

# **ENVIRONMENTAL RISK ASSESSMENT**

## **AN INTRODUCTION TO THE SPREP RISK ASSESSMENT TOOLKIT**

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***SOLOMON ISLAND ENVIRONMENTAL MANAGEMENT WORKSHOP***

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# HAZARD AND RISK

## HAZARD

A hazard is anything that could cause harm or may have an impact on humans or the environment. E.g. chemicals, electrical cables.

## RISK

- Risk, is a combination of two things – the chance that the hazard will cause harm and how serious that harm could be.
- The outcome of a hazard or a hazardous event

## IMPACT

The consequences or effects on the environment, communities, or valued components as a result of an event or activity.



# ENVIRONMENTAL RISK ASSESSMENT

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Risk assessment is the process undertaken to identify evaluate and apply mitigation and control measures to the potential environmental risks of a proposed development.

Risk assessment methodologies have been developed to provide a structured approach to the analysis of safety hazards.

They allow a systematic assessment of the management options to minimize the risk to workers and the public.

# RISK ASSESSMENT IN EIA

- Risk assessment is a scientific process that is evaluates the following criterion
  1. Consequence of an impact
  2. Probability of an impact occurring
  3. Significance of an impact.
- Risk assessment applies throughout the EIA Process.



1. Screening



2. Scoping



3. Impact Assessment and Mitigation



4. Impact Management



5. EIA Report



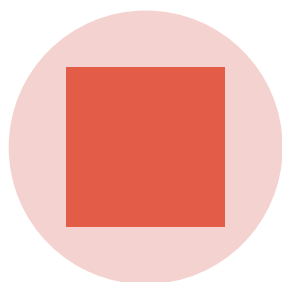
6. Review and Decision



7. Monitoring

# WHY RISK ASSESSMENT?

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Identify relevant potential direct and indirect consequences of the identified impacts and determine their associated likelihood.



Quantify and qualify risks to identify key environmental issues that require detailed assessment and management responses



Provide transparent and auditable guidance in decision making for mitigation prioritisation and escalation.



Helps government and stakeholders to understand why particular management measures need to be put in place

# RISK ASSESSMENT METHODOLOGY FOR EIA

Leopold Matrix

Environmental impact / Elements of the environment	Regime modification	Surface transformation	Urbanization and structures on the surface	Changes in vehicle traffic	Pollutant movement	Use of chemicals	Extraordinary hazards and accidents
Soil	2	1	3	4	4	1	2
Water	1	1	4	4	3	1	2
Atmosphere	4	1	4	5	4	1	2
Land use	3	1	1	1	1	1	1
Qualities of the landscape	2	1	1	1	1	1	1
Infrastructure	1	1	3	2	1	1	1

Rapid Impact Assessment Matrix (RIAM)

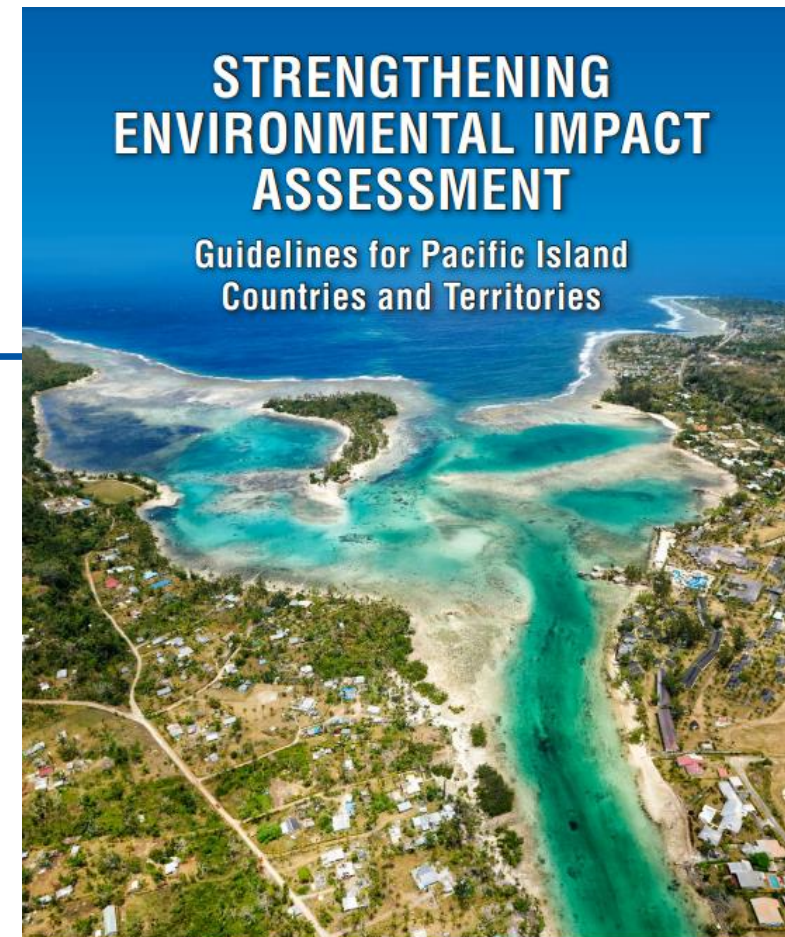
Environmental Score	Range Bands	Description of Range Bands
+72 to +108	+E	Major positive change/impacts
+36 to +71	+D	Significant positive change/impacts
+19 to +35	+C	Moderately positive change/impacts
+10 to +18	+B	Positive change/impacts
+1 to +9	+A	Slightly positive change/impacts
0	N	No change/status quo/not applicable
-1 to -9	-A	Slightly negative change/impacts
-10 to -18	-B	Negative change/impacts
-19 to -35	-C	Moderately negative change/impacts
-36 to -71	-D	Significant negative change/impacts
-72 to -108	-E	Major negative change/impacts

- Battelle Environmental Evaluation System
- Checklists
- SPREP Risk Assessment Method

# RISK ASSESSMENT STEPS

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1. Impact identification and analysis
2. Impact characterization
3. Impact significance
4. Impact mitigation
5. Level of confidence
6. Impact summary



# STEP 1: IMPACT IDENTIFICATION AND ANALYSIS

## A. Extent – the area over which the impact will be experienced

Rating	Definition of Rating	Score
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



# STEP 1: Impact identification and analysis

**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**

Rating	Definition of Rating	Score
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; increased traffic on local roads	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; clearance of village food gardens; 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

# STEP 1: Impact identification and analysis

**C. Duration – the timeframe over which the impact will be experienced and its reversibility**

Rating	Definition of Rating	Score
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

# STEP 1: IMPACT IDENTIFICATION AND ANALYSIS

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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 2: IMPACT CHARACTERIZATION

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

Probability rating	Definition
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 3: IMPACT SIGNIFICANCE

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 4: Confidence

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.

## 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: IMPACT MITIGATION

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- a) identify and describe practical mitigation measures that can be effectively implemented to reduce the impact.
- 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 6: IMPACT SUMMARY

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

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