TOOL 4 Risk assessment for EIA reports – an example approach

Risk assessment can be used by proponents or consultants when preparing EIA reports to examine the *consequences*, *probability* of occurrence, and relative *significance* of potential negative impacts associated with a development. Risk assessment uses explicit criteria, a defined rating methodology, and qualitative and quantitative evaluation to examine and classify negative impacts and to prioritise their management. Given there is often uncertainty surrounding potential impacts, risk assessment can bring some precision to the process of deciding on impact mitigation and management strategies.

In recent years different risk assessment approaches have been developed and applied to projects undergoing EIA, especially large-scale projects e.g. mining and energy developments. To provide an example of a risk assessment approach, a method developed by SRK Consulting[25] has been adapted for the Pacific context and is outlined below. This is one of many approaches that can be used to support the EIA process.

The method outlined below includes an assessment of four impacts to demonstrate how risk assessment can be incorporated into EIA reports. The impacts are: (1) soil erosion during project construction; (2) pumping of wastewater into the ocean during project operation; (3) degradation of a cultural heritage site; and (4) storm surge and flooding of a development and surrounds, closing down operations.

The benefits of incorporating risk assessment in an EIA report are that it provides a clear and concise summary of technical information and analyses; highlights the likely future consequences of development choices; and helps government and stakeholders to understand why particular management measures need to be put in place. Limitations sometimes experienced with risk assessment include terms and concepts being interpreted differently by different people, leading to different risk assessment results; cumulative impacts not being easily accounted for; and some impacts being difficult to assign to discrete categories.

In writing up risk assessment results it is important for proponents or consultants to clearly outline their rationale for assigning different ratings; to provide appropriate justification where the consequence or probability of an impact is expected to be reduced as a result of proposed mitigation measures; and to highlight any constraints, assumptions or uncertainties that influence their assessment.

It is also important to remember that risk assessment can help with making judgments about how to deal with impacts but it cannot be used to make judgments about the acceptability of impacts. The acceptability of impacts will depend on the values and preferences held by stakeholders, including the local community and local land/resource owners affected by a development.

25 SRK Consulting: http://www.srk.com/en

RISK ASSESSMENT METHOD

STEP 1

Assign a rating and score for each of the three criteria (A-C) listed in the table below, and then add the scores to determine the *consequence* rating for an impact.

RATING	DEFINITION OF RATING	SCORE
A. Extent – the area over which the impact will be experienced		
Local	Confined to the project site or study area.	1
Wider catchment or province	Extends beyond the project site to the wider, surrounding area.	2
Island or national	Extends to the whole island or nation.	3
Regional or global	Extends to the Pacific region and potentially beyond.	4
B. Intensity – the magnitude of the impact i.e. whether the impact will result in minor, moderate or major environmental, economic and social (including human health) changes		
Low	Minor or negligible changes, disturbances, damages, injuries or health effects. Likely to generate minimal interest or concern amongst the local community/affected stakeholders. Examples: dust and exhaust gases from construction machinery; temporary or single exceedance of a pollution limit or threshold; first aid cases; minor discomfort or irritation from construction noise; increased traffic on local roads to transport construction materials to a project site.	1
Medium	Moderate changes, disturbances, damages, injuries or health effects. Likely to generate more prolonged interest or concern amongst the local community/stakeholders. Examples: generation of hazardous waste; large fish kill incident; frequent exceedance of a pollution limit or threshold; clearance of village food gardens; influx of workers from overseas for project construction; moderate disruption of daily life/work activities within a village; intermittent production of foul odour near a village; infrastructure damage from flooding or strong winds.	2
High	Major or severe changes, disturbances, damages, injuries or health effects. Likely to generate widespread and intense interest or controversy amongst local, national and regional communities/ stakeholders. Examples: clearance of endangered species habitat; drawdown of limited groundwater supplies; large increase in suspended sediment levels from dredging; destruction of cultural artefacts; forced relocation of village settlements; permanent disabilities or fatalities; loss of coastal buildings and infrastructure due to extreme weather events.	3
C. Duration – the timeframe over which the impact will be experienced and its reversibility		
Short-term	Up to 2 years – impact is reversible or limited to when particular development activities or environmental events are taking place. Remediation or recovery is possible.	1
Medium-term	2 to 15 years – impact is reversible or limited to when particular development activities or environmental events are taking place. Remediation or recovery is possible.	2
Long-term	More than 15 years – impact is permanent or gradually reversible with sustained remediation and recovery efforts.	3

The combined score of the three criteria (extent, intensity, duration) corresponds to a *consequence* rating, as follows:

Combined score (A+B+C)	3 – 4	5 – 6	7 – 8	9 – 10
Consequence rating	Minor	Moderate	Major	Massive

STEP 1 EXAMPLES

(Note, there are no units of measurement attached to the example impacts, so they should be viewed as illustrative examples only)

Soil erosion during project construction:

Extent	Intensity	Duration	**Consequence**
Local 1	Medium 2	Short-term 1	Minor 4

Pumping of wastewater into the ocean during project operation:

Extent	Intensity	Duration	**Consequence**
Wider catchment 2	High 3	Medium-term 2	Major 7

Degradation of a cultural heritage site:

Extent	Intensity	Duration	**Consequence**
Local 1	High 3	Long-term 3	Major 7

Storm surge and flooding of a development and surrounds, closing down operations:

Extent	Intensity	Duration	**Consequence**
Wider catchment 2	High 3	Medium-term 2	Major 7

STEP 2

Assess the *probability* of the impact occurring according to the following definitions:

