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Determination of significance in Ecological Impact Assessment: Past change, current practice and future improvements

Sam Briggs, Malcolm D. Hudson *

Centre for Environmental Sciences, Faculty of Engineering and the Environment, University of Southampton, Highfield, Southampton, Hampshire, SO17 1BJ, United Kingdom

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ABSTRACT

Ecological Impact Assessment (EcIA) is an important tool for conservation and achieving sustainable development. 'Significant' impacts are those which disturb or alter the environment to a measurable degree. Significance is a crucial part of EcIA, our understanding of the concept in practice is vital if it is to be effective as a tool. This study employed three methods to assess how the determination of significance has changed through time, what current practice is, and what would lead to future improvements. Three data streams were collected: interviews with expert stakeholders, a review of 30 Environmental Statements and a broad-scale survey of the United Kingdom Institute of Ecology and Environmental Management (IEEM) members.

The approach taken in the determination of significance has become more standardised and subjectivity has become constrained through a transparent framework. This has largely been driven by a set of guidelines produced by IEEM in 2006. The significance of impacts is now more clearly justified and the accuracy with which it is determined has improved. However, there are limitations to accuracy and effectiveness of the determination of significance. These are the quality of baseline survey data, our scientific understanding of ecological processes and the lack of monitoring and feedback of results. These in turn are restricted by the limited resources available in consultancies. The most notable recommendations for future practice are the implementation of monitoring and the publication of feedback, the creation of a central database for baseline survey data and the streamlining of guidance.

1. Introduction

1.1. Environmental Impact Assessment and Ecological Impact Assessment

There are two purposes of EIA. The first is to analyse the potentially significant environmental impacts resulting from major developments and to communicate this to decision-makers and the public (Wood, 2008). This should result in either the abandonment of environmentally unacceptable actions, mitigation of the impacts to the point of acceptability where possible or desirable or the compensation for unavoidable impacts (Sadler, 1996; C. Wood, 1995). The second purpose is in achieving or supporting the ultimate goals of sustainable development (Gilpin, 1995; Sadler, 1996).

Similarly, Ecological Impact Assessment (EcIA) is the "process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components" (Treweek, 1999 pp1). The main use of EcIA is within the broader remit of Environmental Impact Assessment (EIA). It is here that most experience in EcIA has been gained (Treweek, 1999). Therefore the focus of this research is on Ecological Impact Assessment as a component of EIA. The purpose of EcIA in this context is to ensure that the potential significant ecological impacts of a development are fully considered, mitigated and communicated to decision-makers on a proposal. Additionally, it links the conservation of biodiversity with the goal of sustainable development. Only recently have humans begun to realise the scale of value that biodiversity offers and our dependence upon it (Rands et al., 2010; TEEB, 2010). It is important, even vital, that biodiversity is conserved for the benefit of current and future generations (Rands et al., 2010). Development has been a major cause of biodiversity loss; it has rapidly driven habitat loss and fragmentation (Dolman, 2000; MEA, 2005). The Economics of Ecosystems and Biodiversity study (TEEB, 2010) provides a number of case studies illustrating how ecosystems have been undervalued. In these examples the cost resulting from the destruction of ecosystems for development overshadows the benefits of the development.

Principle Four of the *Rio Declaration on Environment and Development* (UN, 1992) states that "in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it." This firmly establishes the link between the environment and development. It requires that the potential environmental impacts of developments must be investigated in order to manage

* Corresponding author. Tel.: +44 2380 594797; fax: +44 2380 677519.
E-mail address: mdh@soton.ac.uk (M.D. Hudson).

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them. To achieve sustainable development existing environmentally harmful developments must be managed as best they can, but new developments must be designed to have the smallest practicable negative impact or even a positive one (Glasson et al., 2005). The purpose of EIA is to prevent significant negative impacts from occurring; such prevention is better than remedying impacts at a later date. However, EIA is not always viewed as being able to help in achieving sustainable development without large improvements to practice (Benson, 2003; George, 1999). Since the outcome of an EIA hinges on the determination of significance of environmental impacts, significance itself becomes a critical issue. EIA's use as an effective tool in contributing to sustainable development depends greatly on what is regarded or determined as significant (George, 1999).

1.2. The concept of significance

The concept of 'significance' is central to the EIA process and is considered throughout the process (Duinker and Beanlands, 1986; Lawrence, 2007; Sadler, 1996). Schedule 4 of the United Kingdom Town and Country Planning (Environmental Impact Assessment) Regulations 1999 and Schedule 3 of the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 make it a requirement for Environmental Statements (ESs) to include a description of the likely 'significant' effects of the proposed development on the environment, including the flora and fauna. However, the legislation does not provide a definition of 'significance' and its determination can vary a great deal in practice (Gilpin, 1995; Lawrence, 2007). There is a paucity of research into this topic and the term itself is poorly understood (Lawrence, 2007; Wood, 2008). The focus of this paper is on the problematic issue of determination of significance for predicted impacts. Generally an impact can be defined as a measurable change to the environment to a measurable degree; levels of significance can then be assigned to an impact in order to illustrate its importance (Fortlage, 1990).

