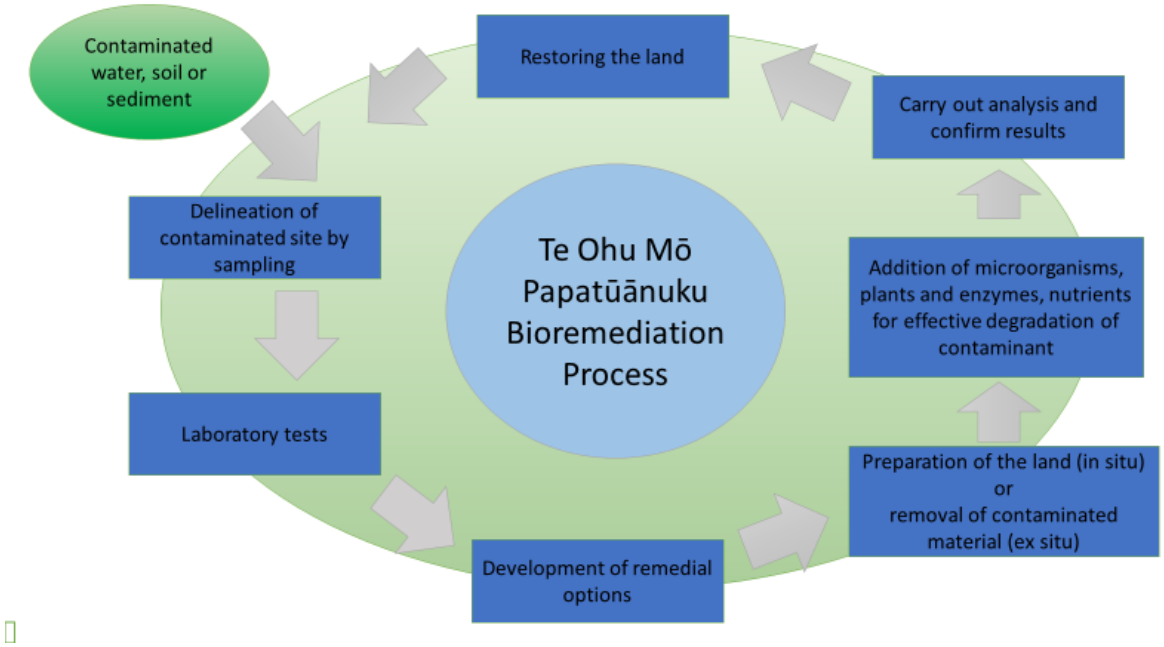
Bioremediation



What is Bioremediation?

Bioremediation is the use of living organisms (bacteria, fungi, plants) to break down or degrade contaminants. The goal of bioremediation is to detoxify contaminants, converting them to non-hazardous products that are no longer harmful to humans and the environment.

Biological organisms underpin bioremediation and have the ability to restore contaminated water, soil, or sediment to its original state.

How does bioremediation work?

- In-Situ Bioremediation – remediation carried out at the site of contamination.
- Ex-Situ Bioremediation – physical removal of contaminated material to another location for treatment.

Bioremediation can work in different ways:

Biotransformation – the bioremediating organism modifies the contaminant to another chemical end-product. If the end-product is a mineral (CO_2, H_20, salts) the process is called mineralisation.

Biodegradation – the bioremediating organism extracts energy/nutrients from organic matter (including organic contaminants) which is subsequently degraded. Contaminants that appear similar to organic matter are degraded in a similar way. Dioxin, for example, is attacked by lignin-degrading microorganisms.

The success of bioremediation depends on:

1. The contaminant – Co-contamination can be a problem for bioremediation
2. Environmental conditions – available moisture, oxygen, nutrients, pH, temperature
3. The living organism/s used in bioremediation process

The presence of contaminated soil at wood waste sites may represent a risk to human and environmental health. Bioremediation technologies such as fungal-based remediation and phytoremediation (described in separate fact sheets) have potential to be less expensive than physical or chemical remediation methods. Past research has shown that a combination of treatments (fungal-based remediation and phytoremediation) is highly effective in degrading dioxin-contaminated sediment from the Kopeopeo Canal (Whakatane, New Zealand). Used in synergy, the combination of treatments enhances natural attenuation of dioxin in the environment.

Bioremediation will generally take many years to reduce contaminants to background levels. The time is dependent on the initial contamination concentration; the size of the area; and environmental conditions.

Is it safe? The microbes are safe; the chemicals added to stimulate bioremediation are safe and are commonly used in gardens/agriculture; and progress is measured regularly to ensure effectiveness and efficiency.