

Appendix 1: Oman EIA Guidelines

The Oman's Environment Impact Assessment (EIA) guidelines are a set of regulations and procedures established by Oman to systematically evaluate the potential environmental impacts of proposed projects before they are undertaken. These guidelines aim to ensure that development projects are environmentally sustainable and that environmental considerations are integrated into planning and decision-making processes. The guidelines provide the procedures, criteria, and environmental limits for conducting EIAs for projects within Oman. They cover air, water, noise, waste, biodiversity, and social impacts. Focused on project-level assessments for obtaining environmental approvals, the guidelines specify permissible limits for emissions and waste discharge and set out mitigation measures.

Key Aspects of Oman's EIA Guidelines:

- Scope: Applies to a wide range of projects, including industrial, infrastructure, oil and gas, tourism, and infrastructure developments.
- Process: Typically involves stages such as screening, scoping, preparing the Environmental Impact Assessment report, review by authorities, and approval or rejection.
- Content Requirements: The EIA report must include project description, baseline environmental data, impact predictions, mitigation measures, and monitoring plans.
- Approval: Projects usually require approval from the Oman Environmental Authority, which reviews EIA reports based on established criteria.
- Legal Basis: The guidelines stem from Oman's Law No. 114/2011 concerning the Protection and Development of the Environment, and associated ministerial decisions.

Purpose and Goals:

1. Minimize environmental damage.
2. Promote sustainable development.
3. Protect sensitive ecosystems and resources.
4. Ensure transparency and public involvement in environmental decision-making.

Appendix 2: Dutch EIA Standards

The Dutch Standards refer to the Netherlands' environmental assessment criteria and standards used in EIA processes. Dutch Standards include detailed threshold values for pollutants in air, water, soil, and sediments. Used widely in environmental monitoring and site contamination assessments and known for being strict and precautionary, they are often used as a benchmark for best practice in international studies and environmental consultancy when local standards are lacking.

These standards include:

- Environmental quality benchmarks: Thresholds for pollution levels, noise, emissions, etc.

- Air and water quality standards: Based on EU directives and national regulations.
- Biodiversity and habitat protection criteria: To safeguard protected species and ecosystems.
- Impact threshold levels: To determine the significance of impacts and necessary mitigation.

Comparison between Oman's EIA Guidelines and Dutch Standards:

Aspect	Oman's EIA Guidelines	Dutch Standards
Scope	Broad, covers various sectors with flexibility depending on project size and type	Specific thresholds for pollution, noise, and ecological criteria based on EU and national regulations
Framework	Emphasize comprehensive assessment, public participation, and mitigation	Focuses on strict environmental quality standards and thresholds for impact evaluation
Standards Basis	National environmental policies, local context, and international conventions	EU directives, Dutch laws, and scientific research
Impact Significance	Determined through qualitative and quantitative analysis, with emphasis on cumulative effects	Based on predefined standards and impact thresholds; impacts exceeding standards are classified as significant
Public Involvement	Mandatory consultation process	Mandatory, with emphasis on transparency and stakeholder engagement

Appendix 3: UK EQS Standards

The UK EQS (Environmental Quality Standards) are legally binding limits established under UK and European environmental law to protect environmental and human health from harmful pollutants. These standards specify maximum allowable concentrations for specific contaminants in various environmental media such as air, water, and soil.

Key Points about UK EQS:

- Purpose: To prevent environmental damage and protect public health by regulating pollutant levels.
- Scope: Covers a wide range of substances including heavy metals, pesticides, and industrial pollutants.
- Implementation: Enforced through legislation like the Water Framework Directive (WFD) and the Environmental Protection Act.
- Examples:
 - Water EQS: Maximum concentrations for pollutants like lead, mercury, and other heavy metals in surface and groundwater.

