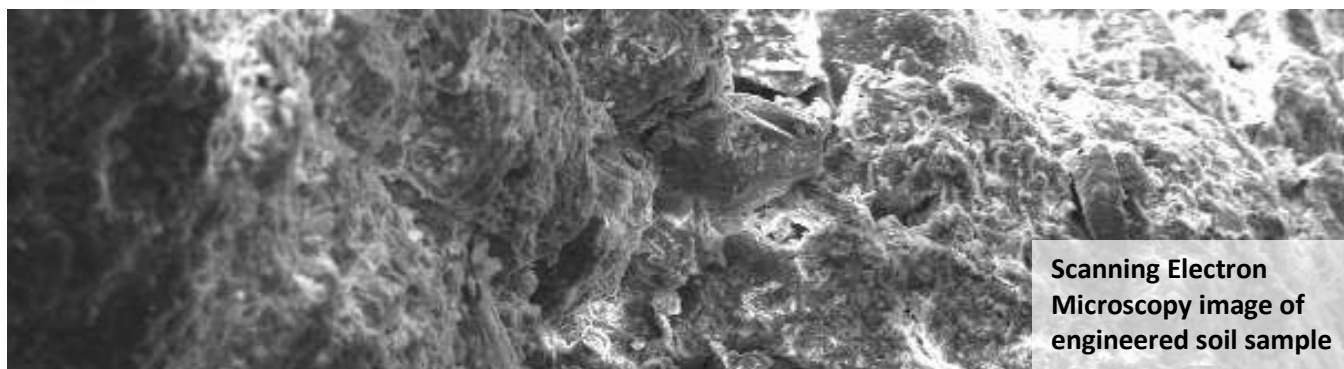




Sustainable Urban Carbon Capture:
Engineering Soils for Climate Change



EPSRC
Pioneering research
and skills



**Scanning Electron
Microscopy image of
engineered soil sample**

SUCCESS NEWSLETTER Spring, 2016

Special points of interest:

- Dr Ehsan Jorat carried out laboratory measurements on engineered soil samples and conducted cone penetration tests (Below right)
- Dr Mark Goddard needs your help with a short [survey](#) on the ecosystem services of brownfield land
- Dr Ben Kolosz is currently developing a multipurpose inorganic soil carbon prediction tool for eventual public release

Prof David Manning (PI) and Dr Saran Sohi (Co-I)



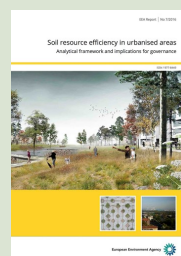
SUCCESS is now well and truly into its second season – in terms of the activity we see while plants are growing, from the point of view of the field work associated with the project. It is still early days to see results coming through, so like gardeners we must be patient. But we are using this current year to engage with stakeholders who are interested in using carbon capture as a design function for the soils that they manage.

One example is the Sill (www.thesill.org.uk), where we hope that a carbon capture function will become

part of the landscaping and roof design of this iconic building in Hadrian's Wall country. The concept of carbon capture as a service provided by urban soils has been accepted by the European Environment Agency in its report "Soil resource efficiency in urbanised areas - analytical framework and implications for governance", edited by Geertrui Louwagie. This is a major

can be found [here](#).

In addition to our work in Britain, we are contributing to the International Geological Congress in Cape Town in August 2016, with an oral paper in a session on 'Man-Made Strata and Pollution', where we stress that such land can have a positive, carbon capture, function. Finally, urban soils have hit the headlines in the House of Commons Environmental Audit Committee report on Soil Health [here](#). Importantly, the report reminds us that the UK Government has signed up to the COP21 commitment to raise soil carbon to 0.4%. The research we are doing in SUCCESS provides one of the mechanisms needed to do this.



report that will shape policy relating to urban soils, and



“How can urban carbon capture influence geotechnical engineering?”

*Dr Ehsan Jorat
Geotechnical
Engineering*

From the geotechnical engineering perspective three main objectives of the SUCCESS project are as follows:

- i) Build research demonstration plots, using artificial materials (slag, cement-based) and quarried natural rocks (basalt, dolerite).
- ii) Identify existing ‘live’ sites suitable for investigation of the process and monitor carbon capture at the sites.
- iii) Measure the effect of carbonate precipitation on physical, chemical and geotechnical properties of the soils at the carbon capture site con-

structed in Morpeth.

The experimental work associated with the first and second objectives were explained briefly in the autumn 2015 SUCCESS [Newsletter](#). Regarding the third objective, three series of in-situ Cone Penetration Test (CPT) and undisturbed substrate sampling were conducted in May and October 2015 and May 2016. Comprehensive physical, chemical and mechanical tests were conducted on the substrate samples collected in May and October 2015. Comparison of carbon analysis between these dates showed a general potential to sequester CO₂ within the first six month of the construc-

tion, the highest rate of 2.79 tCO₂ha⁻¹a⁻¹ measured in a plot containing crushed concrete. Significant increase in shear strength was observed in samples collected in October compared with the collected samples in May based on in-situ CPT and laboratory shear test results.

The next physical, chemical and mechanical tests are scheduled for summer 2016, with a focus on comparing CPT results to undisturbed substrate samples collected this May.

“Which benefits of brownfield land are important to you?”

*Dr Mark
Goddard
Urban Ecology*

**We need your help with the
SUCCESS Ecosystem
Services Survey!**

The SUCCESS project is investigating the ability of previously developed vacant urban land (known as ‘urban brownfield’ land) to capture CO₂ from the atmosphere and store it in the soil in mineral form as calcium carbonate. This carbon capture process is one of many potential benefits (or ‘ecosystem ser-

vices’) that could be provided by urban brownfield soils and we need your help with a survey to help us understand how people from different sectors value these different benefits. Please complete the short online survey [here](#).

The recent [European Environment agency report](#) highlights the multi-functional role of urban soil. The results of our survey will lead to recommendations for maximising the ability of brownfield land to support a range of different benefits simultaneously to different stakeholders.

***“Can Soil Inorganic Carbon (SIC) be accurately predicted?”***

*Dr Ben
Kolosz
Urban Sustainability*

Soil Inorganic Carbon (SIC) prediction is at this moment in time, difficult to estimate. This is mainly due to a lack of research focusing on understanding the dynamics of inorganic carbon precipitation. We are therefore attempting to assess which environmental, physical and chemical variables are the most important to predict SIC formation and to then develop a model aimed at measuring total carbon content using existing

methods such as the Rothamsted Carbon Model to determine biological/organic carbon throughput and exposure. Using data from the wider research area as well as results from SUCCESS, an application will be developed that will allow stakeholders the chance to estimate the carbon capture potential of a given area using simple criteria. The benefit of this will be an increased understanding of inorganic carbon formation and also allowing

stakeholders the chance to understand the potential of engineering soils using different substrates.

I will be attending the [8th international congress of Environmental Modelling and Software](#) in Toulouse, France taking place between the 10th -14th in order to present the initial outline and to seek feedback from academia and industry so I hope to see you there!