



**SIVEST (PTY) LTD: ENVIRONMENTAL DIVISION**

# **ENVIRONMENTAL IMPACT ASSESSMENT METHOD**

Issue date: 9 May 2011  
Revision No.: 23  
Project No.: 0014

Date:	9 May 2011
Document Title:	Environmental Impact Assessment Method
Author:	Ryan Edwards
Revision Number:	# 23
Checked by:	Greg Mullins
Approved:	Michelle Nevette
Signature:	
For:	SiVEST (Pty) Ltd

COPYRIGHT IS VESTED IN SiVEST IN TERMS OF THE COPYRIGHT ACT (ACT 98 OF 1978) AND NO USE OR REPRODUCTION OR DUPLICATION THEREOF MAY OCCUR WITHOUT THE WRITTEN CONSENT OF THE AUTHOR

**SIVEST (PTY) LTD: ENVIRONMENTAL DIVISION**  
**ENVIRONMENTAL IMPACT ASSESSMENT METHOD**

<b>Contents</b>	<b>Page</b>
<b>1 INTRODUCTION.....</b>	<b>1</b>
<b>2 ASSESSING IMPACTS ON THE BIOPHYSICAL ENVIRONMENT.....</b>	<b>1</b>
2.1 ENVIRONMENTAL VALUE.....	1
2.1.1 <i>Ecosystem Goods &amp; Services Value</i> .....	1
2.1.2 <i>Conservation Status</i> .....	2
2.2 IMPACT MAGNITUDE.....	3
2.2.1 <i>Degree of Disturbance</i> .....	3
2.2.2 <i>Impact Extent</i> .....	3
2.2.3 <i>Impact Duration</i> .....	4
2.2.4 <i>Impact Probability</i> .....	4
<b>3 DETERMINING IMPACT SIGNIFICANCE .....</b>	<b>4</b>

# SIVEST (PTY) LTD: ENVIRONMENTAL DIVISION

## ENVIRONMENTAL IMPACT ASSESSMENT METHOD

### 1 INTRODUCTION

The EIA Regulations (2010), promulgated in terms of Section 24(5) of the National Environmental Management Act (NEMA) (Act no. 107 of 1998), requires that each potentially significant impact identified in the Scoping Phase be assessed in terms of a number of criteria that give an overall indication of the significance of the impact. These criteria include nature, extent, duration, probability, reversibility, irreplaceability and mitigation potential.

For the purposes of this study, impact significance is defined broadly as a measure of the desirability, importance and acceptability of an impact to society (Lawrence, 2007).

The method used in this impact assessment determines significance of an impact by multiplying the **value** of the environmental system or component affected by the **magnitude** of the impact on that system or component (**System/Component Value x Impact Magnitude**).

In this method, all impacts on the natural or biophysical environment are assessed in terms of the overall impacts on the health of ecosystems, habitats, communities, populations and species. Thus, for example, the impact of an increase in stormwater runoff generated by a development can only be assessed in terms of the impact on the health of the affected environmental systems.

### 2 ASSESSING IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

The significance of an impact on a biophysical system or component is determined by multiplying the **environmental value** of the system or component affected by the **magnitude** of the impact on that system or component (**Environmental Value x Impact Magnitude**).

#### 2.1 Environmental Value

For the purpose of this method, environmental value is defined as the value of an ecosystem, habitat or community to society in terms of the level of ecosystem goods and services provided by the system in question and current conservation status of the system or component. For individual populations and species, environmental value is defined according to the conservation status afforded to the specific population or species.

More specifically, the Environmental Value of ecosystems, habitats and communities is calculated as the average of the sum of its Ecosystem Goods and Services Value and its Conservation Status e.g. **Environmental Value = (Ecosystem Goods & Services Value + Conservation Status) / 2**. The Environmental Value of population and/or species is equal to the conservation status score only. e.g. **Environmental Value = Conservation Status**.

##### 2.1.1 Ecosystem Goods & Services Value

Ecosystems are known to provide important goods and services to society. Ecosystem goods refer to the natural products harvested or used by humans such as water, fish, pastures for livestock, timber, firewood, crafts materials, medicinal plants and harvested wildlife such as game. Ecosystem services refer to a number life support services provided by ecosystems that contribute to human well being and the production of the abovementioned ecosystem goods. Most ecosystem services can be grouped into the following general categories:

- Purification and detoxification: filtration, purification and detoxification of air, water and soils;
- Cycling processes: nutrient cycling, nitrogen fixation, carbon sequestration, oxygen production and soil formation and maintenance;
- Regulation and stabilization: pest and disease control, climate regulation, mitigation of storms and floods, erosion control, regulation of rainfall and water supply;
- Biodiversity maintenance: rare and/or diverse gene pools and/or habitats, storehouse of genetic material that is used in industrial, agricultural and pharmaceutical industries;
- Regeneration and production: production of biomass providing raw materials and food, pollination and seed dispersal; and
- Quality of life, fulfilment and knowledge: aesthetic, recreational, cultural and spiritual role, education and research.