- Air Quality Standards: Limits for pollutants such as nitrogen dioxide, sulfur dioxide, and particulate matter.
- Water EQS: Maximum concentrations for pollutants like lead, mercury, and other heavy metals in surface and groundwater.
- Air Quality Standards: Limits for pollutants such as nitrogen dioxide, sulfur dioxide, and particulate matter.
- Typical Limits:
 - Lead (Pb): For surface water, EQS limits are typically around $1.2 \mu\text{g/L}$ (micrograms per liter).
 - Mercury (Hg): Limits often set around $0.05 \mu\text{g/L}$ in surface waters to protect aquatic life.
 - Cadmium (Cd): Usually about $1.0 \mu\text{g/L}$.
 - Arsenic (As): Around $10 \mu\text{g/L}$, considering health risks.
 - Chromium (Cr): Total chromium limits may be around $50 \mu\text{g/L}$, with specific limits for hexavalent chromium depending on the medium.

Appendix 4: ISQG and PEL

The ISQG (Interim Sediment Quality Guidelines) and PEL (Probable Effect Level) are standards used to assess the contamination levels of heavy metals in sediments and their potential ecological effects.

(1) ISQG (Interim Sediment Quality Guidelines):

- These are guideline levels indicating concentrations of contaminants, including heavy metals, below which adverse effects on aquatic life are unlikely.
- They serve as preventive benchmarks to protect the environment.
- If contaminant levels exceed ISQG, there is a potential risk for biological effects, and further assessment is recommended.

(2) PEL (Probable Effect Level):

- This standard indicates the concentration of a contaminant, like heavy metals, above which adverse effects on aquatic organisms are likely to occur frequently.
- PEL levels are higher than ISQG levels and are used to identify areas where remediation or caution is needed.
- Comparison with other standards:
 - TEL (Threshold Effect Level): Levels below which adverse effects are unlikely; often used alongside PEL and ISQG.
 - Canadian Sediment Quality Guidelines: Similar to ISQG and PEL, providing threshold effect levels for various contaminants.
 - EPA (Environmental Protection Agency) standards: Include guidelines like ERL (Effects Range Low) and ERM (Effects Range Median) for sediment contamination, similar in purpose to ISQG and PEL.
 - International standards and local regulations: May vary in acceptable concentration thresholds depending on legal and environmental policies.

In summary:

- ISQG = Lower threshold, safe levels for most exposures.
- PEL = Higher threshold, levels at which adverse effects are more probable.

- They are part of a tiered approach to environmental assessment, often used together to evaluate contamination risks.

Appendix 5: USEPA Standards

The United States Environmental Protection Agency (USEPA) sets regulatory limits for heavy metals in various environmental media such as water, soil, and air, with the primary goal of protecting human health and the environment from neurological damage, organ toxicity, cancer risk, and ecosystem degradation. USEPA uses a rigorous human health and ecological risk assessment framework, often more conservative than some international guidelines. USEPA standards are legally binding within the U.S., whereas other guidelines (e.g., WHO drinking water guidelines) may be advisory and require national adoption. USEPA often sets separate standards for different environmental media (e.g., drinking water vs. surface water vs. soil), while some international bodies may focus only on one medium. USEPA periodically reviews and updates standards based on the latest scientific evidence, sometimes resulting in stricter limits than older or less frequently updated guidelines. USEPA incorporates regional and local exposure scenarios, which can make the standards context-specific compared to generalized global guidelines.

These standards are based on toxicological data, environmental persistence, and bioaccumulation potential. USEPA standards specify the maximum allowable concentrations of heavy metals such as lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), nickel (Ni), and others. These standards are derived from human health risk assessments, ecological risk evaluations, and scientific evidence on chronic and acute toxicity. Examples of USEPA Maximum Contaminant Levels (MCLs) in Drinking Water

- Lead: 0.015 mg/L
- Arsenic: 0.010 mg/L
- Mercury: 0.002 mg/L
- Cadmium: 0.005 mg/L
- Chromium (total): 0.100 mg/L