RENGENERATION OF BROWNFIELD USING SUSTAINABLE TECHNOLOGIES (ROBUST)

Dr Karen Johnson[1] and Clare Bambra[2]

[1]School of Engineering, Durham University, Science Laboratories, South Road, Durham, DH1 3LE, UK, [2]Department of Geography, Durham University, Science Laboratories, South Road, Durham, DH1 3LE, UK

EPSRC

Introduction

The Government has created unprecedented demand to recycle brownfield land (estimated to be 300,000 ha by the Environment Agency). Novel solutions are required to remediate both high-value brownfield land, where a large proportion of new builds will take place, and also low-value brownfield where, whilst there are few financial incentives to remediate, there are negative effects on community health and wellbeing. There is a pressing need for novel low-cost sustainable technologies to make both low and high-value brownfield land safe.

"*Low-value brownfield sites have a disproportionately deleterious effect on the health and wellbeing of local communities and we desperately need new technologies to deal with them*"

Prof. Paul Syms, English Partnerships, February 2008

ROBUST will pioneer the use of 'waste' to provide low-cost sustainable technologies, which are resilient to the effects of climate change and suitable for the remediation of low and high-value brownfield land.

Vision

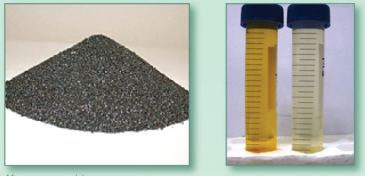
The sustainable technologies in ROBUST involve using 'waste' products from industry. The 'wastes' are actually valuable minerals which have excellent soil remediation properties; these minerals such as manganese oxide are already naturally present in soil and form a large part of the soil's natural defence system against man-made pollution. These minerals will be added to the brownfield land and will help transform organic contaminants such as petrol into harmless by-products and immobilise any metal contaminants deep within the ground. Using 'waste' products means sending less to landfill and extracting smaller quantities of primary aggregates all of which makes our society more sustainable.

Engineering science can provide novel solutions for contaminated land remediation but the technologies on their own will not be effective unless they are accepted by Society. ROBUST will build an interdisciplinary team of engineers who will engage with social science and public health to incorporate stakeholder and community perspectives on the use of these novel 'waste' technologies to remediate contaminated land. Such a collaborative approach is critical if the long-term regeneration of land is to be environmentally and socially sustainable and therefore have a potential impact on the community's sense of wellbeing and health (Maas *et al*, 2006).

Aims and Context

1. Development of novel 'waste' remediation technologies which are resilient to the effects of climate change

Manganese oxide is naturally present in the soil and forms part of its natural defence mechanism against contamination. Natural manganese oxide minerals are available in significant quantities as 'waste' from the UK water industry and from mining sources internationally. Manganese oxides have the potential to both immobilise metals and to oxidise organic contaminants and this proof of concept work is currently being carried out at Durham (EP/E0441/17). These natural manganese oxides can be added to soil to remediate the land.



Manganese oxide

2. Development of terahertz spectroscopic techniques for improved data collection

Terahertz radiation (far infra-red spectrum) corresponds well to the vibrational and rotational modes of many contaminants. The new technique will allow real-time data collection from the treated soils at both the nano and macro-scale in order to understand the fundamental processes operating at the molecular scale and to provide adequate data for validation of our computer model.

3. Development of combined hydro-geochemical mechanical finite element computer model

ROBUST will develop a model which reduces uncertainty in ascertaining how these remediation technologies will react to various climate change scenarios, specifically flooding. There are few state-of-the art models of contaminant transport which combine geomechanical, hydrogeological and hydrogeochemical elements and even fewer which incorporate all three with both inorganic and organic contaminants. All of these factors are essential to model brownfield remediation for new builds.

4. Incorporating stakeholder perspectives and the impact on health and wellbeing of local communities

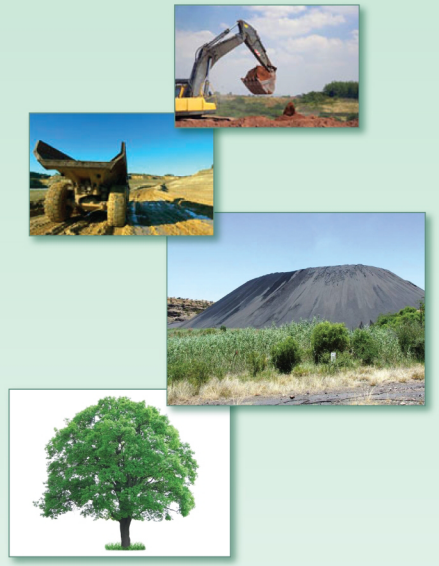
ROBUST will engage with local communities in regenerating brownfield sites. By training engineers in the multi-disciplinary skills required ROBUST can provide a platform whereby stakeholders can understand and help to develop safe methodologies for brownfield regeneration. We have developed strong links with the necessary partners to help engage communities in the regeneration of their locality. Public engagement activities including school visits and focus groups on issues around brownfield site investigation and 'waste' will be used. ROBUST is specifically interested in understanding the public perception of risk (with regard to health and wellbeing) associated with contaminated land before and after treatment. Additionally, the ROBUST team will also assess the risk and liability associated with the community-led regeneration process (working with the Health Protection Agency, Environment Agency and Local Authorities).

5. Evaluating the success of ROBUST and assessing the transferability of the methodology

ROBUST will pilot the novel technologies on a real low-value brownfield site in Easington; the site will be near low socio-economic communities as low-value brownfield sites pose a very real and current problem for these local communities. This piloting will form a sound platform from which to assess transferability of the methodology to high-value brownfield land for future new builds in the 21st Century.

Dissemination and Exploitation

Dr Johnson will create a new international forum for discussing brownfield regeneration issues which will involve policy-makers, local and national government organisations and authorities. This will take the form of a series of workshop events which will invite members of the brownfield academic community, regulatory and industry stakeholders and members of the public. Findings will also be disseminated in a wide range of journals, at conferences and in industry-targeted literature as well as the local press. The aims of ROBUST have public engagement at their very heart as brownfield regeneration is frequently unsuccessful without it (Eiser *et al*, 2007).



References

Eiser J.R. et al. (2007). Risk perception and trust in the context of urban brownfields. *Environmental Hazards* 7(2),150-156.

Maas, J. et al. (2006). Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health*, 60, 587 - 592.

Contact Details

Karen Johnson: karen.johnson@durham.ac.uk

Clare Bambra: clare.bambra@durham.ac.uk

Durham University