At an ecosystem and community level, the Ecosystem Goods & Services Value expresses the relative importance of an ecosystem or community in terms of the provision of ecosystem goods and services to society as determined by specialists.

Table 1: Ecosystem goods & services value rating categories

	A: Community/Ecosystem (System)
1	<u>Low</u> : System provides a low/limited level of ecosystem goods and/or services to society and/or the goods are not valued or used by the local population in any way.
2	<u>Medium-Low</u> : System provides some (moderately low) level of ecosystem goods and/or services to society and/or the goods have some value the local population.
3	<u>Medium</u> : System provides an intermediate/moderate level of ecosystem goods and/or services to society and/or the goods are moderately valued by the local population.
4	<u>Medium-High</u> : System provides a moderately-high level of ecosystem goods and/or services to society and/or the goods are highly valued by the local population.
5	<u>High</u> : System provides a high level of ecosystem goods and/or services to society and/or the goods are essential to human activities (e.g. provides potable water).

### 2.1.2 Conservation Status

At the ecosystem and community level, the Conservation Status is an estimation of the current and future ability of an ecosystem and/or community to sustain ecological integrity and viability and adapt to environmental changes at the national, regional and local scales. Conservation status is based on total habitat loss, habitat fragmentation, degree of degradation, degree of protection needed, degree of urgency for conservation needs, and types of conservation practiced or required. At the population and species level, conservation status refers to the likelihood of the survival of a species at present and into the future. The categories below have been adapted from Golding (2002).

Table 2: Conservation status rating categories

	A: Community/Ecosystem (System)	B: Individual/Population (Component)
1	<u>Low</u> : System is not considered rare, endemic, near-threatened, vulnerable or endangered nationally, provincially or locally and/or does not provide core habitat for conservation worthy species.	<u>Low</u> : Component is not considered rare, endemic, near-threatened, vulnerable or endangered nationally, provincially or locally.
2	<u>Medium-Low</u> : System is near-threatened nationally, provincially and/or locally and/or provides core habitat for near-threatened species.	<u>Medium-Low</u> : Component is considered near-threatened nationally, provincially and/or locally.
3	<u>Medium</u> : System is considered rare, endemic and/or vulnerable nationally, provincially and/or locally and/or provides core habitat for rare, endemic and/or vulnerable species.	<u>Medium</u> : Component is considered rare, endemic and/or vulnerable nationally, provincially and/or locally.
4	<u>Medium-High</u> : System is considered endangered nationally, provincially and/or locally and/or provides core habitat for endangered species.	<u>Medium-High</u> : Component is considered endangered nationally and/or provincially and/or locally.

	A: Community/Ecosystem (System)	B: Individual/Population (Component)
5	<u>High</u> : System is considered critically endangered nationally, provincially and/or locally and/or is the object of legislative and regulatory measures and/or provides core habitat for critically endangered species.	<u>High</u> : Component is considered critically endangered and/or critically endangered nationally, provincially and/or locally.

Once the ecosystem goods & services value and the conservation status of the biophysical system or component have been rated according to Table 1 and 2 respectively, the combined average is calculated to give an indication of the overall environmental value rating of the biophysical system or component. The range of possible environmental value scores is from 1 to 5.

## 2.2 Impact Magnitude

The impact magnitude score for each identified impact is calculated by the addition of four criteria, namely 'degree of disturbance', 'extent', 'duration' and 'probability'. The range of possible impact magnitude scores is from 4 to 20.

### 2.2.1 Degree of Disturbance

The 'Degree of Disturbance' to biophysical systems and components expresses the change in the health, functioning and/or role of the system or component as a result of an activity. This criterion also includes possible downstream and/or cumulative impacts arising from the alteration of the system or component.

Table 3: Degree of Disturbance rating categories for biophysical/ecological systems

1	<u>Low</u> : Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	<u>Medium-Low</u> : Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a slightly modified way and maintains original integrity (no/limited impact on integrity).
3	<u>Medium</u> : Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity.
4	<u>Medium-High</u> : Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
5	<u>High</u> : Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

### 2.2.2 Impact Extent

The Extent of the impact generally expresses the spatial influence of the effects produced by a disturbance to an environmental system or component.

