TWIRLS
Treating Wastes for Restoring Land Sustainability

Approaches to the remediation of contaminated land

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TWIRLS

LIFE - Environment funded project

Aim: to demonstrate effective re-use of industry and municipal wastes to produce soil-forming materials for restoring degraded land.

Slate Alfred McAlpine
Blaenau Ffestiniog Quarry, N. Wales

UPM Kymmene UK, former Shotton Steelworks, N. Wales

Welsh Assembly Government, colliery spoil and restored sites

NAGREF, SSIA; TITAN Cement Co. S.A., schist quarry, Greece.
TWIRLS DEMONSTRATION SITES

Schist quarry, Kamariza, Athens
Slate quarry, Wales

Former steelworks, Wales
Former colliery, England
Shotton - former steelworks brownfield site

**Problem**
- Low soil organic matter
- Low water-holding capacity.
- Contaminated (VOCs & PAHs).

**Action**
- Add organic matter as composted wastes.
- Co-compost soil to remove contaminants.
- Seed with biodiverse grassland mix.
Co-composting experiment

Contaminated soil, only, composted.
Contaminated soil, green waste + biosolids composted.
Contaminated soil, biosolids + paper fibre composted.
Contaminated soil, green waste+biosolids+paper fibre composted.

In-vessel composting with 80 d aeration, then 120 d maturation
Spread directly back on contaminated land.
Samples analysed prior to composting, at end of maturation and after landspreading (then after 9 mo and 16 mo).
In-Vessel Composting: EcoPOD® system

- Mixing feedstocks
- Filling pods
- Aeration ducting
- Temperature probes for process control
Percentage PAH (USEPA 16) removal after composting and landspreading contaminated soil. Values represent means ± SEM ($n = 6$).
Adding paper fibre (high in labile carbon) to greenwaste results in better composting because it stimulates microbial activity.
Effect of vapour phase solvent flow through soil on glucose mineralization by the soil microbial biomass.

Values represent means ± SEM (n = 3). Akinola, Williamson & Jones, (in prep.)
Effect of vapour phase solvent flow through soil on plant root and shoot length. Values represent means ± SEM (n = 3).
Conclusions

- Covering land polluted with volatile organic compounds may not be sufficient to block the source-receptor pathway;
- Vertical migration of vapour phase solvents through the soil profile is harmful to soil microbial and plant biomass;
- Composting and landspreading processes both resulted in dissipation of PAHs;
- Co-composting contaminated soil with organic material may initially occlude PAHs from dissipation;
- Microbial mineralization studies will evaluate whether organic material facilitates PAH biodegradation in the medium-term.