

Reuse of Metal Impacted River Sediments

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Conference theme number: 2 Circular Economy – sediment as a resource

Introduction: The Coal Authority, Environment Agency and DEFRA are working to address the widespread legacy of contamination from disused metals mines to deliver a cleaner water environment for people and wildlife. One part of the strategy is to construct check weirs within the polluted rivers to capture and subsequently remove metal impacted sediments, thus reducing the contaminant loading in the rivers. The check weirs require regular dredging to ensure they work at optimum efficiency. The dredged sediment was historically disposed to landfill, often as hazardous waste due to the high lead and zinc content. This approach involved transport of the sediment via minor country roads to landfill facilities >100km away. This had a significant carbon impact from lorry emissions and caused severe disruption to local communities to the point where the benefits of improving river water quality were outweighed by the negative impacts. Ramboll challenged the waste classification process to consider the excavated sediment as a resource rather than a waste and developed solutions to reuse the dredged sediment locally and is a perfect example of Circular Economy within contaminated land management.

Methods: Ramboll carried out a sampling, testing and assessment programme to characterise the sediment, including the grain size fractions, metal species, and contaminant concentrations. Ramboll carried out enhanced waste classification and human health and environmental risk assessments to explore options to reuse the sediment in a safe and sustainable way. Ramboll used our SURE tool to perform a sustainable remediation assessment. The SURE tool considers and evaluates the environmental, social, and economic dimensions (i.e., the sustainability) of different remedial options, to help communicate key decision-making factors to stakeholders.

Results:

Potential reuse options were identified which included;

- Using the coarse fraction within gabion baskets to improve river bank stability (photo 1)
- Using the gravel fraction for footpaths (photo 2)
- Using the fine fraction to create a *calaminarian* grassland nursery (plant species tolerant of high concentrations of heavy metals) (photo 3)

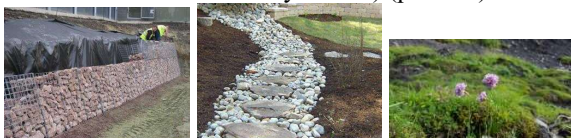


Fig 1 Gabion Baskets, Footpath & Grassland Nursery

Using the detailed risk assessment, Ramboll were able to demonstrate the materials were suitable for these reuse options. The CL:AIRE Definition of Waste: Industry Code of Practice (DoWCoP)¹, allows the reuse of the dredged sediment as a construction material for development projects. To reuse materials through the DoWCoP approach requires the waste producer to establish lines of evidence to demonstrate:

- i) Protection of human health and the environment;
- ii) Suitability for use without further treatment;
- iii) Certainty of Use; and
- iv) Quantity of Material.

Ramboll demonstrated these factors to the EA's satisfaction, thus avoiding tortuous waste regulations. By using the DoWCoP approach, material which was previously being sent to hazardous landfill could be reused safely and sustainably locally to create the enhanced biodiversity grassland feature. This approach was untested and although the principals of the project followed common sense and science, the key element of the project was to adequately demonstrate suitability of use and give the Regulator confidence to consider the excavated sediment as a resource rather than a waste.

Conclusion: This is an excellent example of contaminated land management practices that enhance soil health and local biodiversity, whilst reducing the negative economic, social and environmental impacts associated with the previous approach. This project demonstrates a safe, sustainable and circular use of excavated sediments. The mitigation solutions used were simple, easily implemented and required little technology or specialist equipment. This work aligns with the vision of the EU Soil Strategy for 2030 and also contributes to the UN Sustainable Development Goals:



Fig. 2: UN Sustainable Development Goals

6 and 14 – Improving river water quality by removing lead and zinc contaminants from the rivers

9 – Using detailed modelling and risk assessment to allow the reuse of dredged sediment under DoWCoP

11 – Reuse of sediment avoiding transport, landfilling and the need for virgin materials in construction.

15 – Enhancing the biodiversity in specific areas by preserving and expanding the *calaminarian* grassland.

Acknowledgements: UK Coal Authority, UK Environment Agency and UK Department of Environment, Food and Rural Affairs

References: [1] CL:AIRE et al. (2011) *Definition of Waste: Industry Code of Practice* Version 2 March 2011