

Method of Assessing the Significance of Potential Environmental Impacts

The assessment of the significance of impacts for a proposed development is by its nature, a matter of judgement. To deal with the uncertainty associated with judgement and ensure repeatable results, Zutari rates impacts using a standardised and internationally recognised methodology adhering to ISO 14001 and World Bank/IFC requirements.

For each predicted impact, criteria are applied to establish the **significance** of the impact based on likelihood and consequence, both without mitigation being applied and with the most effective mitigation measure(s) in place.

The criteria that contribute to the **consequence** of the impact are **intensity** (the degree to which pre-development conditions are changed), which also includes the **type** of impact (being either a positive or negative impact); the **duration** (length of time that the impact will continue); and the **extent** (spatial scale) of the impact. The sensitivity of the receiving environment and/or sensitive receptors is incorporated into the consideration of consequence by appropriately adjusting the thresholds or scales of the intensity, duration and extent criteria, based on expert knowledge. For each impact, the specialist applies professional judgement to ascribe a numerical rating for each criterion according to the examples provided in Table 1, 2 and 3.

below. The consequence is then established using the formula:

$$\text{Consequence} = \text{type} \times (\text{intensity} + \text{duration} + \text{extent})$$

Depending on the numerical result, the impact's consequence would be defined as either extremely, highly, moderately or slightly detrimental; or neutral; or slightly, moderately, highly or extremely beneficial. These categories are provided in Table 5.

To determine the significance of an impact, the **probability** (or likelihood) of that impact occurring is also taken into account. In assigning probability the specialist takes into account the likelihood of occurrence but also takes cognisance of uncertainty and detectability of the impact. The most suitable numerical rating for probability is selected from Table 4 below and applied with the consequence according to the following equation:

$$\text{Significance} = \text{consequence} \times \text{probability}$$

When assigning **probability** to an impact, it is vitally important to distinguish this from the concepts of **frequency** and **confidence**, with which it is sometimes confused.

- **Probability** refers to the likelihood that an impact will occur.
- **Frequency** refers to the regularity with which an impact occurs. To illustrate the difference between frequency and probability, it must be considered that something that happens infrequently may still be a certainty (i.e. have a high probability). For instance, Halley's Comet only comes close to the sun every 75 to 76 years (i.e. it has a very low frequency), but it is still a certainty.

- **Confidence** (see Table 7) refers to the degree of certainty of a prediction. Confidence may be related to any of the impact assessment criteria (extent, intensity, duration or probability) and is not necessarily only related to probability. Confidence may be influenced by any factors that introduce uncertainty into a prediction.

Depending on the numerical result of this calculation, the impact would fall into a significance category of negligible, minor, moderate or major, and the type would be either positive or negative. Examples of these categories are provided in Table 6.

Once the significance of an impact occurring without mitigation has been established, the specialist must apply his/her professional judgement to assign ratings for the same impact after the proposed mitigation has been implemented.

Lastly, two further points are important when applying these criteria to impacts:

- Specialists need to assess the impact, **not** the source or origin of the impact (i.e. the activity that causes the impact). For instance, although the activity that causes a specific impact may take place over a long period of time, this does not necessarily imply that the impact itself will persist for the same length of time. The assessment must focus on the impact (the change in the environment) rather than on the activity that causes an impact.
- When assessing impacts, consider the **proposed project design** rather than assuming that the project will necessarily affect highly sensitive resources, even if those resources occur on a part of the site that is left unaffected by the design. If the design of a project avoids an area where a highly sensitive or irreplaceable resource occurs, it would be a mistake to assume that this resource would experience an impact, simply because the resource occurs within the boundaries of the site. As an example, if a wetland or archaeological site occurs on portion A, but the project is located on portion B, then clearly the wetland or archaeological site would not be affected, hence, there would be no direct impact on these resources.

The tables on the following pages show the scales used to classify the above variables and define each of the rating categories.

Table 1 | Definition of Intensity ratings

Rating	Criteria	
	Negative impacts (Type of impact = -1)	Positive impacts (Type of impact = +1)
7	Complete destruction (irreversible and irreplaceable loss) of natural or social systems, resources (e.g. species) and human health. No chance of these processes or resources ever being restored to their pre-impact condition.	Noticeable, sustainable benefits that improve the quality and extent of natural or social system or resources, including formal protection.
6	Very high degree of damage to natural or social systems or resources. These processes or resources may restore to their pre-project condition over very long periods of time (more than a typical human life time).	Great improvement to ecosystem or social processes and services or resources.
5	Serious damage to components of natural or social systems or resources and the contravention of legislated standards.	On-going and widespread benefits to natural or social systems or resources.
4	High degree damage to natural or social system components, species or resources.	Average to intense positive benefits for natural or social systems or resources.

