Annex E

Impact Assessment Methodology

E1 IMPACT ASSESSMENT METHODOLOGY

E1.1 ASSESSING IMPACTS

The adequate assessment and evaluation of the potential impacts and benefits that will be associated with the proposed Project necessitates the development of a scientific methodology that will reduce the subjectivity involved in making such evaluations. A clearly defined methodology is used in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this the proposed project must be considered in the context of the area and the people that will be affected.

Nonetheless, an impact assessment will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and ESIA practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to society.

The purpose of impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the proposed project component or by the execution of a proposed Project related activity.

The nature of the Project may determine whether one needs to assess both routine and non-routine impacts. Non-routine impacts generally relate to accidents and could include oil/chemical/fuel spills, emergency venting of noxious gases, etc.

The types of impacts and terminology to be used in the assessment are outlined in *Table 1.1*.

Table 1.1 Defining the nature of the impact

Term	Definition
Impact nature	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned

Term	Definition
	project activity and the receiving environment/receptors (eg. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (eg. in-migration for employment placing a demand on resources).
Cumulative impact (1)	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

E1.1.2 Assessing Significance

There is no single accepted definition of '*significance*' and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. It is widely accepted that Impact Magnitude (or Severity) is a function of the extent, duration and intensity of the impact.

The criteria used to determine significance are summarised in *Table 1.2*. These criteria (specifically Extent and Duration) should be customised to suit individual projects.

Table 1.2 Significance Criteria

Impact magnitude – the degree of change brought about in the environment	
Extent	**On-site** – impacts that are limited to the site boundaries. **Local** – impacts that affect an area in a radius of 2km around the site. **Regional** – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. **National** – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International** – impacts that affect internationally important resources such as areas protected by international conventions.
Duration	**Temporary** – impacts are predicted to be of short duration and intermittent/occasional. **Short-term** – impacts that are predicted to last only for the duration of the construction period. **Long-term** – impacts that will continue for the life of the Project, but ceases when the Project stops operating. **Permanent** – impacts that cause a permanent change in the affected receptor or resource (eg. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Intensity (2)	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).*

(1) The assessment of cumulative impacts is qualitative and is often discussed in a separate chapter in the ESIA Report. One should remember to include the assessment of cumulative impacts in the terms of reference to specialists.

(2) The frequency of the activity causing the impact also has a bearing on the intensity of the impact, ie. the more frequent the activity, the higher the intensity.

	Negligible – the impact on the environment is not detectable. **Low** – the impact affects the environment in such a way that natural functions and processes are not affected. **Medium** – where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High** – where natural functions or processes are altered to the extent that it will temporarily or permanently cease. ***Where appropriate, national and/or international standards are to be used as a measure of the impact.*** *Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.* SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.* **Negligible** – there is no perceptible change to people's livelihood **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.

Impact likelihood – the likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

Once a rating is determined for magnitude and likelihood, the matrix in *Table 1.3* can be used to determine the impact significance.

Table 1.3 Example of Significance Rating Matrix for Positive and Negative Impacts

SIGNIFICANCE RATING				
	LIKELIHOOD	**Unlikely**	**Likely**	**Definite**
MAGNITUDE	**Negligible**	**Negligible**	**Negligible**	**Negligible**
	Low	**Negligible**	**Minor**	**Minor**
	Medium	**Minor**	**Moderate**	**Moderate**
	High	**Moderate**	**Major**	**Major**

A colour scale for negative and positive ratings is given in *Table 1.4*:

Table 1.4 Colour scale for ratings

Negative ratings	**Positive ratings**
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 1.5 outlines the various definitions for significance of an impact and is based on the significance rating matrix.

Table 1.5 Significance Definitions

Significance definitions	
Negligible significance	*An impact of negligible significance is where the magnitude is negligible, low or medium and the likelihood of the impact occurring is unlikely or likely.* An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	*An impact of minor significance is where the magnitude of the impact is low but the likelihood is high or where the magnitude is high but the likelihood of occurrence is unlikely or likely.* An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	*An impact of moderate significance is where the magnitude is medium to high and the likelihood of the impact occurring is likely or definite.* An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	*An impact of major significance is where the magnitude of the impact is medium to high and the likelihood of the impact occurring is also likely or definite.* An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

E1.2 MITIGATION POTENTIAL AND RESIDUAL IMPACTS

One of the key objectives of an ESIA is to identify and define socially, environmentally and technically acceptable and cost effective mitigation measures. These should avoid unnecessary damage to the environment; safeguard valued or finite resources, natural areas, habitats and ecosystems; and protect humans and their associated social environments.

Mitigation measures are developed to avoid, reduce, remedy or compensate for any negative impacts identified, and to create or enhance positive impacts such as environmental and social benefits. In this context the term mitigation

measures includes operational controls as well as management actions. These measures are often established through industry standards and may include:

- changes to the design of the project during the design process (e.g. changing the development approach);
- engineering controls and other physical measures applied (eg waste water treatment facilities);
- operational plans and procedures (eg waste management plans); and
- the provision of like-for-like replacement, restoration or compensation.

It is expected that for the identified significant impacts, the project team will work with the client in identifying suitable and practical mitigation measures that are implementable. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts will be developed. A description of these mitigation measures should also be included within the Framework ESMP.

The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in *Box 1.1*.

Box 1.1 ***Mitigation Hierarchy***

THE MITIGATION HIERARCHY FOR PLANNED PROJECT ACTIVITIES
Avoid at Source; Reduce at Source **Avoiding or reducing at source is essentially 'designing' the project so that a feature causing an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimisation.**
Abate on Site **This involves adding something to the basic design to abate the impact - pollution controls fall within this category. Often called 'end-of-pipe'.**
Abate at Receptor **If an impact cannot be abated on-site then measures can be implemented off-site - an example of this would be to use the stand-by vessel to help control the level of interference with fishing activity.**
Repair or Remedy **Some impacts involve unavoidable damage to a resource, eg land disturbance. Repair essentially involves restoration and reinstatement type measures, such as base camp closure.**
Compensate in Kind **Where other mitigation approaches are not possible or fully effective, then compensation, in some measure, for loss, damage and general intrusion might be appropriate.**

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

The focus of mitigation is usually on avoiding or reducing negative environmental and social impacts. However, measures to enhance positive impacts, such as economic benefits, are also mitigation measures.