Probability – the likelihood of the impact occurring	
Improbable	Unlikely to occur during project lifetime < 20% chance of occurring
Possible	May occur during project lifetime 20%–60% chance of occurring
Probable	Likely to occur during project lifetime > 60%–90% chance of occurring
Highly probable	Highly likely to occur, or likely to occur more than once during project lifetime > 90% chance of occurring

STEP 2 EXAMPLES

Soil erosion during project construction:

Probability
Probable

Pumping of wastewater into the ocean during project operation:

Probability
Possible

Degradation of a cultural heritage site:

Probability
Highly probable

Storm surge and flooding of a development and surrounds, closing down operations:

Probability
Probable

STEP 3

Determine the overall *significance* of the impact as a combination of the *consequence* and *probability* ratings, as set out in the matrix below:

		PROBABILITY OF OCCURRENCE			
		Improbable	Possible	Probable	Highly probable
CONSEQUENCE OF IMPACT	Minor	VERY LOW	VERY LOW	LOW	LOW
	Moderate	LOW	LOW	MEDIUM	MEDIUM
	Major	MEDIUM	MEDIUM	HIGH	HIGH
	Massive	HIGH	HIGH	VERY HIGH	VERY HIGH

STEP 3 EXAMPLES

Soil erosion during project construction:

Consequence	Probability	**Significance**
Minor	Probable	LOW

Pumping of wastewater into the ocean during project operation:

Consequence	Probability	**Significance**
Major	Possible	MEDIUM

Degradation of a cultural heritage site:

Consequence	Probability	**Significance**
Major	Highly probable	HIGH

Storm surge and flooding of development and surrounds, closing down operations:

Consequence	Probability	**Significance**
Major	Probable	HIGH

STEP 4

State the level of *confidence* in the assessment of the impact as high, medium or low. The level of confidence will depend on the extent and type of information available, whether it is qualitative or quantitative, and whether it is based on direct measurements, extrapolated data, estimations or expert opinion.

STEP 4 EXAMPLES

- Soil erosion during project construction – *high*
- Pumping of wastewater into the ocean during project operation – *medium*
- Degradation of a cultural heritage site – *high*
- Storm surge and flooding of a development and surrounds, closing down operations – *high*

STEP 5

5(a) – identify and describe practical mitigation measures that can be effectively implemented to reduce the impact.

5(b) – assume mitigation measures have been implemented and reassess the impact, by following steps 1 to 4 again. The point of the second assessment is to examine how impact extent, intensity, duration and/or probability are likely to change, after mitigation measures have been put in place.

STEP 5 EXAMPLES

Soil erosion during project construction:

	Extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Without mitigation	Local 1	Medium 2	Short-term 1	Minor 4	Probable	LOW	High
Mitigation measures: • Preparation of a site-specific erosion and sediment control plan (ESCP) • ESCP to include measures such as: minimising land disturbance and clearing the smallest area of land practicable; staging the land clearing activities to minimise area exposed at any one time; installing a silt fence along the boundaries of the construction site; managing surface flows upstream of the project area; vegetating topsoil stockpiles as soon as possible; checking erosion and sediment controls daily and after rain							
With mitigation	Local 1	Low 1	Short-term 1	Minor 3	Improbable	VERY LOW	High

Pumping of wastewater into the ocean during project operation:

	Extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Without mitigation	Wider catchment 2	High 3	Medium-term 2	Major 7	Possible	MEDIUM	Medium
Mitigation measures: • On-site wastewater collection and storage • Wastewater to be transported to provincial wastewater treatment facility • Monthly inspections of wastewater storage structures and transport vehicles to ensure there are no leakages • Inspection of wastewater storage structures and transport vehicles following extreme weather events							
With mitigation	Wider catchment 2	Low 1	Medium-term 2	Moderate 5	Improbable	LOW	Medium

Degradation of a cultural heritage site:

	Extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Without mitigation	Local 1	High 3	Long-term 3	Major 7	Highly probable	HIGH	High
Mitigation measures: • Alert local chiefs of discovery of cultural heritage artefacts • Safely collect cultural heritage artefacts, with approval and guidance from local chiefs and the assistance of an archaeologist, and provide artefacts to the national museum • Provide long-term (50 years) financial support for upkeep of the cultural heritage exhibit at the national museum, based on recommendations from local chiefs							
With mitigation	Local 1	Medium 2	Long-term 3	Moderate 6	Highly probable	MEDIUM	Medium

Storm surge and flooding of a development and surrounds, closing down operations

	Extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Without mitigation	Wider catchment 2	High 3	Medium-term 2	Major 7	Probable	HIGH	High
Mitigation measures: • Essential buildings and infrastructure to be set-back 100 m from coast and built on raised platforms • Revegetation of coastal zone with mangroves and other native vegetation • Generator to be on-hand for back-up power							
With mitigation	Wider catchment 2	Medium 2	Short-term 1	Moderate 5	Probable	MEDIUM	Medium

STEP 6

Summarise all the impact assessment ratings in a single table that can be included in the executive summary or concluding section of an EIA report.

STEP 6 EXAMPLES

IMPACT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Soil erosion during project construction	Minor	Probable	Low	High
With mitigation	Minor	Improbable	Very low	High
Pumping of wastewater into the ocean during project operation	Major	Possible	Medium	Medium
With mitigation	Moderate	Improbable	Low	Medium
Degradation of a cultural heritage site	Major	Highly probable	High	High
With mitigation	Moderate	Highly probable	Medium	Medium
Storm surge and flooding of development and surrounds, closing down operations	Major	Probable	High	High
With mitigation	Moderate	Probable	Medium	Medium