Subjectivity can be an area of contention in EcIA; it is looked upon both favourably (Wilkins, 2003) and unfavourably (Treweek, 1996), but is inherent within the determination of significance. Since there is no widespread agreement on a definition of significance it becomes a collective judgement of the stakeholders in each case—this usually makes subjectivity inescapable (Fortlage, 1990; Gilpin, 1995). Additionally, subjectivity arises from the value placed on the receptor (species or habitat) of an impact; it is dependent on the value society places on it (Wood, 2008). There is concern that developers and consultants can use subjectivity to scale impacts down in order to increase the likelihood of achieving planning permission (Treweek, 1996).

Early reviews of ESs found that guidance was needed for practice to improve (Thompson et al., 1997; Treweek, 1996). In the UK there is now a variety of guidance for the different aspects of EIA (DETR, 2000; DoE, 1995; DoT, 1993; IEMA, 2004) and EcIA specifically (Byron et al., 2000; IEEM, 2006), and these have had some positive impacts; for example the third of a series of reviews of ESs for road schemes found that Volume 11 of the *Design Manual for Roads and Bridges* (DMRB) (DoT, 1993) had a positive impact on practice (Byron et al., 2000).

In this paper we focus on the UK Institute of Ecology and Environmental Management's (IEEM) *Guidelines for Ecological Impact Assessment in the United Kingdom*, published in 2006. These will be referred to as the "IEEM guidelines" hereafter. The level of uptake of these guideline and others from associated sectors and their effect on practice will be investigated. The guidance provides a framework within which to assess significance and factors that should be considered. To do so the guidelines propose placing a value on the ecological receptor at a geographic frame of reference, such as County Value. This determined using a number of factors; designations, biodiversity value, habitat value, species value, potential value, secondary or supporting value, social value and economic value. The impact on the receptor is then predicted taking into account the magnitude, extent, duration, reversibility, integrity, timing and frequency of the impact. The impact and value are then combined to establish significance at a geographic level alongside the probability of the predicted impact.

A great number of techniques are used to determine the significance presented in ESs, ranging from wholly qualitative descriptions to quantitative statistical analysis (Bevan, 2009; Thompson, 1990). A mixture of approaches are often used such that a balance between quantification and professional judgement is often used (Sadler, 1996). The main examples of such techniques from literature (Bevan, 2009; Gilpin, 1995; Glasson et al., 2005; Thompson, 1990; Treweek, 1999; Westman, 1985) are the use of matrices, cost-benefit analysis, monetary evaluation, multi-criteria analysis, standardised generic criteria specific to each impact or the same for all impacts and *ad hoc* methods, such as characterising significance with qualitative text or in tables.

The variety of techniques and the inconsistency of their use by consultants make the results from ESs difficult to compare (Treweek, 1999). All of the techniques offer different benefits, but also come with inherent limitations; the technique used should be appropriate to the context of the site (Thompson, 1990). When assessing the significance of an impact a variety of factors may be considered; again these vary from project to project and between recommendations. The lack of standardisation in the factors considered makes comparison between projects difficult, especially if there is a lack of transparency.

Historically reviews of ESs have concluded that their overall quality has been poor (Byron et al., 2000; DoE, 1991; Thompson et al., 1997; Treweek et al., 1993; P. Wood, 1995) but there have been noticeable improvements with time (Byron et al., 2000; DoE, 1996). The 'quality in the impact prediction and determination of significance' component was found to be the "weakest in the majority of ESs reviewed" (Treweek et al., 1993 pp301). The justification of the levels of significance assigned and the methods of determining significance were found to be a major problem (Byron et al., 2000). This paper examines how the quality of the justification of the assigned levels of significance, and the methods used, have changed through time.

The overall aim of this paper is to further the understanding of the determination of significance in practice, in terms of its history, its present state and how it might be improved in the future, to better fulfil the purposes of EcIA.

2. Methods

Three data streams were collected: interviews with expert stakeholders, ES reviews and a broad-scale survey of IEEM members. These three methods were conducted to complement one another: the review of ESs provides a quantitative sample of the main document of the EcIA process; the interviews assess the evolution of practice through time, techniques and limitations of current practice and ideas for future practice qualitatively; the survey provides a quantitative sample of these elements of practice and how the members currently determine significance in practice.

2.1. Semi-structured interviews with expert stakeholders

Until now projects looking at practice in EcIA have largely focussed on simply reviewing ESs (Bevan, 2009; Byron et al., 2000; Treweek et al., 1993; Wood, 2008) though some have also included questionnaires (Matrunola, 2007). Generally the focus is narrow, based mostly on practice by consultants and studies often overlook the views of other bodies involved in the process. Interviewees were therefore chosen to reflect the different organisations involved. They were from six consultancies, three local planning authorities in England, two statutory consultees and two non-governmental organisations (NGOs). Confidentiality has been provided for the interviewees—identities and affiliations are not