Soil sucks up 65,000 tonnes of CO2

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(Phys.org) -- A city-centre site earmarked to become the heart of sustainability research in Newcastle is already playing a key role in mitigating the effects of climate change.

Research carried out by Newcastle and Oxford universities, has shown that Science Central – a 10ha brownfield site in the centre of Newcastle – has already 'captured' around 38,000 tonnes of CO2 from the atmosphere and has the potential to remove a further 27,000 tonnes.

This is estimated to be the same amount of carbon as will be removed from the site in the form of coal during the first phase of the development – a legacy of the former North Elswick Colliery which occupied the site until the 1940s.

Publishing their findings this month in the academic journal *Science of the Total Environment*, the project has been led by PhD student Carla-Leanne Washbourne and Professor David Manning, of Newcastle University in collaboration with Dr Phil Renforth in the Department of Earth Sciences, University of Oxford.

Professor Manning said the results highlighted the potential of urban soils to remove CO2 from the atmosphere.

"Any carbon we release as a result of coal extraction is effectively being cancelled-out by the carbon that has been absorbed by the soil on the site," explains Professor Manning, based in the School of Civil Engineering and Geosciences.

“Urban soils tend to be rich in waste materials such as concrete or metal slag that contain calcium and magnesium. These minerals capture and store atmospheric carbon through the processes of weathering to form carbonates which are chemically stable and a permanent store of soil carbon.

“This means that on sites such as Science Central, we can offset carbon-intensive development through soil engineering.”

Funded by the Engineering and Physical Sciences Research Council (EPSRC) and the Natural Environment Research Council (NERC), the team analysed the geochemistry of the site in order to assess its potential to capture and store carbon as carbonate minerals.

The former home of the Scottish and Newcastle Breweries, the Science Central site is covered by approximately 1 million tonnes of demolition material, spread on the site as a layer of ‘made ground’ from 0.2 to 6.0 m in thickness.

The material onsite originally had an overall carbon capture and storage potential of 65,000 tonnes CO2, equivalent to 18,000 tonnes of carbon or 30,000 tonnes of coal, since most coal is only around two thirds carbon.

Geochemical analysis suggests that within 3 years of demolition approximately 60% of this potential has already been exploited, capturing 37,500 tonnes of CO2 and leaving a remaining capture potential of 27,500 tonnes CO2.

Riddled with old mine-workings, early estimates suggest 30,000 tonnes of coal needs to be removed from the Science Central site – the heart of Newcastle Science City which is a partnership between Newcastle University and Newcastle City Council.

The site is underlain by shallow mine-workings at several levels. In fact, there are more workings at more levels than just about anywhere else in the country.

In these old mines, more than half of the original coal has been left behind, as was the old style of mining where it had to be left in place to keep the roof up.

The vision for Science Central is for the creation of a new urban quarter in the centre of Newcastle which will be an exemplar in sustainability and home to Newcastle University's Institute for Research on Sustainability (NIReS).

Professor Manning said the data from this research provided further evidence of the importance of secondary carbonate mineral formation.

"It suggests that engineered soils could be used for carbon capture and storage with the addition and management of suitable Ca/Mg-rich materials," he explains.

"On a wider scale, the findings demonstrate the potential for a carbon capture and storage value to be assigned to some anthropogenic 'wastes', which could be utilised in helping to develop and support the urban ecosystem. Introducing a carbon capture and storage function in urban soil design can add environmental value with little additional energy input or expense."

Provided by Newcastle University