BACTERIA-ASSISTED PHYTOREMEDIATION

TO CURE SOILS AND GROUNDWATER CONTAMINATED WITH ORGANICS
Phytoremediation: The Solar Powered Pump and Treat and Biostimulation

**Pump and treat**

...is a common method for cleaning up contaminated groundwater with dissolved chemicals. Groundwater is pumped from wells to an above-ground treatment system that removes the contaminants.

Trees can **pump 200 liters** of groundwater **per day** and in this way attract high amounts of contaminants. This process is completely solar powered. Moreover, some of these trees such as poplar and willow are phreatophytic, meaning their roots always reach the groundwater, even on e.g. 10m depth.

**Organics can be degraded** by plants and their associated bacteria. The **plant** itself often has different strategies to cope with organics (going from sequestration, transformation to degradation). The **plant-associated bacteria** are from nature present allover (on and inside) the plant. Next to the well known pathogenic bacteria, beneficial bacteria are ubiquitous. These bacteria can promote plant growth and development and might even be able to degrade the organic contaminants. They are localized in the plant’s transport system (xylem vessels), which can act as a catalyst to degrade the contaminants.

**Biostimulation**

The term “biostimulation” is often used to describe the addition of electron acceptors, electron donors, or nutrients to stimulate naturally occurring microbial populations.

Planting a tree increases the **rhizosphere effect**: microbial populations are strongly stimulated in the rooting zone due to the root exudates acting as additional carbon sources. Introducing a tree also strongly contributes to an improved aeration of the soil, stimulating aerobic degradation processes.

By planting a tree, you get a lot for free!
THERE IS A REVERSE TO EVERY MEDAL...

In case of natural phytoremediation, the degradation capacity remains uncontrolled. The degradation efficiency is affected by the plant species as well as by the present micro-organisms. If degradation fails, plants might suffer from phytotoxicity and volatile contaminants can be transported from the soil and groundwater through the leaves to the atmosphere.

ADDITIONAL BACTERIAL ASSISTANCE
To guarantee an efficient degradation

In order to ensure an efficient degradation, bacteria with the appropriate characteristics are enriched inside the plant by means of inoculation.

The ideal bacteria to inoculate are bacteria that
- are capable of degrading the desired contaminant,
- are living in the rhizosphere and/or inside the plant,
- and have plant growth promoting traits

In case of bacteria-assisted phytoremediation, all trees are provided with a drainage tube in their rooting zone when they are planted. In this way, the trees can be enriched with these ideal bacteria by inoculation
- before planting the trees and
- after the root system reached the groundwater

Evapotranspiration measurements guarantee there are no significant amounts of contaminants transported to the atmosphere.

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MORE INFORMATION?

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