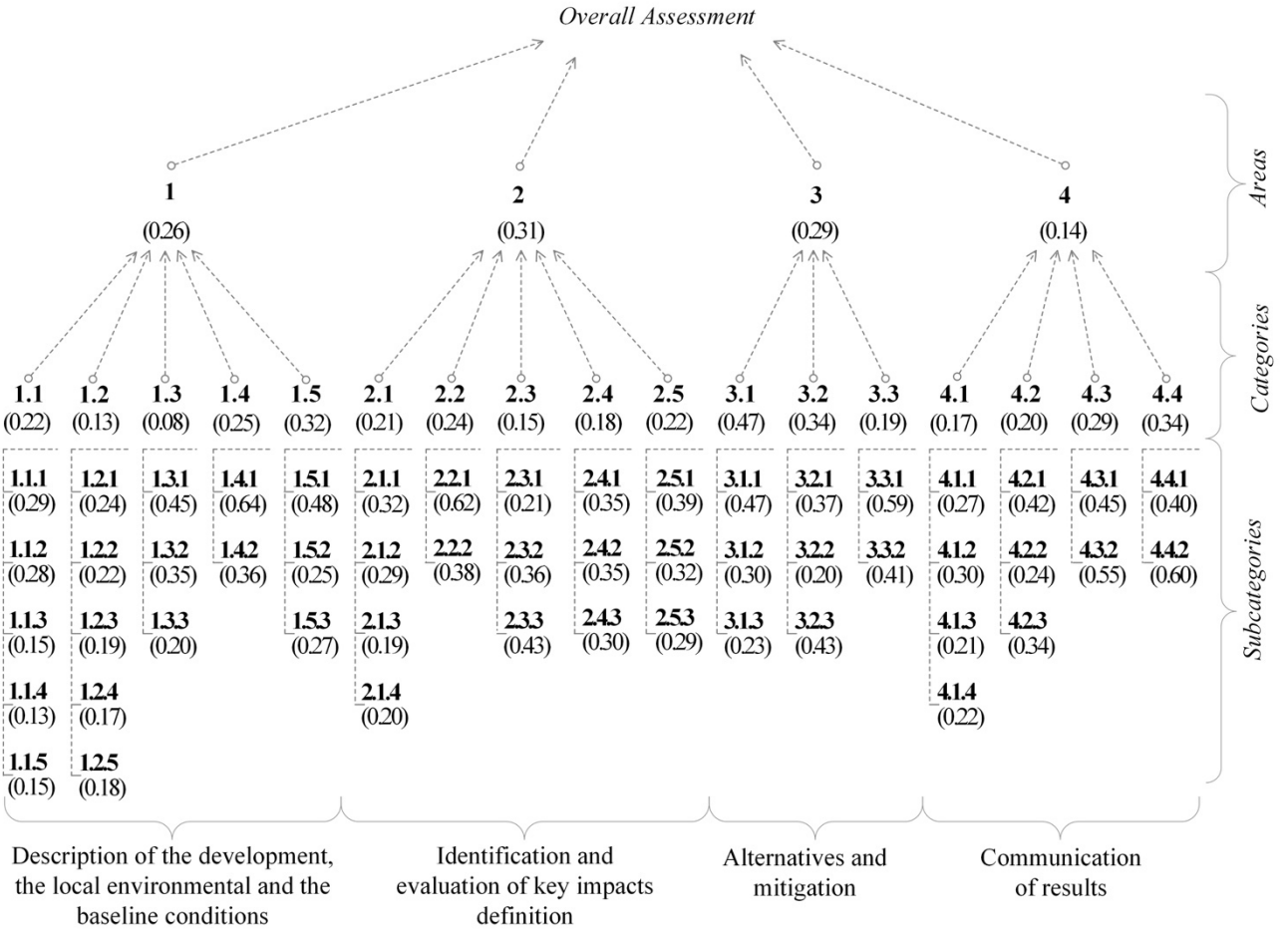

Fig. 2. The relative importance for Subcategories, categories and Areas of *Lee and Colley review package.*

Conclusions

Considering the scarcity of critical work related to the quality analysis tools of the Environmental Impact Study (EIS), this paper presents a standardized review strategy using relative weights as contribution guidelines to reduce the subjectivity of the application of the Lee and Colley Review Package.

Following an expert elicitation we conclude that the relative importance amongst LCRP's sub-categories is not only recognizable but also that it is possible to be described in terms of a quantitative scale, thus allowing to determine reasonable and robust relative weights for the sub-categories, categories and areas of evaluation, as presented in this paper.

A subsequent challenge to the systematic use of EIS quality review packages is related to the integration of the respective weights along the different levels in the review framework.

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