Impact Significance:
Risk Based Approach

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Requirement for impact significance assessment

Identifying the issues and recording the process

Methods of determining impact significance

Xodus perspective based on project experience

An approach to significance assessment that incorporates impact likelihood

Common pitfalls to watch out for and a brief worked example

Summary
Statutory requirements to establish impact significance

**Environmental Impact Assessment to inform an Environmental Statement**

a description of the likely significant effects; and

a description of the measures envisaged in order to avoid, reduce and, if possible remedy significant adverse effects on the environment.

**Habitats Regulations and Appropriate Assessment**

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.

**Strategic Environmental Assessment**

Environmental assessment is carried out on certain plans and programmes which are likely to have significant effects on the environment.

**Environmental and Social Impact Assessment under the Equator Principals**

Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented.
Impact Significance as a project tool

As well as the various public documents required to gain project consent and/or project funding establishing potential impact significance is an important project level tool which can assist the project team in:

> Early environmental impact risk assessment;
> Site and concept selection;
> Project design refinements;
> Schedule/project non approval risk; and
> Identification of appropriate and efficient mitigation strategies.

For both statutory and internal project purposes the establishment of potential and residual impact significance needs to be clear, logical, auditable and consistently recorded.

When problems arise, it is often not that impact significance assessment is incorrect, rather its the process by which they have been determined has not been recorded and communicated logically and effectively.
Identifying the issues for significance assessment

The first step is to identify which issues should be included in the assessment (and justify why others have been excluded).

Since this process determines the scope of the impact assessment it is critical that it is recorded in a clear, defendable and transparent way.

Environmental Issues Identification ENVID Workshop

> Undertaken during scoping and revisited throughout the project as designs are refined and mitigation strategies developed.

> Workshop includes relevant project staff including engineers, environmental, social (where appropriate) and methodically works through all project aspects and makes an assessment of each in terms of potential significant impact.

> Formal process that is facilitated and scribed where all issues are considered and included or excluded in an auditable way.

> Output is a matrix which records assessment of each impact significance in terms of its consequence and its likelihood.

*Example next slide*
### Example Aspect- Receptor Interactions Matrix from ENVID

<table>
<thead>
<tr>
<th>Process</th>
<th>Activity</th>
<th>Aspect</th>
<th>Planned or Unplanned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riser and Mooring Installation</td>
<td>Connection of risers to FPSO</td>
<td>Chemical use and discharge</td>
<td>P</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>Connection of risers to FPSO</td>
<td>Accidental spill of chemicals</td>
<td>UP</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>Presence of FPSO Installation Vessels.</td>
<td>Vessel presence and interference with other sea users</td>
<td>P</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>FPSO Installation Vessels</td>
<td>Oil and chemical spill risk - small operational spills</td>
<td>UP</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>FPSO Installation Vessels</td>
<td>Oil and chemical spill risk - total loss of inventory</td>
<td>UP</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>Dropped objects</td>
<td>Seabed impacts, interference with other users, oil spill</td>
<td>UP</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>Operation of FPSO installation vessels</td>
<td>Resource use and atmospheric emissions</td>
<td>P</td>
</tr>
<tr>
<td>Riser and Mooring Installation</td>
<td>Operation of FPSO installation vessels</td>
<td>Noise emissions - disturbance to marine mammals</td>
<td>P</td>
</tr>
</tbody>
</table>
Determining Impact Significance – Consideration of Likelihood

There is a well established approach of using the receptor sensitivity and the impact magnitude to derive impact significance.

SNH 2009 handbook on environmental impact assessment:
Expressing the significance of the impacts of the project, usually in relative terms, based on the principle that the more sensitive the resource, the more likely the changes and the greater the magnitude of the changes, compared with the do nothing comparison, the greater will be the significance of the impact.

SNH make the point that the more likely the change the greater the significance will be.

For the purposes of this presentation I will use the following definition:

\[ \text{receptor sensitivity} \times \text{potential impact magnitude} = \text{potential environmental consequence} \]

The likelihood of the potential overall consequence of the impact occurring is then explicitly taken into account to derive the impact significance.
Xodus Project Perspective – Oil and Gas and Marine Renewables

Oil and Gas and associated infrastructure offshore, near shore and onshore

Offshore Wind, Wave and Tidal Energy
Q: How to effectively and transparently communicate an impact significance that incorporates an assessment of likelihood?

*Examples: oil spill, bird strike, seal injury etc.*

For some projects consequences can be very severe BUT also have low probability/frequency.

A simple assumption that all impacts identified are bound to happen does not usefully inform the impact assessment in these cases.

Here impact significance assessment is often supported by modelling and this can be explicitly included in significance assessment (see next slide).

