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Remediation of cyanide-contaminated industrial sites through woody biomass production

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Due to the unfavourable chemical and physical soil quality parameters and the potential presence of contaminants, former industrial sites can hardly be utilized as arable land and can thus be classified as marginal areas. Still, as far as possible, they can effectively be used for the production of alternative energy, including the cultivation of fast growing trees. Apart from being a source of bioenergy, trees might facilitate the stabilization, remedation, contaminant extraction and degradation and, not on the last place, to enhance soil quality improvement on former industrial areas. This process is known as phytoremediation and has successfully been applied on industrial sites of various organic and inorganic contamination. The former manufactured gas plant site (∼2500 m2) "ehemalige Leuchtgasanstalt" Cottbus, contaminated, among others, with iron cyanides undergoes phytoremediation with simultaneous biomass production since 2011. The project "Biomass-Remediation" is fully financed by the German Railways JSC. A dense (23700 stems/ha), mixed cover of willow (Salix caprea), poplar (Populus maximowicii Henry x Populus trichocarpa Torr. et Gray (Hybrid 275)) and black locust (Robinia pseudoaccacia) trees has been planted on the site. Throughout the five years of remediation, a successful long-term stabilization of the site has been achieved as a result of the nearly outright established tree stock and the dense planting. Annual monitoring of the cyanide levels in the leaf tissue of the trees on the site and results from greenhouse experiments indicate the ability of all tree species to extract and transport the cyanide from the soil. Additonally, the greenhouse experiments suggest that the willows might be able, although not to a full extent, to detoxify the contaminant by splitting the CN moiety. The contaminated biomass material might easily be dealt with through regular harvests and subsequent incineration. Phytoremediation with simultaneous biomass production for bioenergy offers an environmenatlly-friendly and a cost-effective solution of the problem with contaminated former industrial areas in the context of marginal land use options.