Environmental Protection Authority

Land

Environmental Factor Guideline

Terrestrial Environmental Quality

The objective of the factor *Terrestrial Environmental Quality* is:

To maintain the quality of land and soils so that environmental values are protected.

Purpose

The purpose of this guideline is to communicate how the factor *Terrestrial Environmental Quality* is considered by the Environmental Protection Authority (EPA) in the environmental impact assessment (EIA) process.

Specifically, the guideline:

- defines the factor *Terrestrial Environmental Quality* and explains the associated objective
- describes terrestrial environmental quality considerations for EIA
- discusses the environmental values supported by terrestrial environmental quality, and the significance of those values
- describes issues commonly encountered by the EPA during EIA of this factor
- discusses the impacts that can occur to terrestrial environmental quality and the environmental values supported by terrestrial environmental quality as a result of a range of activities
- provides a summary of the type of information that may be required by the EPA to undertake an assessment related to this factor.

What is terrestrial environmental quality?

For the purpose of EIA, the EPA defines *Terrestrial Environmental Quality* as:

> *The chemical, physical, biological and aesthetic characteristics of soils.*

Soils are the layer of organic and inorganic weathered material that accumulates at the Earth's surface.

The environmental objective for the factor *Terrestrial Environmental Quality*

The EPA's environmental objective for the factor *Terrestrial Environmental Quality* is "to maintain the quality of land and soils so that environmental values are protected".

The objective recognises the fundamental link between soil quality and the protection of ecological and social values that good soil quality supports. Therefore, the focus of this factor and its associated objective is how changes to soil quality impact environmental values.

Considerations for Environmental Impact Assessment

Considerations for EIA for the factor *Terrestrial Environmental Quality* include, but are not necessarily limited to:

- application of the mitigation hierarchy to avoid or minimise impacts to terrestrial environmental quality, where possible
- the environmental values supported by soil quality which are potentially impacted, and their significance
- the contaminants of concern and potential pathways through which soil quality may be impacted, and the associated risks to values supported by good soil quality
- the significance of the potential impacts in the context of the location, regional cumulative impacts, and other relevant issues discussed in this guideline
- that all risk modelling, analyses, mapping, testing and proposed management are undertaken to a standard consistent with recognised published guidance and appropriate accreditation
- the current state of knowledge and the level of confidence in predicting the residual environmental impacts
- the risk to environmental values should the predictions be incorrect
- whether proposed mitigation is technically and practically feasible.

Environmental values related to Terrestrial Environmental Quality and their significance

Environmental value is defined under the *Environmental Protection Act 1986* as a beneficial use, or an ecosystem health condition.

The beneficial uses of good quality soil are primarily agriculture, maintaining drinking water quality, recreation and cultural values. Ecosystem health values that are supported by soils include biodiversity, water quality, and seed banks.

Issues

The following issues are matters that are commonly encountered by the EPA due to the nature of proposals that are referred to it. Background on these issues is provided here to help proponents and the community engage with EIA. This issues section will be updated from time to time to reflect new issues as they arise in referrals and EIA.

Land use practices causing erosion impacts to soil quality

Erosion occurs through soil being blown or washed from the land. It is a natural process that usually occurs at low rates and is influenced by landforms, climate, soil type, vegetation cover and land use.

Erosion can be accelerated by vegetation clearing, crop cultivation, fires, earthworks and

livestock grazing. Severe erosion leads to poor soil structure in remaining soil, reduced water infiltration and general loss of soil health.

The erosion of soil can affect biodiversity by stripping native vegetation seed banks from topsoil, and spreading weed seed. Loss of valuable topsoil can significantly reduce productivity of agricultural land, requiring additional soil treatments.

The most significant impacts leading to erosion are from land use practices that increase exposure and vulnerability of soils through vegetation clearing. Where these may arise from the implementation of a significant proposal, strategic proposal or planning scheme, they may be considered by the EPA in EIA.

Land use practices causing salinity impacts to soil quality

Agricultural areas of Western Australia have historically been extensively cleared of native vegetation. The loss of these deep-rooted plants has allowed the groundwater levels to rise, bringing with it large quantities of salt stored deep in the soil, causing 'dryland salinity'.