*NB: This is where significance of impact and significance of risk start to be used interchangeably in some industries.*
Example of Probability/Frequency Guidelines

<table>
<thead>
<tr>
<th>Frequency / Probability Category</th>
<th>Routine (Planned) Operation Frequency</th>
<th>Accidental Event (Probability)</th>
</tr>
</thead>
</table>
| 5                                | Continuous emission or permanent change over more than 5 years | Likely  
10^{-1} >1 per year  
Event likely to occur more than once on the facility. |
| 4                                | Continuous emission or permanent change over less than 5 years OR Regular over more than 3 years | Possible  
10^{-2} – 10^{-1} per year  
Could occur within the lifetime of the development. |
| 3                                | Regular over less than 3 years OR Intermittent over more than 3 years | Unlikely  
10^{-3} – 10^{-2} per year  
Event could occur within the life of 10 similar facilities, Has occurred at similar facilities. |
| 2                                | One off event over lifetime of development over several weeks durations OR Once per year for <24 hours | Remote  
10^{-5} – 10^{-3} per year  
Similar even has occurred somewhere in industry or similar industry but not likely to occur with current practices and procedures. |
| 1                                | One off event over lifetime of development for <5 days | Extremely remote  
<10^{-5} per year  
Has never occurred within industry or similar industry, but theoretically possibly. |
Determining Impact Significance including regulatory, stakeholder and likelihood considerations

As already outlined:

\[
\text{receptor sensitivity} \times \text{potential impact magnitude} = \text{potential environmental consequence}
\]

Where appropriate two other factors: stakeholder perception and regulatory compliance are then combined with environmental consequence to give an overall consequence.

The potential overall consequence is then combined with likelihood to give the impact significance.

The inclusion of regulatory, stakeholder and likelihood considerations provides an integrated assessment of the significance of risk/impact.

*Flowchart on next slide*
Impact Significance flow chart

- Project description
  - Environmental Aspects
    - Impact Magnitude
  - Regulatory Context
    - Environmental Consequence
- EnvironmentalBaseline
  - Environmental Receptors
    - Receptor Sensitivity
  - Stakeholder Expectations
    - Overall Consequence
      - Likelihood
        - Impact significance
          - Mitigation measure
            - Residual Impact Significance
### Significance Ranking

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Regulatory</th>
<th>Environment</th>
<th>Stakeholder</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Continuous / likely</td>
</tr>
<tr>
<td>5 Severe</td>
<td>Activity prohibited</td>
<td>Severe magnitude / sensitivity ranking</td>
<td>International concerns</td>
<td>25</td>
</tr>
<tr>
<td>4 Major</td>
<td>Possibly major non-compliance</td>
<td>Major magnitude / sensitivity ranking</td>
<td>National concerns</td>
<td>20</td>
</tr>
<tr>
<td>3 Moderate</td>
<td>Possibly non-compliance</td>
<td>Moderate magnitude / sensitivity ranking</td>
<td>Regional concerns</td>
<td>15</td>
</tr>
<tr>
<td>2 Minor</td>
<td>Regulatory terms or corporate policy set defined conditions</td>
<td>Minor magnitude / sensitivity ranking</td>
<td>Local concerns</td>
<td>10</td>
</tr>
<tr>
<td>1 Negligible</td>
<td>No specific statutory control</td>
<td>Negligible magnitude / sensitivity ranking</td>
<td>Individual concerns</td>
<td>5</td>
</tr>
<tr>
<td>0 Positive Impact</td>
<td>N/a</td>
<td>Positive benefit or enhancement</td>
<td>No public interest or improves aspect of community importance</td>
<td>0</td>
</tr>
</tbody>
</table>
Some challenges in significance assessment

When integrating impact consequence and likelihood we can sometimes trip up by double counting impacts through confusion around impact magnitude, impact consequence and likelihood. *Example next slide*

Definition consistency across different disciplines – especially matching up quantitative issues such as compliance with noise emissions legislation and something more qualitative such as an assessment of habitat fragmentation. *This is a particular issue when using specialist sub consultants who may not be familiar with the approach. Good communication and worked examples key here.*

Consistency across different environments, and assessment regimes. *E.g. large projects that include onshore/offshore components in one ES. Require very clear and explicit boundary setting and potentially varying definitions and assessment methods for some components.*
Example of Double Counting leading to underestimate of significance

Under estimate of impact significance:

- Impact Magnitude assessed as **negligible** for fatal seal-tidal turbine interaction as this impact is considered extremely unlikely.
- Overall consequence assessed as **low** because negligible magnitude has brought down the high receptor sensitivity, regulatory and stakeholder ratings.
- Impact significance assessed as **negligible** as the low overall consequence is combined with the negligible likelihood.

More accurate assessment:

- Impact magnitude assessed as **severe** as the assumption is made that the impact will occur.
- Overall consequence is **high** as receptor sensitivity is high and there are also high ratings for stakeholder and regulatory requirements.
- Impact significance is **moderate** (i.e. requiring mitigation) as the very low/negligible likelihood of the impact is combined with the high consequence.
Assessment of significance is key to many aspects of the work we do as environmental practitioners.

The main requirement with regards to significance assessment is that the process is clear and unambiguous and recorded.

ENVID workshops facilitate and record issues identification in a transparent way.

Using a method of assessing impact significance that explicitly takes account environmental, stakeholder and regulatory potential consequence and then combines this overall consequence with likelihood to give the impact significance teases apart the various aspects of significance assessment.

The strength of this explicit method is that each step deals with one aspect of significance at a time and, when used correctly, allows stakeholders to follow the logical steps that have lead to the impact significance rating.