Significance assessment – a method that can revolutionise impact assessment

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Abstract

Having the right tools is effective when they are used properly for the right task. This is never more relevant than for impact assessment. Despite an abundance of tools and guidance, they are frequently incorrectly applied or ignored, leading to inadequate impact assessment, with ineffective mitigation, that only heightens stakeholder concerns. Such outcomes frustrate governments, regulators and communities who struggle to understand impacts on what is important to them.

This paper presents a method for impact assessment that combines elements of established approaches, applying a different lens to identify impacts, and assess significance. When applied at the right time, and in the right way, the result is an enhanced understanding of impacts at all levels. The method has been used on projects in developing and developed countries and has proven particularly effective in assessing impacts on intact and poorly understood ecosystems, and indigenous peoples, and for developments where the location of infrastructure is uncertain. Key concerns of regulators are addressed, by making two key assumptions – credible impacts will occur, and mitigation is proven and effective.

The benefits of the method are demonstrated through two case studies: a major oil and gas development in a remote part of PNG with intact forest and high biodiversity; and an unconventional gas project in high quality agricultural land in Australia, where the final locations of infrastructure were unknown.

Introduction

Various methods have been developed to assess impacts of development. Impact assessment requires application of appropriate methods. Too often impact assessments use one method leading to confusion and uncertainty about impacts and their management.

Benchmarking is used to compare project performance against industry best practice. For example, a project's greenhouse gas emissions and abatement measures are evaluated against the Intergovernmental Panel on Climate Change's 2006 IPCC Guidelines for National Greenhouse Gas Inventories predictions (IPCC 2006) and industry best practice.

Compliance with relevant air quality, water quality and noise and vibration standards and guidelines is used to assess a project's ability to protect human, animal and ecosystem health. These include World Health Organisation and jurisdiction standards and guidelines.

Cumulative impacts are assessed in accordance with the International Finance Corporation's good practice handbook (IFC 2013).

The most widely misused method is risk assessment. Risk is not impact; it is the likelihood of a hazard being released and the consequence of the released hazard on receptors. Consequence equates to impact and is the focus of impact assessment.

Inappropriate application of impact assessment methods results in impacts being not properly assessed and, in some instances, discounted. Inappropriate impact assessment results from environmental, social and cultural values not being properly identified and/or characterised, their sensitivity to change being poorly understood, the context in which the impact will occur not being properly established and mechanisms or drivers of impact being confused with impacts. These issues often result in unproven or ineffective mitigation being proposed and its efficacy in managing the impacts not adequately explained. Uncertainty is often inadequately dealt with due to assumptions about the probability or frequency of impacts occurring.

These issues are overcome by defining the sensitivity of values to change and therefore the context for the impact assessment, and assuming credible impacts will occur, and that mitigation is proven and effective. Credible impacts occur where a hazard exists, a mechanism or driver exists to release the potential embodied in the hazard and a pathway exists to a sensitive receptor. This approach is not new. While sensitivity of values is inherent in impact assessment it is too often not explicitly defined and consequently overlooked or poorly evaluated.

The revised impact assessment method assesses the significance of impacts on values by assessing the sensitivity of the value to change and the magnitude of change it experiences, as shown in Figure 1.

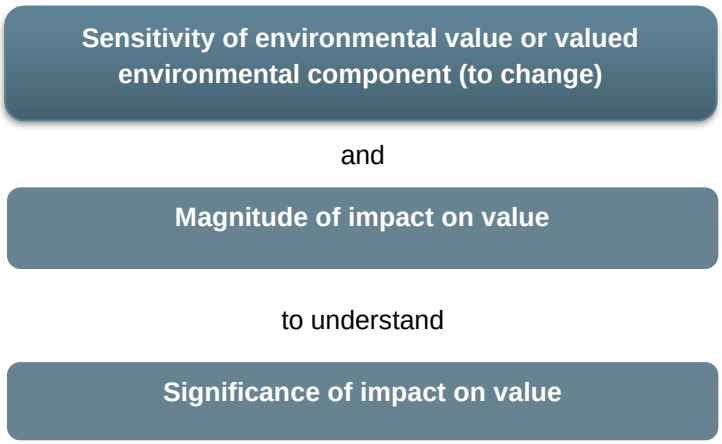

Figure 1 Assessing significance of impact on value using sensitivity and magnitude

This method complements but does not replace published guidelines that define significance. For example, the Australia ICOMOS Burra Charter 2013 (Australia ICOMOS 2013) and significant impact guidelines for matters of national environmental significance published by the Australian Government Department of the Environment (DOE 2013).

Environmental value or valued environmental component

Defining environmental values or valued environmental components (IFC 2013) is essential to the successful application of this method. Various definitions exist. Useful definitions are:

- an aspect that is valued, desirable or useful

- a quality or characteristic that is conducive to ecological and human health and/or public amenity and safety.

In defining values, it is important to consider interdependencies, for example, as proposed in ecosystem services (WRI 2008).

Sensitivity attributes

The sensitivity of an environmental value or valued environmental component is determined with respect to its worth, intactness, uniqueness or rarity, adaptability and recovery potential, and replacement potential. These attributes are described below.

Worth is defined differently for each environmental aspect. It is the worth or value placed on a natural resource or asset by communities. It encompasses such factors as dependency, level of use, benefit, and economic value. In many instances it is prescribed in legislation, policy, guidelines and international conventions. Typically, this applies to the physical and biological environment e.g., conservation status. Social and cultural (including religious) values are defined by individuals, communities and societies and their sense of wellbeing.