Table 4: Extent rating categories

1	<u>Site</u> : Effects of an impact experienced within or in close proximity (100m) to the project site. However, the size of the site needs to be taken into account. A really large site may have to be scored according to category 2 below.
2	<u>Surrounding Area</u> : Effects of an impact experienced beyond the project site but within a 2km radius of the site.
3	<u>Local</u> : Effects of an impact experienced within the local area (e.g. between a 2km to 50km radius of the site).
4	<u>Regional</u> : Effects of an impact experienced within the local region (e.g. between a 50km to 200km radius of the site).
5	<u>Provincial</u> : Effects of an impact experienced within a large geographic area beyond a 200km radius of the site.

### 2.2.3 Impact Duration

The *Duration* of the impact describes the period of time during which an environmental system or component is changed by the impact.

Table 5: Duration rating categories

1	<u>Short-term</u> : The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	<u>Medium-Short</u> : The impact and its effects will continue or last for the period of a relatively long construction period and/or a limited recovery time after this construction period, thereafter it will be entirely negated (2 – 5 years).
3	<u>Medium-term</u> : The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (5 – 15 years).
4	<u>Long-term</u> : The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (15 – 50 years).
5	<u>Permanent</u> : The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).

### 2.2.4 Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring.

Table 6: Probability rating categories

1	<u>Unlikely</u> : The chance of the impact occurring is extremely low (Less than a 20% chance of occurrence).
2	<u>Fairly Unlikely</u> : The chance of the impact occurring is moderately low (Between a 20% to 40% chance of occurrence).
3	<u>Possible</u> : The impact may occur (Between a 40% to 60% chance of occurrence).
4	<u>Probable</u> : The impact will likely occur (Between a 60% to 80% chance of occurrence).
5	<u>Definite</u> : Impact will certainly occur (Greater than an 80% chance of occurrence).

## 3 DETERMINING IMPACT SIGNIFICANCE

The overall significance score for each identified impact is calculated by multiplying **impact magnitude** by **environmental value or social value** (e.g. **Magnitude x Environmental Value**). The range of possible impact significance scores is from 4 to 100. The range of possible significance scores were classified into seven rating classes as shown in Table 7 below.

For the purpose of this assessment, a significance score of 37 to 45 (**medium-low**) is considered 'acceptable but undesirable' to society. Undesirable impacts are not recommended and should be mitigated, but they may be offset by significant gains (>45+) in other aspects of the environment. A significance score of 46 to 55 (**medium**) and 56 to 63 (**medium-high**) is considered 'generally unacceptable' to society and only high gains (>63+) in other aspects of the environment can or should offset this impact. However, tradeoffs between 'generally unacceptable' and 'highly beneficial' impacts should be avoided in line with the principles of sustainability. A significance score of over 63 (**high to very high**) is considered 'totally unacceptable' to society and no gains in other aspects of the environment can or should offset this impact.

It is important to note, however, that this rating system is not prescriptive and its aim is to aid and inform decision making. The method and ratings are there to guide the assessment of

significance and all significance ratings will need to be interpreted realistically by the practitioner involved. In the end the decision to authorise this activity is the responsibility of the Department of Agriculture, Environmental Affairs & Rural Development (DAEA&RD).

Table 7: Significance score rating categories

Significance Score	Significance Rating	Significance Interpretation	
		Negative	Positive
4 – 22	Very Low	Acceptable / Not Serious	Marginally Positive
23 – 36	Low	Acceptable / Not Serious	Marginally Positive
37 – 45	Medium-Low	Acceptable But Undesirable / Mildly Serious	Moderately Positive
46 – 55	Medium	Generally Unacceptable / Serious	Beneficial/Important
56 – 63	Medium-High	Generally Unacceptable / Very Serious	Very Beneficial/Important
64 – 79	High	Totally Unacceptable / Highly Serious	Highly Beneficial/Important
80 – 100	Very High	Totally Unacceptable / Critically Serious	Critically Beneficial/Important





**SiVEST Environmental Division**

4 Pencarrow Crescent, La Lucia Ridge Office Estate  
Umhlanga Rocks. 4320. South Africa  
PO Box1899, Umhlanga Rocks.4320. South Africa

Tel + 27 31 566 2201  
Fax +27 31 566 2371  
Email [info@sivest.co.za](mailto:info@sivest.co.za)  
[www.sivest.co.za](http://www.sivest.co.za)

Contact Person: Ryan Edwards  
Tel No.: 031 581 1578  
Email: [ryane@sivest.co.za](mailto:ryane@sivest.co.za)