Rating	Criteria	
	Negative impacts (Type of impact = -1)	Positive impacts (Type of impact = +1)
3	Moderate damage to natural or social system components, species or resources.	Average, on-going positive benefits for natural or social systems or resources.
2	Minor damage to natural or social system components, species or resources. Likely to recover over time. Ecosystems and valuable social processes not affected.	Low positive impacts on natural or social systems or resources.
1	Negligible damage to individual components of natural or social systems or resources, such that it is hardly noticeable.	Limited low-level benefits to natural or social systems or resources.

Table 2 | Definition of Duration ratings

Rating	Criteria
7	Permanent: The impact will remain indefinitely.
6	Beyond project life: The impact will remain for some time after the life of the project.
5	Project life: The impact will cease after the operational life span of the project
4	Long-term: The impact will continue for 6-15 years.
3	Medium-term: The impact will continue for 2-5 years.
2	Short-term: The impact will continue for between 1 month and 2 years.
1	Immediate: The impact will continue for less than 1 month.

Table 3 | Definition of Extent ratings

Rating	Criteria
7	International: The effect will occur across international borders.
6	National: The impact will affect the entire country.
5	Province/ Region: The impact will affect the entire province or region
4	Municipal Area: The impact will affect the whole municipal area.
3	Local: The impact will extend across the site and to nearby properties.
2	Limited: The impact will be limited to the site.
1	Very limited: The impact will be limited to the footprint of the development and will not extend to the boundaries of the site.

Table 4 | Definition of Probability ratings

Rating	Criteria
7	Certain/ Definite: There are sound scientific reasons to expect that the impact will definitely occur.
6	Almost certain/Highly probable: It is most likely that the impact will occur.
5	Likely: This impact has occurred numerous times here or elsewhere in a similar environment and with a similar type of development and could very conceivably occur.
4	Probable: This impact has occurred here or elsewhere in a similar environment and with a similar type of development and could conceivably occur.
3	Unlikely: This impact has not happened yet but could happen.
2	Rare/ improbable: The impact is conceivable, but only in extreme circumstances. The possibility of the impact manifesting is very low as a result of design, experience or implementation of adequate mitigation measures.
1	Highly unlikely/None: The impact is expected never to happen or has a very low chance of occurring.

Table 5 | Application of Consequence ratings

Range		Significance rating
-21	-18	Extremely detrimental
-17	-14	Highly detrimental
-13	-10	Moderately detrimental
-9	-6	Slightly detrimental
-5	5	Negligible
6	9	Slightly beneficial
10	13	Moderately beneficial
14	17	Highly beneficial
18	21	Extremely beneficial

Table 6 | Application of significance ratings

Range		Significance rating
-147	-109	Major - negative
-108	-73	Moderate - negative
-72	-36	Minor - negative
-35	-1	Negligible - negative
0	0	Neutral
1	35	Negligible - positive
36	72	Minor - positive
73	108	Moderate - positive
109	147	Major - positive

Despite attempts at ensuring objectivity and impartiality, environmental assessment remains an act of judgement and can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on context (spatial and duration) and intensity of that impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the

observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, environmental assessments must endeavour to come to terms with the significance of the environmental impacts. Recognising this, Zutari has attempted to address potential subjectivity in the current ESIA process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the specialist to come to terms with the various facets that contribute to significance (thereby avoiding arbitrary assessment), but also provides the reader with a clear summary of how the specialist derived the significance;
- Wherever possible, differentiating between the significance of potential environmental impacts as experienced by the various affected parties; and
- Utilising a team approach and internal review of the assessment to facilitate a rigorous and defensible system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

The specialists appointed to contribute to this impact assessment have empirical knowledge of their respective fields and are thus able to comment on the confidence they have in their findings based on the availability of data and the certainty of their findings (Example provided in Table 7).

Table 7 | Definition of Confidence ratings

Rating	Criteria
Low	Judgement is based on intuition and there some major assumptions used in assessing the impact may prove to be untrue.
Medium	Determination is based on common sense and general knowledge. The assumptions made, whilst having a degree of uncertainty, are fairly robust.
High	Substantive supportive data or evidence exists to verify the assessment.