Green potential of our industrial past

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Manipulating the soil in urban and industrial areas in order to capture more carbon from the atmosphere is the "best resource we have to begin to mitigate human CO2 emissions", experts claim.

Soil scientists and ecologists at Newcastle University have been investigating ways to maximise the carbon capture and storage in soils on brownfield sites where the land is typically high in mineral waste such as concrete or slag from metal production.

Creating a pilot "Carbon Capture Garden" on Newcastle's Science Central - the site of the former Scottish & Newcastle Breweries in the heart of the city centre – the team is looking at how demolition waste could be used to capture around 20,000 tonnes of carbon from the atmosphere.

Presented at conference today in Edinburgh, the team has shown that by choosing vegetation to suit a specific soil type, we can optimise the carbon sink and potentially offset the carbon footprint of any new development.

The Carbon Capture Gardens project has been funded by the Engineering and Physical Sciences Research Council (EPSRC) through one of their Impact grants.

"Soils are the best resource we have to begin to mitigate human CO2 emissions," explains research lead Professor David Manning, of the School of Civil Engineering and Geosciences.

“We have been manipulating the plant-soil system for thousands of years through agriculture. Now is the time to use that experience to help compensate for the more recent use of fossil fuels by increasing inorganic soil carbon storage through soil engineering.

“Using plants to absorb atmospheric carbon isn’t exactly a new concept - but what we have tried to do here is maximise that potential on land that is traditionally seen as a burden rather than a resource.

“Our study showed that when engineered in the right way, urban soils are able to capture twice the amount of CO2 as that which is absorbed by agricultural soils.”

Soils play a major role in the carbon cycle and global climate regulation. Over the course of a decade, the plant-soil ecosystem can ‘cycle’ all of the CO2 that is in the atmosphere.

Soils capture large amounts of atmospheric CO2 and store this in stable mineral forms. This happens because CO2 from the air, respiring plant roots and decomposing plant material combines with soil minerals to form chemically stable carbonate, effectively a permanent store of soil carbon.

The minerals which are key to this process are calcium and magnesium-rich silicate. These are found in high concentrations in soils that are rich in artificial materials such as concrete or metal slag.

The pilot garden at Science Central was set up to assess the efficiency of carbon capture processes in cement minerals in the presence of different vegetation. Overlain by 1,000,000 tonnes of demolition rubble, a section of the old brewery site was divided into 24 experimental plots and treated in a range of ways from bare rubble seeded with grass and wild flowers to plots treated with green compost and planted with Buddleia

and birch seed.

The team analysed the inorganic and organic carbon in the soil before and after the growing season and initial results show the most effective combination on the site was the green compost – from garden waste – planted with a wildflower mix containing the species of limestone grasslands.

Newcastle University's Dr Pete Manning, of the School of Agriculture, Food and Rural Development, explains: "The aim was to maximise not only the carbon capture potential of the soil but also to encourage biodiversity to sites that are usually occupied by nothing but unwanted weeds.

"There's a great opportunity on sites like these not only to capture carbon but to make green spaces that people can use for inspiration and recreation."

Professor David Manning adds: "A Carbon Capture Garden is a cheap, easy and attractive way of beginning to offset the environmental impact of a development."

Newcastle University is recognised as a leader in sustainability research. Under the banner of "Enough, for all, forever", it has outlined its commitment to solving one of the great societal challenges of our age and the work being carried out at Science Central is part of that.

The team have also set up a number of other carbon capture systems at sites around the UK including the Consett Steel Works in County Durham; Scunthorpe Steel Works, North Lincolnshire and a former Parsons site in Byker, Newcastle upon Tyne.

More information: "Engineering the soil carbon sink: Carbon Capture

Gardens in urban development." D. Manning, P.Manning and E. Lopez-Capel. Presented at "New Techniques and Practical Solutions for Investigating, Remediating and Developing Brownfield Land in Scotland.", Edinburgh, February 2, 2012.

Provided by Newcastle University