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Introduction

An Environmental Impact Assessment (EIA) Calculator has been developed by Neil Cousins of Bluedot Associates Ltd to provide a consistent methodology for determining the significance of environmental impacts.

The purpose of the calculator is to provide a platform for the assessment of significance once all of the evidence has been gathered. The aim is not to replace thematic guidelines for EIA approaches that exist, but to add to these by drawing out a transparent way of forming conclusions across all themes addressed. EIA approaches can therefore continue to follow existing guidelines for thematic EIA approaches where they exist and use the calculator to finalise how significance is determined. The calculator also aims to provide a standard approach for themes where there are no guidelines available on how to determine impact significance.

The transparency and consistency that is created through the use of the calculator also enables conclusions to be more easily verifiable by third parties who can also have access to the calculator to compare conclusions made. It also ensures that impact significance is measured consistently through the use of a standard systematic scoring system.

Background

The calculator is a copyrighted software package that can be easily accessed and distributed by EIA practitioners for common use across projects and geographic areas. The software is being distributed for free upon request.

The calculator provides a standard matrix approach to determining impact significance, but aims to draw combinations of the components of significance together a little better and more consistently than can sometimes be achieved using professional judgement alone.

By promoting the selection of values, the EIA Calculator inherently raises questions that need to be answered and those answers need to be supported by evidence in an EIA Report. The EIA Calculator therefore helps to address subjective and poorly thought out decision-making that can sometimes be undertaken during an EIA process.

It is important to note that although the EIA Calculator is focused use for EIAs it could also be used for early assessments for Strategic Environmental Assessment and for comparing design options.

Supporting EIA decision-making

There are numerous methods used to determine environmental impacts, many of which can be somewhat subjective and rely upon the experience and technical knowledge of the evaluation team. The key to delivering a successful EIA is to undertake the assessment in an objective and verifiable way so that conclusions on impacts are clear and can be peer reviewed. Ensuring an objective and quantifiable assessment is arguably one of the most fundamental requirements of a good EIA.

The calculator aims to support this requirement by providing a simple mechanism for determining significance. The selection of components of the EIA Calculator makes the process for determining significance clear. The reporting on why these components have been selected helps to draw out a robust discussion and understanding of the impacts associated with a project.

Although the calculator allows the conclusion on significance to be easily made, it is still dependent on the expertise of practitioners to determine what values should be selected. The calculator therefore only provides the end point of decision-making. In many instances guidelines and methods for determining impacts for different environmental

themes is available and these should be used to guide the selection of components within the calculator. However, the calculator helps to provide guidance on the questions that need to be answered and reported upon for themes that have no prescriptive established guidance.

How it works

The calculator allows for impacts to be determined against pre-set components of significance that are consistent with internationally accepted standards.

The calculator uses a scoring system to establish the significance of impacts. Scoring systems have been incorporated in EIA approaches since the early 1970s. Probably the most important initiation of this approach was developed by Dr Luna Leopold of the US Geological Survey in 1971. Dr Leopold adopted a matrix approach where environmental actions (stressors) were set against the environmental conditions that could be affected (receptors). For each impact/receptor a score of magnitude (-10 to +10) and importance (1 to 10) is assigned.

The methodology used by the calculator allows for a combined scoring approach that draws together all of the elements of impact significance so that one level of significance is assigned dependent upon the combination of these factors..

The EIA Calculator does not weight components of significance as the Calculator should be used for each individual impact that may occur for the pre-mitigation and post-mitigation scenarios. The aim is therefore not to assign the level of importance associated with each of the different impacts that have been considered. Each impact is considered on its own merit and the level of significance should therefore be considered independently, particularly as scores may change drastically following the adoption of mitigation. Therefore rather than adopt a generic matrix of impacts the calculator should be used to consider each expected impact in turn as highlighted by each specific project.

The scoring matrix has modified and adapted the risk-based scoring approach set out within NATA guidelines for the potential for road schemes to cause harm to water (DETR, 1998) - as discussed by Morris and Therivel (1995, p.235 – 237). This system used a similar matrix to that developed for this calculator, but it set environmental sensitivity (vertically) against the potential to cause harm (horizontally) to give an overall risk score.

The significance of impacts is achieved by taking account of the size and severity of impacts (magnitude) in combination with other elements that determine significance, such as:

- the importance and value of the receptor affected;
- the sensitivity of the receptor to the change;
- the timeframe of impacts;
- the reversibility of impacts.

Significance = Size and Severity of Impact x (Importance and Value + Sensitivity + Timeframe + Reversibility)

Each of these components are defined on scales with scores provided for the extent of impact against the level of magnitude. The size and severity of the impact has been used as the key determining factor as this will correlate very closely to the sensitivity of a receptor to change.

The image shows (F1) how the scores are assigned across the matrix of the EIA Calculator.

EIA Calculator

File Help

Select one button from each of the four groups

		Importance			Sensitivity			Timeframe			Reversibility	
		L	M	H	L	M	H	S	M	L	R	IR
Size / Severity	H	2	3	4	1	3	4	2	3	4	2	4
	M	1	2	3	1	2	3	1	2	3	1	2
	L	0	1	2	0	1	2	0	1	2	0	1

Reset Significance

Figure 1 How the scores are assigned across the matrix of the EIA calculator

EIA Calculator

File Help

Select one button from each of the four groups

		Importance			Sensitivity			Timeframe			Reversibility	
		L	M	H	L	M	H	S	M	L	R	IR
Size / Severity	H	2	3	4	1	3	4	2	3	4	2	4
	M	1	2	3	1	2	3	1	2	3	1	2
	L	0	1	2	0	1	2	0	1	2	0	1

Reset Significance

Figure 2 This figure shows the size and severity of the impact is medium, importance and value is high, the sensitivity of impact is low, the timeframe of impact is short-term and the impact is reversible

Figure 3 The EIA calculate showing the significance of the impact as being minor/moderate

In order to determine significance, the practitioner should identify the size and severity of the proposed impact and then select a button in each of the four other groups of significance. As an example, if a practitioner determines that the size and severity of the impact is medium, importance and value is high, the sensitivity of impact is low, the timeframe of impact is short term and the impact is reversible, the appropriate buttons should be selected as shown in the image (F2).

The significance of the impact is then calculated by pressing the 'significance' button, which will provide a score in the header box. In this example the significance of the impact will be minor/moderate as shown in the image (F3).

The score level that determines the significance of impacts in the calculator is shown in the following table.

Impact Category	Score
Slight	0
Minor	1 – 4
Minor/Moderate	5 – 6
Moderate	7 – 8
Moderate/Major	9 – 10
Major	11 – 16

Once an impact has been determined, another calculation can be undertaken to reflect the significance post the adoption of mitigation. Therefore each impact considered can have a pre-mitigation and post-mitigation score. The aim is to clearly show how effective the adoption of mitigation is.

The software calculations to be saved as a jpg image, which and can be stored to provide evidence on the decision making.

As already stated, the determination of the scale of impacts for each of the components of significance needs to be supported by detailed factual evidence. This requires an appropriate understanding of baseline conditions and also the influence of impacts on the baseline situation, which should be standard to any EIA.

Further information

For further information please contact Neil Cousins, Managing Director at Bluedot Associates (www.bluedotassociates.com). Email: thetoolbox@bluedotassociates.com

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