Agricultural practices of excessive irrigation and leakage from irrigation channels also causes groundwater levels to rise, bringing salt to the surface, causing 'irrigation salinity'.

Salinisation is having a significant effect on biodiversity through the direct loss of plant species, and the associated loss of mammals, birds, subterranean fauna, and other animals which depend upon a healthy ecosystem. Salinisation may also affect the quality of drinking water supplies.

Activities that may significantly exacerbate dryland or irrigation salinity may be matters for consideration in EIA.

Acid Sulfate Soils

Acid sulfate soils occur naturally in Western Australia and are not considered an issue when left in a waterlogged, undisturbed environment. Disturbance through drainage or excavation can cause the iron sulfides in the soils to react with oxygen and water to produce iron compounds and sulfuric acid. These can release other substances, including heavy metals, into the surrounding environment and waterways.

Where developments are proposed in areas with acid sulfate soils, then acid sulfate soils assessments should be carried out prior to disturbing soil or altering groundwater levels. Care should be taken to manage activities with the potential to disturb acid sulfate soils to avoid serious environmental harm.

Agricultural practices causing impacts to soil structure and quality

Soil structure requires a very long time to develop but can be changed rapidly by land use practices.

Agricultural practices such as large scale irrigation can significantly increase the amount of water passing through a soil profile, as opposed to natural conditions. This can cause the acceleration of mineral weathering, the transportation and leaching of soil material, changes to soil structure, and raising of the local water table.

Intensive cropping and tillage can also expose the soil surface to wind disturbance and erosion, and soil disturbance at depth.

Waste structures, including tailing storage facilities

Many developments require the storage of large quantities of waste derived materials.

Waste structures, including tailings storage facilities and waste rock dumps, can cause impacts to soil quality during operations and/or after operations cease.

Areas of particular interest to the EPA include:

- the appropriate siting of waste structures in a catchment
- the nature of the materials stored in the waste structures, as there is the potential for erosion, oxidisation of acid forming materials, and metals and other elements to impact soil quality
- the 'co-disposal' of large waste rock material in disused pits, which has the potential to create an artificial and unusual soil structure potentially rendering areas of land sterile (while recognising the potential benefits of back filling disused pits)
- the availability of suitable material to encapsulate (and neutralise) waste which could cause soil contamination
- the design, monitoring, and management of waste structures to avoid environmental impacts, taking into account appropriate standards.

Impacts of development activities

Development activities that have the potential to impact on *Terrestrial Environmental Quality* include, but are not necessarily limited to:

- clearing of deep-rooted remnant native vegetation in agricultural areas prone to salinity and erosion
- excessive irrigation and leakage of irrigation channels
- intensive tillage
- waste rock and tailings disposal
- disturbance to acid sulfate soils
- industrial land uses such as refineries, chemical storage, blending, and manufacturing, etc
- land use practices causing soil contamination.

Information required for EIA

Where *Terrestrial Environmental Quality* has been identified as an environmental factor the EPA may require the proponent to provide information or studies within the following broad topics:

- baseline information on soil quality
- chemical and physical characterisation of waste materials
- the mitigation, management, and rehabilitation practices at a catchment and local level which may include:
  - strategies to address salinity, such as the protection of native vegetation, rehabilitation of degraded native vegetation and reafforestation and tree planting, particularly in areas of high recharge, pasture maintenance, cropping management, and management of salinity affected areas
  - current site contamination classification, or acid sulfate soil risk information and proposed avoidance, management or remediation methods
  - proposed amelioration of damage to soil structure.

Environmental Protection Authority 2016, *Environmental Factor Guideline: Terrestrial Environmental Quality*, EPA, Western Australia.

This document is available in alternative formats upon request.

National Relay Service
TTY: 133 677
(To assist persons with hearing and voice impairment)

More information

Office of the Environmental Protection Authority
Level 8, The Atrium
168 St Georges Terrace
Perth WA 6000

Locked Bag 10,
East Perth WA 6872

p: 08 6145 0800
e: info@epa.wa.gov.au
w: www.epa.wa.gov.au