Intactness is an assessment of how intact the physical or biological environmental value is. It is a measure (with respect to its characteristics or properties) of its existing condition, particularly its representativeness. In a social context, it relates to the cohesiveness of communities and their customs.

The **uniqueness** or **rarity** of a physical or biological environmental value is an assessment of its occurrence, abundance and distribution within and beyond its reference area, e.g., bioregion or biosphere. A people's culture and communal structures contribute to its uniqueness or rarity.

The extent to which a physical or biological environmental value can recover from change or return to its original state determines its **adaptability** and **recovery potential**. Peoples' resilience and ability to adapt inform their sensitivity to change.

The potential for a representative or equivalent example of the physical or biological environmental value to be replaced determines its **replacement potential**. The availability of temporary or permanent substitutes for resources determines the potential for people to cope with change.

Professional judgement is used where the combined evaluation of each attribute is inconclusive. In these instances, those attributes assessed as contributing more to sensitivity take precedence in determining overall sensitivity to change.

Magnitude attributes

The magnitude of impact on an environmental value is an assessment of the geographical extent, temporal extent or duration and severity of the impact. These attributes are described below.

Geographical extent is an assessment of the spatial extent of the impact where the extent is defined as local, regional or widespread (meaning state-wide, national or international).

Temporal extent or duration is the timescale of the effect, including immediate or delayed; occurring during the day or night, wet or dry seasons, in summer, autumn, winter or spring; occurring during early works, construction, operation or decommissioning; once-off, cyclical or continuous; short term, medium term or long term.

Severity is an assessment of the scale (large or small), degree of change (intense or mild, acute or chronic) and rate of change (rapid or gradual onset) from the existing condition.

Assessing significance of impact

The significance of impacts on an environmental value is determined by the sensitivity of the value to change and the magnitude of change it experiences. An example of a matrix used to assess significance is shown in Figure 2. A key feature of the matrix is the inclusion of positive and very positive impacts. This is possible because mitigation applied to magnitude reduces the severity, extent and/or duration of an impact on a value, whereas mitigation applied to sensitivity increases the resilience and/or enhances the adaptability of the value to change. For example, immunising people will increase their resilience to disease. Educating people and supporting small business initiatives enhances their ability to participate in the economy. Upgrading a road makes it more resilient to increased traffic. Each of these examples has the capacity to produce a positive outcome for affected communities.

	Sensitivity				
Magnitude	**Extremely sensitive** (very low resilience)	**Very sensitive** (low resilience)	**Sensitive** (some resilience)	**Not very sensitive** (moderate resilience)	**Not sensitive** (high resilience)
Very high	Major	Major	Major	High	Moderate
High	Major	Major	High	Moderate	Low
Moderate	High	High	Moderate	Low	Low
Low	Moderate	Moderate	Low	Low	Very low
Very Low	Moderate	Low	Very low	Very low	Very low
Positive	**Positive**	**Positive**	**Positive**	**Positive**	**Positive**
Very positive	**Very positive**	**Very positive**	**Very positive**	**Very positive**	**Very positive**

Figure 2 Example matrix for assessing significance of impact

Case study – Surat Gas Project

Surat Gas Project is an unconventional (coal seam) gas project in Southeast Queensland. The proposed development of wells, gathering systems, gas processing facilities and export pipelines extends over 6,500 km^2. The nature of coal seam gas exploration and development means infrastructure locations were uncertain during the environmental and planning approvals process.

The project area encompasses high quality agricultural land that is sustained by access to extensive groundwater resources comprising several formations. The resources are regionally and nationally significant supporting springs and associated groundwater dependent ecosystems.

To understand the impact of uncertain locations of infrastructure on environmental values, a reverse impact assessment was undertaken. The sensitivity of environmental values to change informed constraints mapping which defined areas vulnerable to development. An assessment of the impacts of developing each type of infrastructure in those areas determined what development was manageable and what development was inappropriate. This analysis supported a development framework that protected important values and proposed measures to effectively manage impacts.

Case study – P'nyang Project

Located in Western Province, Papua New Guinea, P'nyang Project is a conventional gas development comprising wells, gathering systems, a gas processing facility and export pipelines. The project extends over 250 km from the Upper Fly River to near Kutubu.

Western Province extends from the Central Dividing Range to the coast. Limestone karst formations give way to vast plains intersected by major rivers with, in some area, back swamps. The project area encompasses a limestone massif, intact forests and the heavily dissected valleys of the Great Papuan Plateau. Parts of the project area are seismically active producing dynamic landforms. The intact forests support high biodiversity and Papua New Guinean's living subsistence lifestyles, largely cut-off from mainstream society.

The sensitivity of the landscape, ecosystems, endemic species and people to change was comprehensively understood through application of the revised method. A strong focus on identifying the affected environmental and societal values and assessing their sensitivity to change enabled environmental and social management to focus on the mechanisms or drivers of impacts; rather than focussing only on reducing the severity of the impacts.

Conclusion

Various tools and methods are available to assess the environmental and social impacts of development. Too often tools and methods are inappropriately applied leading to incomplete or inadequate impact assessment.

Context is essential to understanding impacts on values. Enhanced effort in identifying affected values and assessment of their sensitivity to change provides the appropriate context for conducting impact assessment. Better understanding the sensitivity of values to change enables mitigation to focus on enhancing their resilience and adaptability potentially leading to positive impacts.

The revised method presented in this paper is particularly useful where there is uncertainty and where particularly vulnerable landscapes, ecosystems, species or people are likely to be impacted.

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